DEVELOPMENT OF WOMEN AND YOUTH SELF SUSTAINABLE ENTREPRISES WITHIN THE SMALLHOLDER FARMING SECTOR IN LIMPOPO

AE NESAMVUNI













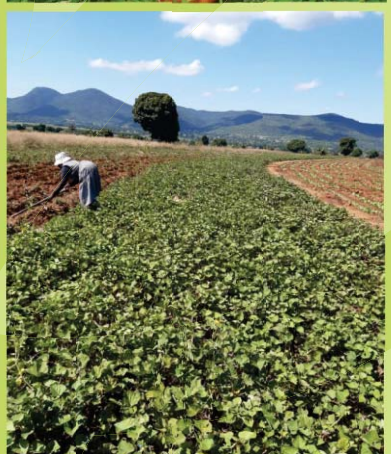

WATER RESEARCH COMMISSION

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DEVELOPMENT OF WOMEN AND YOUTH SELF SUSTAINABLE ENTREPRISES WITHIN THE SMALLHOLDER FARMING SECTOR IN LIMPOPO

Report to the
WATER RESEARCH COMMISSION

by

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EXECUTIVE SUMMARY

A study was carried out with the aim to develop a Sustainable Model for Agricultural Enterprises Led by Women & Youth. The specific objectives were to: (a) Characterize agricultural enterprises led by women and youth (socio-economic, critical success and failure factors, water sources & use, commodities of choice) in Limpopo; (b) Investigate a potential model for multi stakeholder interaction (especially the need for water for ecological and social good) for agricultural enterprises led by women & youth in Limpopo; (c) Investigate the potential commodity production & Value chain by Agricultural Enterprises Investigate the potential commodity production & Value chain by Women & Youth Agricultural Enterprises within the scenarios of different water management systems (rain-fed, irrigation & ecological use groundwater); (d) Develop a model to sustain economic development by enhancing the long-term sustainability of Women & Youth Agricultural enterprise (creation projects, propose new institutions, water management interventions, strategies, and to propose new institutions).

Based on the said four main specific objectives, the following chapters written in paper form were developed: (1) Review of Policies for Development of Enterprises led by Women and Youth for Sustainable smallholder farming in Limpopo Province; (2) Characterization of Women and Youth Smallholder Agricultural Entrepreneurs in Rural Irrigation schemes in Vhembe District, South Africa; (3) The Impact of Multiple Stakeholders on Women & Youth Agricultural Enterprises (W-Y SHAE); (4) Analysis of Multi-Stakeholder: A case of Youth Agricultural Entrepreneurs in Limpopo Province of South Africa; (5) Agroecological characterization of the smallholder subtropical farmers, a case of Vhembe District Municipality Limpopo Province, South Africa; (6) Perceptions on Irrigation Water Supply and Utilisation by smallholder agricultural enterprises in Vhembe District of Limpopo Province, South Africa; (7) Demography of smallholder agricultural women and youth enterprises and their association with the cultivation of selected vegetable crop; (8) Socio-Economic Contribution of Smallholder women and youth Agricultural Entrepreneurs producing selected vegetable crops in the Vhembe District, Limpopo Province of South Africa.

The study was carried out in Vhembe District Municipality of Limpopo Province, South Africa. The specific areas were Madimbo Corridor in Musina and Mutale Valley in Thulamela Local Municipality. The two areas were categorized as independent smallholder agricultural enterprises (SHAE) each with a private water supply in the case of Madimbo and as irrigated smallholders which are served by communal water supply infrastructure in the case of Mutale. The two areas of Madimbo corridor and upper Mutale valley irrigation schemes constitute a total of more than 2270 ha of production area. Stratified random sampling was used to obtain a representative sample of villages and households for interview (Leedy et al., 2005) with target population being women and youth SHAEs.

A two-stage random sampling process was conducted using *SURVEYSELECT* procedure of SAS. The *PROC SURVEYSELECT* allowed for probability-based random sampling where sampling in a category or class depended on the number of units within that class. The sampling was regarded appropriate for handling selection bias. A semi structured household questionnaire was used to carry out a survey with an emphasis on women and youth SHAE. Total number of SHAE interviewed were two hundred and ninety-four (N=294) with a response rate of 75 percent. The sample comprised of 71 youths aged 18 to 35 years old (56 females and 15 males) and 223 women of whom 153 were adults (36-59 years) and 70 pensioners (≥ 60 years old).

The Statistical Package for the Social Sciences (SPSS) version 22 was used to analyse quantitative data. Descriptive statistics included frequency tables and measures of central tendency. Inferential statistics were in the form of chi-square analyses, which assessed the association between major demographic variables (gender, age, education, and income) and vegetable/field crop production, water resources and governance. (Fischer Exact tests were interpreted in cases where the assumptions for chi-square analysis had been violated.) A Bonferroni adjustment was made to prevent a type I error, therefore significance was considered when p <0.013. Qualitative data was analysed using MS-Excel, themes for each question were created according to participant's responses and each response was coded accordingly. (In some cases, these themes were further broken down into one or more relevant sub-themes.)

The study integrated the results of the chapters to contribute to the development of an Agricultural Sustainability Model. The model's components gave a framework for the long-term sustainability of the enterprises led by women and youth entrepreneurs. Four coherent subsystems within which smallholder agriculture operate were considered. These were the environmental, economic, social, and institutional subsystems. Each subsystem's narrative indicated the following:

(1) Enhancing the Long-Term Social Sustainability of W-Y SHAE

In this study only 24.15 percent of the SHAEs were within the ages of 30-34 years, the category likely to understand issues involved in farming and with necessary information regarding climate and business risks. The majority (52.72%) of the SHAE were Adults of the ages between 36 to 59 years and therefor aging. In the same logic over two-third (65.70%) of SHAEs had secondary education which is the level of education with a strong influence on the extent to which a farmer can access. Focussing on women, the study showed that W-Y SHAE were mostly female (94.9%), and adults of 36-59 years (52.72%) with rather little education where 27.84% possessed primary while 39.86% had secondary education.

Most participants (88.65%) were not formally employed (54.61% were self-employed and 34.04% were full-time farmers. W-Y SHAE probably experienced some level of poverty with 68.03% receiving low household incomes (R1 001 to R5 000/month) and 77% dependent on social grants. It was interesting to note that 65.31% of participants stayed in houses with multiple rooms mostly with cement brick walls and corrugated iron roofs (54.42%). They all had access to electricity and possessed a stove and fridge. The majority owned radio (96.67%), digital satellite television (87.45%), and vehicle (65.56%). They all had cell phones except for 6.19% of males. Also, worth noting is the fact that 91.84% of W-Y SHAE participants reported having had an adequate food supply with 79.38% having provided three meals per day. However, the situation was different during hard times where most (49.56%) provided two meals with only 40.27% maintaining three meals. As revealed by participants, the reason for the provision of fewer meals was mostly delayed maturity of farm produce. However, their monthly returns received were above the international minimum poverty lines of R900.00 and had to be supplemented by social grants that consist of child grant and old age grant. The need for addressing challenges related to transformation in line with new policies of government and sourcing of financial resources (budget) cannot be overemphasized. It was recommended that:

(a) Extension Program Coordinating Units be established to mainstream the contribution that External Stakeholders and Government make to smallholder farmers.

(b) Farmer Field schools and other partnership models should be promoted by government for transfer of skills from experienced farmers to youth. In return youth farmers should help transfer technology and information to older farmers.

(c) Farmers should also be provided with content-related education through extension agents and other appropriate means. About 61.7% SHAW-YE were at the level of Adult Basic Education & Training (ABET), indicating low level of education for most women farmers.

(d) Government should enhance skills training on-farm to SHAW-YE to complement the farmers experience with cultivation of vegetables.

(e) About 45.8% of the SHAW-YE earned less than R5000.00, compared with 50.7% earning more than R5000.00. Markets channels and access should be promoted for SHAW-YE to enable throughput of vegetables to not only informal but also fresh produce and retail markets.

All the demographic indicators suggest that government support for W-Y SHAE should be continued for the following social reasons:

(a) The sector offset the challenge of food security for the rural poor (92% having adequate food supply and 79.4% able to provide three meals per day), the returns on investment to this sector should not just be measured in economic returns but the social stability that indirectly create opportunities for economic growth through agricultural value addition.

(b) Food security also create a base for broader human capital development, at school youth with adequate meals perform better at school compared to hunger-stricken youth.

(c) The sector is a major creator of employment for rural communities – the study showed that 88.65% of W-Y SHAE were not formally employed, 54.61% were self-employed and 34.04% were full-time farmers. This is a major contribution that stabilises provinces such as Limpopo and the informal economic boom in Vhembe District.

(d) The level of income also manifested not only in profits or returns from farming but the total livelihood of the W-Y SHAEs households. They were reported to stay in well-built multiple roomed houses (65.3%), the majority owned radio (96.67%), digital satellite television (87.45%), and vehicle (65.56%). They all had cell phones except for 6.19% of males. These facts indicate that the W-Y SHAE are all set for a digital platform of the future.

(e) Lastly, the indicators are very favourable for government in terms of political stability in an environment of Covid-19 and the need for the economy to recover.

(2) *Enhancing the Long-Term Environmental Sustainability of W-Y SHAE*

The geo-physical attributes showed that Madimbo Corridor varied from Arid and Semi-arid whereas the Mutale Valley varied from Semi-Arid to Sub-humid. An Arid area was characterized by a severe lack of water resources to the extent of hindering the development of plants and vegetation. The study area had variable precipitation with low rainfall (at most 460 mmpa) received by villages along the Madimbo Corridor and medium to high rainfall (701 to 1 380 mmpa) received by those along the Mutale Valley. The annual maximum temperatures ranged from 38.1℃ to 44.0℃ (Madimbo Corridor) and 30.0℃ to 40.0℃ (Mutale Valley). The study area relied on surface water supplemented by groundwater which was utilized more at Madimbo Corridor compared to Mutale Valley. The area was characterized as semi-arid to sub-humid, hence technologies for efficient use of irrigation water should be promoted for long term sustainability. Similarly, investment needs to be made for groundwater exploration and exploitation where necessary.

Evidence of the study showed that W-Y SHAE based in the Madimbo Corridor (Ha-Gumbu, Malale, Masea, Ngwele, Tshipise, Masea and the Musina-Nwanedi) villages use more underground water to supplement the surface water river systems than the Mutale Valley (Tshiombo, Matangari, Maraxwe). The Madimbo Corridor varies from Arid and Semi-arid whereas the Mutale Valley varied from Semi-Arid to Sub-humid. The smallholder farmers are allotted conformant to their agroecological requirements. However, the prime agroecological variable defines the spatial distribution of the smallholder subtropical farmers in the water resource. The potential of the smallholder farmers is restricted by the low adoption of surface water resources. The adoption of the gravity-driven irrigation system holds the potential to amplification of the smallholder sector. The geo-physical character meaning the predominance of arid to semi-arid of the area of study meant that there was a lack brought

forth by the prevalence of the evapotranspiration to the rate of the precipitation. Agricultural production in this category is impossible with the exception where there is irrigation. Cristal issues identified as components of Agricultural Sustainability towards the long-term sustainability of W-Y SHAE were the following:

(a) Most of the W-Y SHAE cultivate the crops in winter when the micro-climate permits and gives the W-Y SHAE a competitive advantage of high temperatures in winter to grow major horticultural and field crops ahead of the rest of the country. The sustainability of the sector can be improved through the adoption of the smart intercropping system even for Sub-tropical Fruit Trees.

(b) W-Y SHAE uses pesticides for their crops with risks that needs to be mitigated. Considerable evidence links pesticide uses to chronic health problems in farmers, and pesticides are known to bio-accumulate in soil and water and be very harmful to ecosystems and wildlife. Fresh produce vendors, meanwhile (a group that includes many farmers), are often unaware of the potential health risks to consumers or themselves.

(c) The results of the study indicated that in both winter and summer mainly women participation was higher at (38.4%) and (50.0%), respectively. The second category of participation was exclusively women in winter (45.2%) and summer (38.1). These results re-affirms that women make essential contributions to agriculture and rural agricultural enterprises. However, it should be noted that there is much diversity in women's roles and over-generalization undermines policy relevance and planning.

(d) Although surface water was generally perceived as the most used (55.4%), groundwater (used by 44.2% of SHAEs) was also an important source of irrigation water; groundwater was regarded to have better supply quantity compared to surface water while also being always available

(e) Irrigation scheduling was generally based on intuition and practices of rotation without being backed by science-based information for long terms sustainability, there will be a need for Research-Extension-Farmer linkages to develop irrigation scheduling depending on crops.

(f) Competition for irrigation water seemed to be an issue although not yet at the level of causing major conflicts among the SHAEs the model that supplement surface water resources with groundwater is recommended.

(3) Enhancing the Long-Term Economic Sustainability of W-Y SHAE

The participation of SHAW-YE in Agriculture through vegetable production was significant measured by the irrigated land under Tomatoes, Okra and Butternut. The levels of income broadly indicate a contribution to the informal economy which is mostly rural. From a policy perspective there should be an ongoing support, especially the commercialization of W-Y SHAE, and continued support to link produce to the market channels such as retail shops, fresh produce market and processing facilities.

The objective of cultivating the selected vegetables was mainly for selling – re-emphasizing the fact that SHAW-YE are indeed market oriented, but with loose value chains. There seems to be an optimum utilization of natural resources such as compost and manure combined with inorganic fertilizers. This creates an environment of low cost with an effort to maximize production with less. From a policy perspective there should be continued support to W-Y SHAE with Input Support Policy ILIMALE-TSEMA. Tomato seems to be an appropriate winter crop based on the agro-ecological and economic indicators of the study. Similarly, Okra seems to make a better contribution as a summer crop than tomatoes. These results re-affirms that women make essential contributions to agriculture and rural agricultural enterprises. For long-term sustainability the Agricultural Model is recommended for adoption. Limpopo and Gauteng Department of Agriculture, through ENVIRO-GIS, have already developed basic frameworks for use in land and commodity suitability models for smallholder farmers.

(4) Enhancing the Long-Term Institutional Sustainability of W-Y SHAE

The stakeholders regarded as key for success of smallholder production of subtropical fruits and indirectly by W-Y SHAE in the study area were Limpopo Department of Agriculture and Rural Development (LDARD), South African Mango Growers Association (SAMGA), Agriculture Research Council (ARC) and National Agriculture Marketing Council (NAMC).

The roles of these four stakeholders were also to provide information perceived by 100% of the respondents. As for challenges, the main issue reported for stakeholders were: SAMGA – (probably lack of) transformation (95% of respondents), ARC – (lack of) budget (82%), NAMC – (lack of) budget (47%), and LDARD – standard of extension officers (10%) and budget (9%). For long-term sustainability the following needs to be considered:

(a) Increased production of subtropical fruits by W-Y SHAE in the study area requires clarification of the roles of each of the stakeholders to the farmers. Strategies should be developed to strengthen the knowledge base of each stakeholder in accordance with confirmed roles as this will enable the stakeholders to improve their contribution to increased production and transformation of the subtropical fruits industry.

(b) Stakeholders should be assigned leadership of tasks based on their roles and knowledge base to avoid unnecessary duplication and conflicts. The need for addressing challenges related to transformation in line with new policies of government and sourcing of financial resources (budget) cannot be overemphasized.

(c) Stakeholders as individuals seem not to provide solutions for the multiplicity of agricultural challenges. Respondents regarded certain combinations of these stakeholders to be important, namely: SAMGA, ARC, and NAMC (28%), SAMGA, LDARD, and ARC (27%), SAMGA and ARC (18%), SAMGA, LDARD, NAMC, and ARC (11%). The four stakeholders were regarded as key by 100% of the respondents because they all provide information to W-Y SHAE. For instant, SAMGA and LDARD provide information on farming, ARC provide information on research and NAMC provide information on marketing. Information plays an important role, and it is a valuable resource because it guides W-Y SHAE for effective decision making in their farms.

(d) Extension Program Coordinating Units be established to mainstream the contribution that External Stakeholders and Government make to smallholder farmers.

The analysis from this study conforms with the theoretical advances that states that the sustainability concept must extend to social, institutional, and economic sustainability and not exclusively environmental sustainability. The W-Y SHAE practices must be profitable and socially and culturally suitable and must satisfy local requirements such as property rights over natural resources.

It was clear from our study and our experience as part of the community that W-Y SHAE had several constraints in terms of ownership mainly (1) weak relationships with other stakeholders resulting in limited access to information, (2) lack of access to funding, and (3) poor land tenure. What also emerged from this study was that the sustainability model components are not in themselves sufficient to explain the complete complexity of the situation of W-Y SHAE. It was more the association of variables and the interaction of the independent component with each other that forms the model of sustainability. The terminology adopted in this report associated Agriculture and the independent components for example Social elements, thus become Agro-Social component. Similarly, for Economic element became Agro-Economic, for Environmental – Agro-Environmental, for Institutional – became Agro-Institutional. Arising from, the same associations are established terminologies that were developed through individual elements with each other for example Social and Economic elements were closely linked. Same could be argued for Social and Institutional, Social and Environmental.

W-Y SHAE depend on natural available water bodies. This study investigated the water issues in detail, inclusive of developing a model for crop suitability based on the use of both surface and groundwater. Legally the matter of Water Rights which also correlate to Energy – Electricity access is a great impediment for W-Y SHAE. Policy on this matter especially relating to SHAE needs to be reviewed. W-Y SHAE are renowned for intercropping farming system although that is hindered by the limited land-size (2 ha mean). Some farmers are stuck on crop specialization, where a farmer focuses on a particular crop. The challenges with such a farming system include confining the income generation to the seasonality of the crop, sensitivity to the market price if it becomes saturated, and proneness to total production less through pests. On the other hand, a smart intercropping system ensures that the farmer incorporates crops with variable harvest seasons to ensure that the prospective income generation is spread almost throughout the year.

There is underutilization of the agricultural potential areas throughout the district. Makhado exhibit a significant extent of the untapped avocado potential in Tshakhuma, Beaufort, Mutale B, Halahala, and Ha-Lambani. Citrus also reveals the substantial spatial potential that does not coincide with smallholder operations in Matshavhawe, Dopeni, Lambani, Beaufort, Mutale B, Halala, and Tshitungulwane. Interestingly, Halambani, Nkuzana, Matshavhawe, and Mutale B, show the potentiality for all the selected horticultural and field crops, however there is no farming in the area. One of the greatest challenges of the smallholder farmers is the access to land and the legal framework that prohibits their participation in agriculture. From the survey done as part of this study it was revealed that new applicants cannot be offered a land size above 3 ha. Most of the farmers (70%) acquire their land through permission to occupy (PTO) and the rest (30%) are renting.

The PTO is issued by the Tribal Authorities. However, this institution hardly offers the smallholder farmers a land size that exceeds 3 ha, especially to new farmers. Meanwhile, this form of a certificate does not transfer the land ownership to the applicant, because the land may be redeemed due to incompliance to the bylaws, political reasons, and new development projects. This implies that no ownership security is guaranteed to the farmers. The emerging discussions on Land through Traditional Leadership Forums, House of Traditional Leaders and The National Department of Cooperative Government and Traditional Affairs policy must be considered. An additional challenge that is posed by PTO is that the smallholder farmers are deprived of access to the financial institutions because they cannot provide any form of collateral. Apart from the agroecological parameters, the administrative settings prohibit the development of smallholder farmers. Despite the NDP prescription on the potentiality of the sector in job creation and wealth redistribution, there is still limited funding that has resulted in limited institutional support to the sector and a conducive operational environment.

The project achieved its major objectives in terms of:

(a) Creating a Centre of Excellence with standing networks of academics in SMME, HEI, Science Councils, Government and Farmers.

(b) Human Capital Development: with four Doctoral Students already publishing articles before they graduate.

(c) Dissemination of Knowledge: The total number of publications developed through the project and collaborations funded through the WRC counts to 25. Out of the 25 papers project-based papers were eight (8), being three (3) conference proceeding papers and five (5) publications.

(d) Through the collaborative project a model to predict crop suitability based on both surface and ground water was developed and published as paper number 21.

(e) Developing policy briefs based on the chapters done for support of government initiatives.

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ABBREVIATIONS AND ACRONYMS

ADR	Annual Distribution of Rainfall
AEZ	Agro-ecological Zones
AI	Aridity Index
ARC	Agricultural Research Council
ARC-ISCW	Agricultural Research Council – Institute of Soil, Climate & Water
DAFF	Department of Agriculture, Forestry & Fisheries
DEA	Department of Environmental Affairs
DLUSM	Land Use and Soil Management
FAO	Food & Agricultural Organization of the United Nations
Freq.	Frequency
GIS	Geographic Information System
GPS	Global Positioning System
HVI	Household Vulnerability Index
IPCC	Intergovernmental Panel on Climate Change
Kg	Kilograms
Km	kilometre
LDARD	Limpopo Department of Agriculture & Rural Development
LEI	Livelihood Effect Index
LER	Land equivalent Ratio
LGP	Length of growing period
LUT	Land Utilization Type
LVI	Livelihood Vulnerability Index
LVI-IPCC	Livelihood Vulnerability Index – Intergovernmental Panel on Climate Change
MAT	Mean Annual Temperature
MCDA	Multi-criteria Decision Analysis
MDBSA	Municipal Demarcation Board of South Africa
Mm	millimetres
Mmpa	millimetres per annum
NAMC	National Agricultural Marketing Council
NDVI	Normalized Difference Vegetation Index
NGO	Non-governmental Organization
PDA	Provincial Departments of Agriculture

PTO	Permission to Occupy
SAMGA	South African Mango Growers Association
SAS	Statistical Analysis System
SAWS	South African Weather Service
SMME	Small Medium & Micro Enterprises
SPI	Surface Precipitation Index
SPSS	Statistical Package for Social Sciences
StatsSA	Statistics South Africa
THI	Thermal Heat Index
Tmax	Maximum Temperature
WRC	Water Research Commission
W-Y SHAE	Women-Youth Smallholder Agricultural Enterprises

CHAPTER 1
INTRODUCTION

1.1. Background

Because of the past policy of apartheid before 1994, South Africa is characterized by dualism in all her social and economic sectors. Economically, the dualism is dominated by the minority benefactors of apartheid (predominantly white and males) owning most resources while the majority of the population (predominantly blacks and more so women) was excluded, had the least resources (if any) and suffered the highest level of poverty.

The above sentiments were politely alluded to by the Department of Trade and Industry – DTI (2004) who revealed that South Africa has a history that has brought about many interruptions in the development of enterprises, a racial history that has been particularly associated with the destruction of wealth in black hands in both the rural and urban areas. This has adverse effects on income distribution, entrepreneurship and employment creation.

Accordingly, it is central to government's economic policy that it promotes the development of emerging economic enterprises and diversifies the ownership, size and geographic location of those enterprises (DTI, 2004). Agriculture remains the major hope for success in uplifting the lives of the rural poor who were mostly excluded from meaningful economic participation under apartheid, hence the democratic government has prioritized the sector for her investment programs. As is the case with other sectors, the success of agriculture in addressing the ills of apartheid is at a slow pace, hence the need for reviewing the support programs to identify the cause of lack of desired success. As part of developing a sustainable enterprise model this project has as part of its objective to review the policies, strategies, rules, regulations, and governance programs that impacts on omen & youth Enterprises. The focus is to assess the extent of their adequacy and the level to which they address pertinent issues for development of sustainable youth and/or women led smallholder farming enterprises. Although rigorous planning, appraisal and implementation processes are used for agricultural enterprises creation projects, several issues related to the long-term sustainability of such enterprises are still not fully understood.

During the implementation of numerous enterprises creation and development projects over the past 20 years, it became clear that there are still various challenges affecting the long-term success of the individual enterprises supported. In other words, too many enterprises development projects battle to survive or thrive when grant funding and support ends. This leads to job losses and livelihood to the detriment of society at large.

1.2. Problem Statement

For the past 18 years, the South African public sector has undergone a series of changes in the quest of transforming the institutions to re-orient the government systems to create jobs to the majority of citizens, who, during the past apartheid regime, did not have access to job opportunities in economic sectors. Within the agricultural sector there have been changes to empower the predominantly small-scale farmers into the formal agricultural sector. However, there has been a dearth of information and or results to demonstrate the level of empowerment that these Agricultural Development Programs have made to create jobs. Such programs on a national basis will include but not limited to the now enhancement policies Small Business Development Department, inclusive of the co-operative movement under the SMME domain. There is dearth of information relating to job creation and SMME development within the Agricultural Sector

1.3. Aim of The Study

The aim of the project is to develop a Sustainable Model for Agricultural Enterprises Led by Women & Youth

1.4. Objectives

1.4.1. Characterization of agricultural enterprises led by women and youth (socio-economic, critical success and failure factors, water sources & use, commodities of choice) in Limpopo.

1.4.2. Investigate a potential model for multi stakeholder interaction (especially the need for water for ecological and social good) for agricultural enterprises led by women & youth in Limpopo

1.4.3. Investigate the potential commodity production & value chain by Women & Youth Agricultural Enterprises within the scenarios of different water management systems (rain-fed, irrigation & ecological use groundwater).

1.4.4. Develop a model to sustain economic development by enhancing the long-term sustainability of Women & Youth Agricultural enterprises (creation projects, propose new institutions, water management interventions, strategies, and to propose new institutions)

1.5. Outline of the Report

The report is organized in chapters such that Chapter 1 (this chapter) presented the Introduction, Chapter 2 presents the Research Methodology Chapter 3 presents the Review of Policies for Development of Enterprises led by Women and Youth for Sustainable Smallholder Framing in Limpopo Province, Chapter 4 presents Characterisation of Women and Youth Smallholder Agricultural Entrepreneurs in Rural Irrigation Schemes in Vhembe

District, South Africa, Chapter 6 deals with Agroecological Characterisation of the smallholder subtropical farmers, a case of Vhembe District Municipality Limpopo Province, South Africa, Chapter 7 presents Perceptions on Irrigation Water Supply and Utilisation by Smallholder Agricultural Enterprises in Vhembe District of Limpopo Province, South Africa, Chapter 8 addresses Demography of Smallholder Agricultural Women and Youth Enterprises and their Association with the Cultivation of Selected Vegetable Crop, Chapter 9 deals with Socio-economic Contribution of Smallholder Women and Youth Agricultural Entrepreneurs Producing Selected Vegetable Crops in the Vhembe District, Limpopo Province of South Africa. Chapter 10 gives the Conclusions and Recommendations. The Publications and Capacity Building Report is presented in Annexure 1. The report is structured in such a way that each chapter is a standalone, assumes the form of a publishable manuscript, and is accordingly comprised of items such as abstract, introduction, research methodology, results and their discussion, conclusions, and references. As a result of this structuring of the report, an amount of information was repeated across some of the chapters, and this was necessary to ensure coherence and good flow of the presentation

CHAPTER 2
RESEARCH METHODOLOGY

2.1. Background to The District

Vhembe District Municipality (VDM) is a Category C Municipality, with four local municipalities falling under its authority. The VDM is in the Northern region of the Limpopo Province, and is bordered by the Capricorn and Mopani District Municipalities in the East and West respectively. The Vhembe District is well known for producing fresh produce, with large scale exports highlighting the quality and volumes of produced in the VDM. It is estimated that the VDM produces approximately 4.4% of South Africa's total agricultural output, which includes 8.4% of the country's sub-tropical fruit, and 6.3% of its citrus. Agricultural production in Vhembe is undertaken by a small number of large, highly productive commercial producers, and a multitude of small-scale producers (Vhembe District Municipality, 2018).

According to the Vhembe District Municipality Integrated Development Plan (IDP) 2017/18, it is estimated that 70% of arable land in the VDM is being utilised for commercial agricultural activities, with the remaining 30% being utilised for small-scale production. There are two existing agricultural hubs that have been identified in the Levubu and Nwanedi Valleys, with a third hub in Nandoni still in its planning stages**.** Several different commodities, mainly sub-tropical fruit and vegetables have been identified as key commodities in these agricultural hubs**.** According to the StatsSA 2016 Community Survey, the Vhembe district has a population of approximately 1 393 349, with the total number of households amounting to 382 357 and an average household size of 3.6. An average annual population growth of 1.68% has been recorded. The Vhembe District Municipality is comprised of four local municipalities, which include: (a) Makhado, (b) Thulamela, (c) Musina, and (d) Collins Chabane. The project covers the Limpopo Province in terms of the Agro ecological characterization of the SHSE chapter. The work on the demographic characterization covers Musina and Thulamela Local Municipalities of the Vhembe District. The last chapter of this deliverable on Socio-economic characteristic of street food vending enterprises covers, Musina, Makhado and Thulamela Local Municipalities in the Vhembe district.

2.2. The Study Site in Context

The Nwanedi area, situated within the Musina Local Municipality is known for its vegetable production, specifically tomatoes, butternut, chillies, okra, gem squash, and baby vegetables, as well as watermelons and sweet melons. Based on the initial analysis conducted by the DRDLR several attributes favoured the selection of the Nwanedi area for the study.

These attributes include: (a) The completed Packhouse that can be linked with Farmer Production Support Unit; (b) Close proximity to the state land to the north of Nwanedi; (c)

Reasonable access to surface water in the area (dam and rivers); (d) Close proximity to *Ilima Letsema* projects to the north; (e) Existing smallholder and *Ilima Letsema* projects within Nwanedi, and (f) CASP projects and AVMP farms to the north and south of the proposed site. In addition to the attributes identified by the DRDLR, further research showed a number of existing primary production initiatives focusing specifically on vegetable production being implemented. These initiatives include tomato and baby vegetable production projects supported by ZZ2, the Nwanedi/Timbali technology incubation conjunction with the Seda, LDARD and more. There are number of well-established co-operatives in the region, with the Nwanedi Primary Co-operative playing a key role in primary production and marketing of produce. While the area offers a number of positive attributes, concerns around road connectivity, land capability, low rainfall/high evaporation rates and land restitution claims need to be taken serious note of.

2.3. Nwanedi Pack-House Vs Farmer Production Support Units (FPSU)

The study area links two identified FPSU sites in Thulamela and Tshakhuma as per the DLARD. The FPSU sites cater specifically for field crops (sweet potato, maize dry beans) at Tshiombo and sub-tropical fruits (mango, litchi, avocado and mangos) at Tshakhuma. Tshiombo FPSU is located approximately 67 km away from Nwanedi, while the Tshakhuma FPSU is located approximately 108 km away from Nwanedi.

2.4. Methodology

Study Area

The study was carried out in Vhembe District Municipality of Limpopo Province, South Africa. The specific areas were Madimbo Corridor in Musina and Mutale Valley in Thulamela Local Municipality. The two areas were categorized as independent smallholder agricultural enterprises (SHAE) each with a private water supply in the case of Madimbo and as irrigated smallholders which are served by communal water supply infrastructure in the case of Mutale. The two areas of Madimbo corridor and upper Mutale valley irrigation schemes constitute a total of more than 2270 ha of production area.

2.4.1. Climate

Musina Municipality is one of the areas which is a semi-arid area and it is a sweet veld and that receives an annual rain fall of 250 to 300 mm per year. The area is covered by different type of soil types, but the dominating soil type is sandy and sandy loam soils. Due to low rain fall received annually the soil pH is natural to alkaline. The water sources are Nwanedi River, Sand River, Limpopo River and Boreholes. Farmers throughout the entire municipality

use drip irrigation to irrigate their farms. Farmers control their farms well to prevent veld fire occurrence and they prevent soil erosions. The minimum temperature during winter is 11°C and the maximum winter temperature is 27°C while the minimum temperature during summer is 23°C and the maximum summer temperature is 38°C. Due to high temperature throughout the year, farmers produce their crops during winter seasons while other province cannot produce during cold seasons which make them to get high market Price and in Musina there is no hail and frost occurrence.

2.4.2. Agriculture

Crops which are produced during off seasons are butternuts, Okra, Green Pepper, Chillies, Baby marrow, Green Beans, Patty Pens, Baby Gems, Sweet Melons, Tomatoes, and Calabash. Their Markets are Local (Community, School, Clinics, Hospital and Police Stations), National Markets (City Deep, Tshwane, Durban, springs, Bloemfontein, and Cape Town), International Markets (Zimbabwe, Botswana, and Mozambique).

2.4.3. Farm Profiles

The focus of the profile will be the Nwanedi farms which for a long time were leased from the Department of land affairs. The farms were later claimed and restored back to the Community Property Association (CPA. Most of the farmers are women and youth who obtained farms from their parents. Currently the farms are organised into Enterprises mainly Cooperatives. The aim of those primary co-operative is to buy production inputs in bulk so that they can get discounts from inputs suppliers especially those ones who are far from Musina they will also save on transport because they will buy as a group. Other objective is to have their own inputs supplying company and sell to their members at a discount and to other non-members at a market price. Farming area for members of cooperatives ranges from 5 hectares to 150 hectares per individual.

2.5. Mixed Method Approach

Akinwunmi (2009) referred to this method as “integrating” to mean adding together, “synthesis” for amalgamation, and “multi-method” for more than one method in one. In the main the method combines the quantitative and qualitative approaches in one study (Akinwunmi, 2009; Tashakkori and Teddlie, 1998). The collective understanding of several authors (Akinwunmi, 2009, Onwuegbuzie & Leech, 2006; Johnson and Onwuegbuzie, 2004; Creswell, 2003; Mertens, 2003 and Lincoln & Guba, 1985) is that the approach is more suitable in studies that enable the collection of both quantitative and qualitative data. The collected data, in its nature would demand variables in their nature to explain sophisticated systematic problems and or a phenomenon.

Numerous sources (Creswell, 2002, Tashakkori & Tedlie, 1998, Jick, 1983) identify the genesis of mixed methods in the study of psychology. In this study quantitative data will mainly be the secondary data collected from the case study area at Nwanedi, including among others farmer's data, factory production data, and climate and production data. The approach will point to the SWOTC of the enterprise.

The methods will then guide the enterprise management to develop strategies based on the strength and weakness to sustain the company to a competitive advantage. As argued by Creswell (2003 and 1994), Berg (2001), Locke et al. (2000) and Bogdan and Biklen (2007); the basis of selecting a research method for a research project has to do with the objectives of the study. In the context of the investigation at hand, it was evident that a single dedicated approach will not suffice to answer the research questions appropriately.

The mixed methods research method was then chosen for its flexibility to combine the attributes of both quantitative and qualitative methods (Akinwunmi, 2009; Creswell and Plano Clark, 2007). Some of the identified uses includes (a) triangulation – looking for merging and validation of results from different techniques that investigate the same problem; (b) complementarity – pursuing expansion, design, enrichment and interpretation of the results from one technique with results from a different technique; (c) initiation – determining ambiguities and incongruities that guide the re-designing of the research hypothesis; (d) development – employing the findings from one technique to enlighten the other approach; and (expansion – looking for a broadened study by using diverse approaches for different investigations. All the five uses of mixed methods without exception apply to the current study.

2.6. Data Analytics

2.6.1. Sampling Procedure

Stratified random sampling was used to obtain a representative sample of villages and households for interview (Leedy et al., 2005) with target population being women and youth SHAEs. A two-stage random sampling process was conducted using *SURVEYSELECT* procedure of SAS. The *PROC SURVEYSELECT* allowed for probability-based random sampling where sampling in a category or class depended on the number of units within that class. The sampling was regarded appropriate for handling selection bias.

2.6.2. Data Collection

A semi structured household questionnaire was used to carry out a survey with an emphasis on women and youth SHAE. Total number of SHAE interviewed were two hundred and ninety-four (N=294) with a response rate of 75 percent. The sample was comprised of 71

youths aged 18 to 35 years old (56 females and 15 males) and 223 women of whom 153 were adults (36-59 years) and 70 pensioners (≥ 60 years old).

2.6.3. Data analysis

The Statistical Package for the Social Sciences (SPSS) version 22 was used to analyse quantitative data. Descriptive statistics included frequency tables and measures of central tendency. Inferential statistics were in the form of chi-square analyses, which assessed the association between major demographic variables (gender, age, education, and income) and vegetable/field crop production, water resources and governance. (Fischer Exact tests were interpreted in cases where the assumptions for chi-square analysis had been violated.) A Bonferroni adjustment was made to prevent a type I error; therefore, significance was considered when p <0.013. Qualitative data was analysed using MS Excel, themes for each question were created according to participant's responses and each response was coded accordingly. (In some cases, these themes were further broken down into one or more relevant sub-themes.)

2.7. Validity and Reliability

Validity is the degree to which a measure does what is intended to. This includes both the fact that the measure should provide a good degree of fit between the conceptual and operational definitions of the construct and the instrument should be usable for the purposes for which it was designed. Different types of validity include: (a) face validity which is the extent to which a test is subjectively viewed as covering the concept it purports to measure. It refers to the transparency or relevance of a test as they appear to test participants; (b) Content validity on the other hand refers to the extent to which a measure represents all facets of a given social construct; (c) Construct validity the degree to which a test measures what it claims, or purports, to be measuring and lastly (d) criterion validity is a measure of how well one variable or set of variables predicts an outcome based on information from other variables.

Reliability is the dependability of a measurement instrument that is the extent to which the instrument yields the same results on repeated trials. There are a number of different types of reliabilities: test – retest reliability – instrument administered at different times, equivalent reliability – use of different but equivalent instruments, split half reliability – the instrument split in half to cover different set of questions and internal reliability – also called internal consistency.

Reliability will also be ensured using time series data to check trends and the use of the perceived responses from interviews of the respondents. The questionnaire instrument was subjected to face validity. It was scrutinized by an expert who has been in the field with experience to doing research in competitiveness of agricultural commodities. To ensure

content validity, Porter's model on competitiveness was used to ensure that all five factors are measured in full.

2.8. Ethical Considerations

For this type of research to be conducted, it will be necessary to obtain ethical approval from the Limpopo Provincial Research Ethics Committee. However, carrying out a study of this scale, the researcher has a responsibility to respect the rights, needs, value and desires of the respondents and contributing institutes.

2.9. Ensuring participants have given informed consent

A consent form will be arranged for the respondents and participating institutes to sign before their participation in the study. The participants will be well appraised about the objective of the study, assuring them that the study was only for academic purposes and that their responses will not be used for any other reason. Also, that their identity will be protected as individuals and as institutes or bodies.

2.10. Ensuring no harm comes to participants

Participants will have rights to ask questions and to obtain a copy of the results. That the participant's privacy will be respected and that signatures of the respondents/participating organizations will be solicited.

2.11. Ensuring confidentiality and anonymity

Recognize that the participants' **rights** inclusive of **confidentiality and anonymity** will be protected during the data collection process.

2.12. Ensuring that permission is obtained

The right of each member of the target population to participate voluntarily, to refrain from answering any question they do not intend to answer, to withdraw at any time so that they were not being coerced into participating. Approval to collect data will also be requested form the Department of Agriculture and the Management Structures of the Cooperatives as represented by the Secondary Cooperative Committee.

2.13. Contextualization

2.13.1. Developmental Objectives

The project will be conducted as part of the Agri-Park initiative of the Department of Rural Development and Land Affairs. The strategy of the multi-stakeholders through the

department is to increase employment to the agricultural sector by 1 million jobs: 145000 jobs in the Agro-processing sector, and 300 000 new smallholder farmers thus dovetailing and aligning with developmental objective on Empowerment **of Communities**.

The Second developmental objective to be addressed is (**Sustainable Development of Solutions**) through the development of such Agri-parks based on Land Capability and Commodity Suitability planning.

The Parks will also add an additional one million hectors to production, **The Third** will be informing policy and decision making will be address by a specific Agri-Park based in the Arid zone of Limpopo with high potential to produce vegetables baby marrow, baby carrots, tomato, sweet potato and related indigenous vegetables. **The Fourth** objective will be the aspect of **Climate Change** which will be addressed the River Catchment, Climatic Zones and the Commodity Suitability approaches.

The main Agri-park is based at the Nwanedi River catchment with different climatic zone to its Farmer Support Production Unit at Tshiombo at the Mutale River catchment and Tshakhuma at the Luvubu River Catchments. Tshiombo mainly produces cash crops such as maize, groundnuts, sweet potato, potato and various indigenous vegetables. Tshakhuma is mainly a fruit production area with small irrigation schemes producing a variety of vegetables as Tshiombo. **The Fifth** developmental Objective will be **Human Capital Development** through the Masters and Doctoral studies that will be undertaken by students based at the University of the Free State and University of Venda.

2.13.2. Outcomes and Expected Impacts

The research aims to (a) Promote Sustainable Water Behaviours – In a participatory approach an attempt will be made to investigating how Entrepreneurs at the Agri-Park Nwanedi and its Farmer Support Unit people value water and how to elicit these beliefs and behaviour in order to improve water use. (b) Water Food Energy – Global trends of population growth, rising living standards and the rapidly increasing urbanized world are increasing the demand on water, food and energy. Added to this is the growing threat of climate change which will have huge impacts on water and food availability. It is increasingly clear that there is no place in an interlinked world for isolated solutions aimed at just one sector. In recent years the "nexus" has emerged as a powerful concept to capture these inter-linkages of resources and is now a key feature of policymaking. The Agri-park at Nwanedi presents a good scenario for Water Use for Vegetable Production at different Climatic Zones and (c) Green Village and Economy – The ‘green economy’ is broadly defined as development that

results in improved human well-being, social equity and access to resources while significantly reducing environmental risks.

2.13.3. Knowledge Dissemination and Research Uptake

Knowledge will be disseminated through (a) information sessions and workshops that will be held with the Women and Youth agricultural entrepreneurs. The workshops will be facilitated to be participatory for the project goals to be assimilated by the target group. (b) Results of the study will also be disseminated through scientific papers and articles. Publications will be done to share the project results with local, national and international community and (c) Popular articles in workshops & conferences to disseminate the knowledge with peers in the same fields.

2.13.4. Innovation

The study will apply new knowledge on development small business and empowerment of women & youth.

2.13.5. *Geo-Physical Attributes of Smallholder Agricultural Enterprises Study Area*

Figure 2.1 indicates the spatial distribution of SHAE within villages and the associated spread of boreholes in the study area.

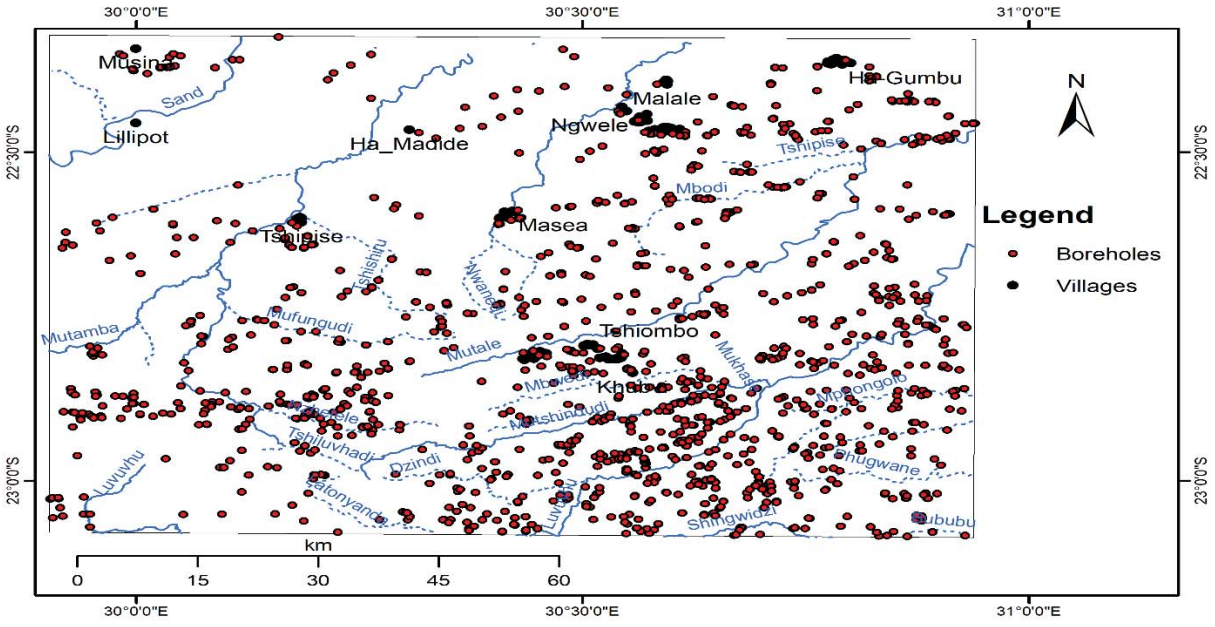

Figure 2.1. Spatial distribution of SHAE within villages, river networks and the associated spread of boreholes in the study area

SHAE based in the Madimbo Corridor (Ha-Gumbu, Malale, Masea, Ngwele, Tshipise, Masea and the Musina-Nwanedi) villages use more underground water to supplement the surface water – river systems more than the Mutale Valley (Tshiombo, Matangari, Maraxwe).

The intensity of the boreholes seems to increase in number in the Mutale Valley more than the Madimbo Corridor. This seems to be a causal effect of the risk of drought and insufficient water during dry periods. Mpandeli and Maponya (2014) reported similar results and concluded that the area falls under the semi-arid zones of the province. Adams (2013) in his extensive study on the potential of underground water to support agriculture and other related sectors also recommended a much broader review of the use of underground water in the country.

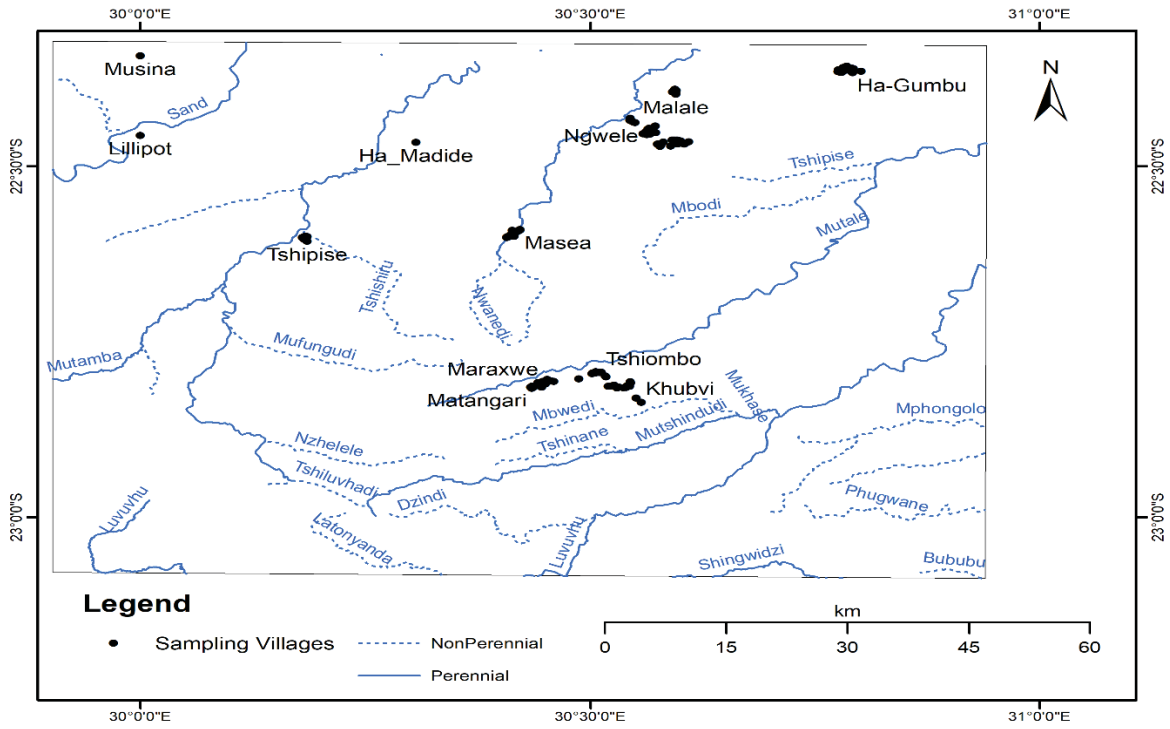

Figure 2.2. Spatial distribution of SHAE within villages and the associated river network in the study area

Figure 2.2 shows the geographic location of the SHAE in relation to the river networks. It is clear that the relative distance of the SHAE interviewed at Ha-Gumbu were far from the river networks. It was also evident from the study that these SHAE relied more on the underground water as indicated in Figure 2.2. The villages of Masea, Ngwele, and Malale are based on the Nwanedi river networks whereas the Tshipise in particular relied on their proximity to the Mutaba river networks. These villages and their respective enterprises developed their irrigation schemes privately. The Mutale Valley Irrigation schemes as per the name depends on the Mutale River for their communal irrigation schemes.

The rainfall pattern in the study area is shown in Figure 2.3. According to Kotir (2011), precipitation is one of the key determent factors for agricultural production in Sub-Saharan Africa because it is a sole source for water supply. It provides the water resource for drinking

and plays a crucial role in rejuvenating the pastures (Omokanye et al., 2018). The mean total precipitation indirectly insinuates the state of the water resources in any given area (Omokanye et al., 2018). Kala (2012), suggests that the amount of precipitation that a particular area experiences, dictates the natures of the agro-ecological setting that shall prevail.

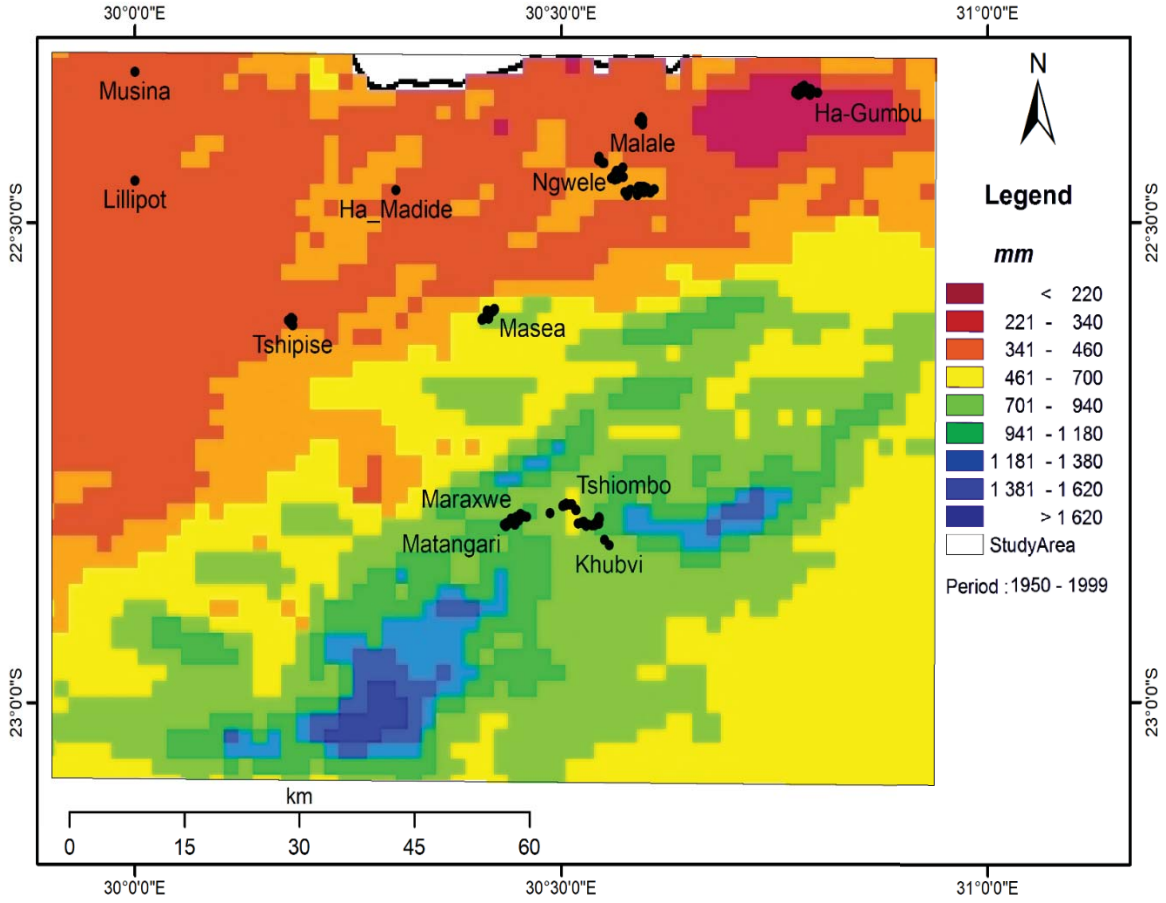

Figure 2.3. Annual rainfall in the Madimbo Corridor villages and the Mutale Valley

The Madimbo Corridor as depicted by the Ha-Gumbu, Malale, Ngwele, Musina, Lillipot, Tshipise and Ha-Madide can be described as arid low rainfall of less than 460 mmpa (Figure 3). Only the villages of Masea have a rainfall between 701 to 940 mmpa. However, the Mutale Valley where our FPSU is based for cash crops and indigenous vegetables has a rainfall that varies from 461 mmpa and above. The irrigation schemes at Tshiombo, Maraxwe and Matangari are well placed for good annual rainfall of 701 mmpa to 1380 mmpa.

The results of the study were confirmed by (Mpandeli and Maponya, 2014) who indicated that Limpopo Province is spatially confined to the arid to semi-arid climatic configurations.

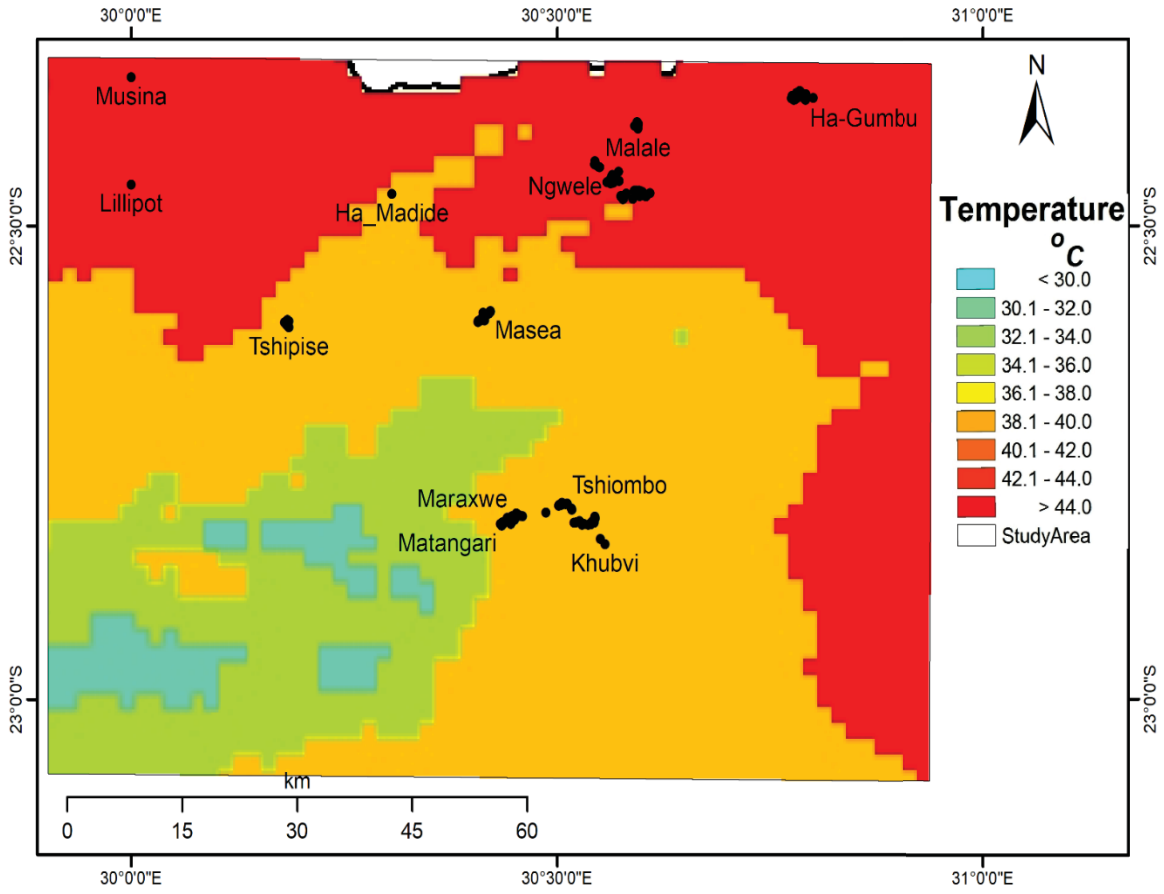

Figure 2.4. Temperature variation in the Madimbo Corridor villages and the Mutale Valley

Associated with the annual rainfall was the annual maximum temperatures of the study area (Figure 2.4). The Madimbo Corridor has temperatures that range from 38.1℃ to higher than44.0℃. In contrary, the Mutale Valley has temperatures that range from less than 30.0℃ to as high as 40.0℃. To complete the geo-physical characterization, an indication of aridity of the study area was essential. Aridity index is a numerical indicator, which denotes the degree of the dryness at a particular location based on the ratio of the evapotranspiration to the precipitation (Derya *et al*., 2009). Maliva and Missimer (2012) define aridity as a lack of moisture and the temporary reduction in the rainfall in an area, meanwhile, the increase in aridity represents a higher frequency of dry years over an area. The aridity indexes that are based on temperature and precipitation are commonly used all over the world (Baltas, 2007, Deniz *et al*., 2011, Croitoru *et al*., 2013, Hrnjak *et al*., 2013, Moral *et al*., 2015). A map in Figure 2.5 portrays the aridity index of the study area.

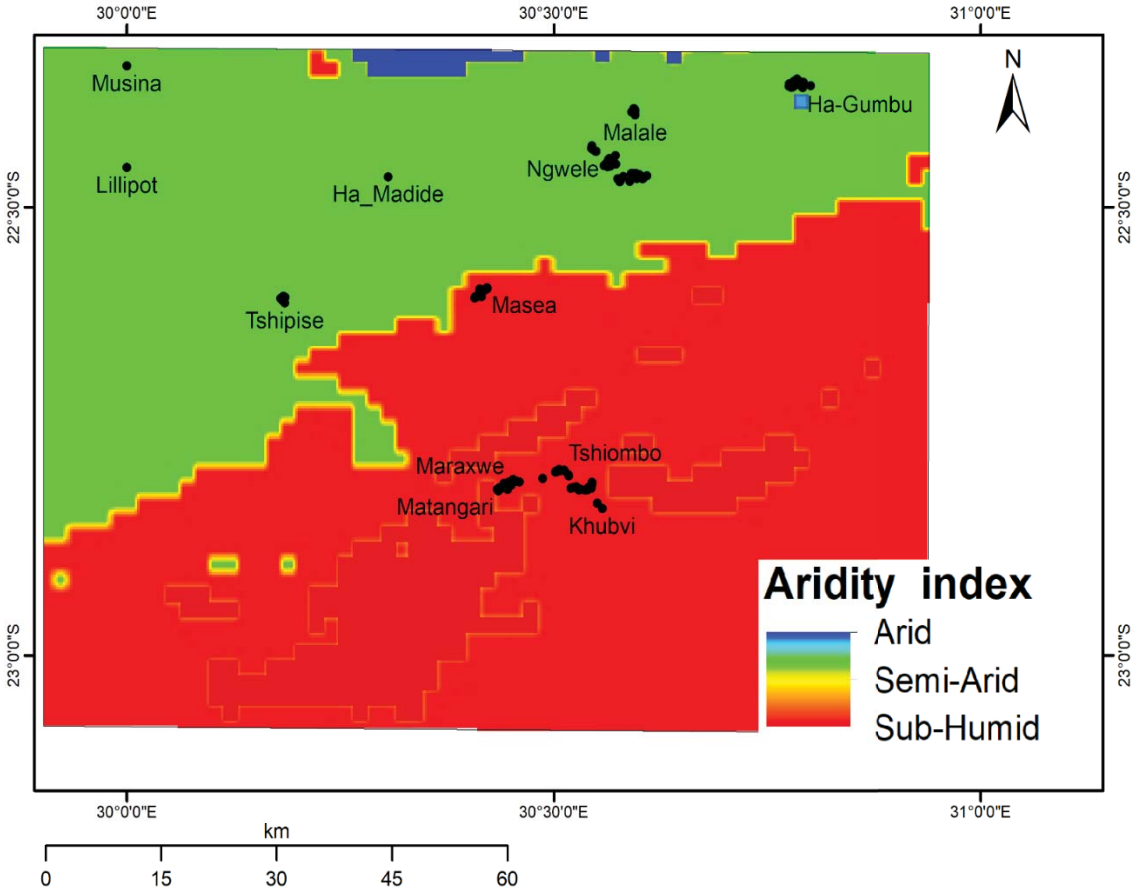

Figure 2.5. Aridity Index in the Madimbo Corridor villages and the Mutale Valley

The Madimbo Corridor varies from arid to semi-arid whereas the Mutale Valley varied from semi-arid to sub-humid. An arid area is characterized by a severe lack of water resources to the extent of hindering the development of plants and vegetation. Such a lack is brought forth by the predominance of the evapotranspiration to the rate of the precipitation (Derya *et al*., 2009). Agricultural production in this category is impossible except for where there is irrigation.

CHAPTER 3

REVIEW OF POLICIES FOR DEVELOPMENT OF ENTERPRISES LED BY WOMEN AND YOUTH FOR SUSTAINABLE SMALLHOLDER FARMING IN LIMPOPO PROVINCE

Abstract: The review of policies for development of enterprises owned/led by youth and/or women for sustainable smallholder farming in Limpopo Province was important to determine the relevance and adequacy of policies that govern (regulate) the establishment and functioning of the farming enterprises. Policy as used in the study included such frameworks as legislations, strategies, rules, regulations, and programmes that regulate the founding and operationalization of the farming enterprises. The review of the policies was a desktop study that was mainly qualitative with regards to data collection, analysis, and interpretation, and allowed for some element of subjectivity. Although other literature was also reviewed, a lot of focus was given to purposively sampled legislations that were regarded important for regulation of the establishment and operation of the smallholder farming enterprises in Limpopo Province. The policies were categorised into founding policies (critical for establishment of the enterprise while also guiding the operation) and support policies (mainly regulating the operation of the enterprise) Research methods used were mainly the literature (document) review with a lot of content analysis performed. Attempt was made to obtain a sense of relevance and sufficiency of legislations by analysing the purpose, important concepts (and their definitions), and the major issues covered by the policy (legislation).

The policy review revealed that there are no committed policies specifically for sole proprietors and partnerships, and those are regulated by all other policies. Also, the review showed that there are a lot of policies in place to regulate the establishment and operation of smallholder farming enterprises in South Africa, including the Limpopo Province. The policies are well detailed with clear stipulations presented for all pertinent issues. The policies seem very appropriate and sufficient to properly regulate (guide) the establishment and operation of smallholder farming enterprises, including those led by youth and/or by women. Provision should be made for policy amendment with time as the situation may not remain the same. Poor performance of smallholder farming enterprises is therefore unlikely to be a result of inappropriate or lack of policy direction.

The study was limited to policy review and did not assess the extent to which these policies are accessed and/or understood by prospective users. Where the policies are available to users, the investigation will determine the reasons for their non-implementation, and where necessary the constraints will be addressed, and policies found to be inappropriate should be amended.

3.1. Introduction

3.1.1. Understanding key concepts

(a) Policy

A policy may be regarded as a formal document or framework in which a government or other institution outlines goals and the guiding principles and strategies for achieving those goals; and gives the authority to undertake actions in pursuit of them. Sound policies should include human and financial commitments, clear timelines, and the roles and responsibilities needed for achieving the stated goals, as well as benchmarks for ensuring accountability. Policies that are developed through consultative, participatory, transparent processes – particularly those that engender ownership among both the implementers and intended beneficiaries of the policy – are more responsive and have a greater chance for effective implementation than those that are not (Health Policy Plus, undated). Policy is a **law, regulation, procedure, administrative action, incentive, or voluntary practice** of governments and other institutions (Centres for Disease Control and Prevention, 2015) and may include programmes, strategies, and rules. Policy decisions are frequently reflected in resource allocations

As mentioned in Health Policy Plus (undated), policy development involves (i) Analysis to identify issues and the root causes of those issues that require policy attention (ii) Clear understanding of the policy goals and the consequences of different policy options (iii) Evidence-informed policy dialogue and stakeholder engagement across all aspects of policy formulation, implementation, and monitoring (iv) Ongoing political will and leadership to put the policy into practice (v) Mobilization of human, financial, institutional, and other resources to implement the policy, including dissemination of the policy to implementers and beneficiaries (vi) Monitoring mechanisms and feedback loops to both assess implementation and to reform policies and implementation approaches Different types of policy exist at different levels.

Various types of policies enlisted by Health Policy Plus (undated) include: (1) Global policies: Normative guidelines, development frameworks and goals, conventions, agreements, financial commitments, human rights instruments, and treaties developed by global bodies (2) National or provincial policies: Constitutions, statutes of parliament, laws, multi-sectoral initiatives, national policies, national development strategies, strategic action plans, cabinet directives, budgets (3) Institutional/agency policies: Strategies and regulations issued by line ministries and departments that specify how laws, decrees, and other high-level policies should be implemented (4) Operational policies: Rules, regulations, codes, guidelines, plans, budgets, and service and administrative norms that governments, organizations, professional

associations, and health facilities use to translate national laws and policies into programs and services.

(b) Enterprise

According to Dobrin (2015), there are multiple criteria for the definition and grouping of enterprises: (i) Form of organization; (ii) Size; (iii) Property subjects; (iv) Field of activity; and (v) Cover area. The first two criteria are elaborated on by way of example. (1) Based on form of ownership, multiple types of enterprises can be defined (Nicolescu & Verboncu, 1999), and those include private companies. The main characteristic of private companies is that their entire patrimony belongs to either one single person or one single group of people. This type of company appeared since early times and, as society developed, its diversity increased. Current realities make possible the existence of multiple private companies all over the world (hundreds of millions of companies). The basic characteristic of private companies is that the establishment and operation decision belong entirely to the entrepreneur, as well as the ownership of the minimum required funds necessary to establish it, the economic and social risks which derive from the development of the company's activities are completely assumed by the entrepreneur etc. If we consider the number of capital owners, private enterprises can be divided into two very important categories: the individual company, which patrimonial belongs to a single individual, is presently the most used for small and medium-sized enterprises; and the group company, which patrimonial belongs to at least two persons. Some of the most frequent forms of group companies are the family company, the corporate company, and the joint stock company.

Another important classification of enterprise types is their size. It must be said that there are multiple parameters which can be used to assess a company's size, but the most frequent one is the number of employees. Its main advantage is the easiness of obtaining information and also the possibility to use it for comparison regardless of economy branch or country. In Europe, companies are divided into: Microenterprises, which have up to 9 employees; Small-sized companies, with 10 to 49 employees; Medium-sized companies, which have between 50 and 249 employees; Large companies, with over 250 employees.

(c) Smallholder farming

Smallholder farmers are defined in various ways depending on the context, country and even ecological zone. Often the term ‘smallholder’ is interchangeably used with ‘small-scale’, ‘resource poor’ and sometimes ‘peasant farmer’. In general terms smallholder only refers to their limited resource endowment relative to other farmers in the sector. Smallholder farmers are also defined as those farmers owning small-based plots of land on which they

grow subsistence crops and one or two cash crops relying almost exclusively on family labour (DAFF, 2012).

As stated by DAFF (2012), smallholder farmers can play an important role in livelihoods creation amongst the rural poor. Even though Smallholder production is important for household food security, the productivity of this sub-sector is quite low. Poor yields may be one of the reasons why urban and rural households either abandon or are uninterested in agricultural production. There is therefore a need to significantly increase the productivity of smallholder farmers to ensure long term food security. This can be achieved by among others encouraging smallholder farmers to pursue sustainable intensification of production through improved inputs. It is a result of the critical role played by smallholder farming that studies of this nature are important.

3.1.2. Rationale of the study

South Africa is characterised by dualism in all her social and economic sectors. Economically, the dualism is characterised by a minority of the population owning most resources while the majority of the population has the least resources (if any) and suffer the highest level of poverty. The above sentiments were alluded to by Department of Trade and Industry – DTI (2004) who revealed that South Africa has a particular history that has brought about many interruptions in the development of enterprises, a racial history that has been particularly associated with the destruction of wealth in black hands in both the rural and urban areas. This has adverse effects on income distribution, entrepreneurship, and employment creation.

Resulting from the, most of the historically disadvantaged business enterprises are smallholders characterised by all the ills described by DAFF (2012). Such smallholder enterprises include those involved in farming, more so the farming units owned by women and those owned by youth. These smallholder farming enterprises are mostly scattered among poverty-stricken villages where the owners live. The enterprises are therefore geographically located in strategic areas when they are needed to alleviate the challenge of poverty also associated with food insecurity.

Accordingly, it is central to government's economic policy that it promotes the development of these smallholder farming enterprises (DTI, 2004). Agriculture remains the major hope for success in uplifting the lives of the rural poor who were mostly excluded from meaningful economic participation under apartheid, hence the democratic government has prioritised the sector for her investment programmes. As is the case with other sectors, the success of agriculture in addressing the ills of apartheid is at a slow pace, hence the need for reviewing the support programmes to identify the cause of lack of desired success. The

purpose of this study was to review the policies to assess the extent of their adequacy and the level to which they address pertinent issues for establishment of sustainable youth and/or women led smallholder farming enterprises.

3.2. Methodology

The concept of 'research method' refers to the techniques used to collect and analyse data. As a result, the method to be used for a particular research problem must always consider the nature of the data that will be collected in the resolution of the problem (Leedy and Ormrod, 2010).

3.2.1. Research approach

The review of policies is a desktop study that is mainly qualitative in nature. Qualitative analysis of data was described by Creswell (1998) who revealed that the process entails: (1) organizing the data where large bodies of text are broken into smaller units; (2) perusing the entire data set several times to have a sense of what it contains as a whole and to note major categories; (3) identifying general categories or themes and classifying them accordingly; and (4) integrating and summarising the data, a step that may include description of relationships among categories. These guidelines were followed in conducting the qualitative analysis of the data in this study.

3.2.2. Research methods

Two complementary methods were mainly used in the review of policies for development of enterprises led by women and youth for sustainable smallholder farming in Limpopo Province, namely: the literature review and content analysis.

3.2.2.1 Literature review methods

Literature reviews are studies that provide an overview of literature in a certain discipline through an analysis of trends and debates. The importance of literature review is that it provides lessons from other researchers on (1) how they have theorised and conceptualized on issues, (2) what they have found empirically and (3) what instrumentation they have used and to what effect (Mouton, 2001). However, the literature reviewed in this study was mainly comprised of policies (inclusive of strategies, rules, and programmes) and hence some of the mentioned lessons may not be applicable.

A review of literature is essentially an exercise where the researcher works from a 'sample' of texts that he/she reads to come to a proper understanding of a specific domain of knowledge. As a result, the sources of the literature must be representative to achieve good

quality review (Mouton, 2001). A comprehensive and well-integrated literature review provides a good understanding of the issues and debates in study, current theoretical thinking and definitions, as well as previous studies and their results.

A literature review can, at best, only summarise and organize the existing knowledge. Even a critical review of the literature cannot produce new or validate existing empirical insights. Although literature reviews often lead to theoretical insights, we still need to undertake an empirical study to test our new insights. The documents subjected to review in this study were mainly policies inclusive of legislations, strategies, rules, and programmes for smallholder farming enterprises with a focus on those owned/led by youth and/or women.

3.2.2.2 Content analyses

Content analysis may be regarded an integral part of literature review where content analyses studies analyse the content of texts or documents. 'Content' refers to words, meanings, pictures, symbols, themes, or any message that can be communicated. The analysis of the texts and documents is a non-reactive method and therefore errors associated with interaction between the researchers and subjects are avoided. Limitations in authenticity of data sources and representativeness of texts analysed may influence the validity of the findings negatively (Mouton, 2001).

Data collection in content analysis entails: (1) identification of the specific body of material to be studied; (2) definition of the characteristics or qualities to be examined; (3) breaking down of lengthy complex material into small, manageable segments that are analysed separately; and (4) scrutiny of the material for instances of each characteristic or quality defined in step 2 (Leedy and Ormrod, 2010).

As stated, the body of materials analysed in this study were mainly policies that regulate the establishment and operation of smallholder business enterprises, especially the smallholder farming enterprises led by youth and by women in the case of Limpopo Province. Focus was mainly on founding and support (mainly financial and human resource/labour related) policies for the smallholder farming enterprises. The study did not attempt to review all the policies but focused on those that are basic to be considered (or are more likely to be considered) for the establishment and operation of the enterprises with most of them being legislations.

For each policy sampled for review, focus was on issues that would reveal the extent of relevance and adequacy of the policy to address pertinent issues for establishment and operation of the smallholder farming enterprises, and those included the purpose of the policy, important concepts addressed in the policy and their definitions, and the major issues covered by the policy.

3.3 Founding Policies

The founding policies govern the establishment and structure of the youth and/or women owned smallholder farming enterprise. The farming enterprise may be owned under **sole proprietorship**, **partnership** (inclusive of general partnerships – GP, limited partnerships – LP, and limited liability partnership – LLP), **co-operatives,** or **companies.** For most of these legal entities**,** there were founding policies that governs the establishment, structure, and the nature of its functioning. A review of the founding policies of the youth and/or women owned smallholder farming enterprises (legal entities) is essential to determine the extent of relevance and adequacy, and the clarity of such policies in guiding the formation and operation of such enterprises.

3.3.1. Sole Proprietors

3.3.1.1. Description of sole proprietors

A sole proprietorship is a business that is owned and operated by a natural person and is the simplest form of a business entity. The **sole proprietorship is not a legal entity**, the business has no existence separate from the owner who is called the proprietor. The owner must include the income from such business in his or her own income tax return and is responsible for the payment of taxes thereon. A sole proprietorship can operate under the name of its owner or it can do business under a fictitious name. The fictitious name is only a trade name--it does not create a legal entity that makes decisions for the business. The proprietor assumes the risks of the business to the extent of all his or her assets whether used in the business or not (www.sars.gov.za/ClientSegments/Businesses/St).

Sole proprietors have both advantages and disadvantages. Among the advantages mentioned for sole proprietor are simplicity to establish and operate, freedom of decision making, and the minimum legal requirements associated with these entities (www.sars.gov.za/ClientSegments/Businesses/St). From the same source, the disadvantages mentioned for sole proprietors are:

(i) Unlimited liability of the owner

The owner is legally liable for all the debts of the business. Not only the investment or business property, but any personal and fixed property may be attached by creditors. The owner signs contracts in his or her own name, because the sole proprietorship has no separate identity under the law;

(ii) Limited ability to raise capital

The business capital is limited to whatever the owner can personally secure. This limits the expansion of a business when new capital is required. A common cause for failure of this form of business organisation is a **lack of funds**. This restricts the ability of a

sole proprietor (owner) to operate the business effectively and survive at an initial low profit level, or to get through an economic “rough spot.

(iii) Limited skills

One owner alone has limited skills, although he or she may be able to hire employees with sought-after skills.

3.3.2. Sole proprietors among youth and/or women owned smallholder farming enterprises

As is the case with many farming enterprises, subsistence, emerging, and commercial, numerous smallholder farming enterprises led by youth and women operate under sole proprietors. Such farming enterprises include crops (field crops that are often dry-land and seasonal, vegetables that are often irrigated, and fruits that may be either dry-land or irrigated) and livestock (includes poultry, small stock and large stock). While the farming enterprises enjoy the advantages of simplicity to establish and operate, freedom of decision making and the minimum legal requirements associated with sole proprietors, they also do experience the challenges associated with sole proprietor (unlimited liability of owner, limited ability to raise capital, and limited skills). The limitation in the ability to raise capital is exacerbated by the high state of poverty of the youth and women owners of the smallholder farming enterprises.

A lot of the smallholder farming enterprises receive support from government, mostly in the form of grant, but the dearth of farming (production and agribusiness) skills reduces the chances of their success.

3.4. Partnerships

3.4.1. Description of partnerships

A partnership is a type of business entity in which partners (owners) share with each other the profits or losses of the business. It is a type of unincorporated company in which partners, manage the business and are equally liable for its debts (Entrepreneur, 2018). Typical characteristics of a partnership are: (i) A partnership is a basic business agreement; (ii) Each partner must contribute something; (iii) The partnership must be carried on for the joint benefit of the partners; (iv) Each partner must share in the profits; (v) It is not required by the law that a partnership agreement should be in writing, however, it is always better to rather have it in a written format; (vi) There must be between 2-20 members and party must contribute something to the partnership, a contribution that can be money or labour; (viii) Each partner is entitled to a share of the profit but it does not have to be an equal share; and (ix) The partners are also involved with the management of the partnership.

A partnership is not a corporate entity, it does not have a separate legal persona, and this has several important legal consequences: in the relationship between the parties all rights and duties only exist between the partners, the rights and duties of the partnership are the rights and duties of the partners and the continued existence of the partnership depends on the continued participation of partners in the partnership, hence it has no perpetual succession. Nevertheless, this notion that the partnership is not a separate juristic person is not followed through consistently. For the purpose of insolvency, the estates of partners and the partnership are mostly regarded as separate and as a matter of civil procedure the partnership is often treated as an entity in that it may sue and be sued in its own name (Van der Merwe, Undated).

Accordingly, there is no registration required for a partnership. However, it is most important to have a written agreement among partners specifying the conduct of the partnership, including the division of earnings, procedures for dividing up assets if the partnership is dissolved, and steps to be followed when a partner becomes disabled or dies (Entrepreneur, 2018). Partnerships are created by contract. Thus for a partnership to be validly formed all the general requirements as regards to contractual validity must be met. Furthermore, for an agreement to be one of partnership consensus must have been reached on all the essential terms of partnership or rather as was described herein above as its salient features.

The general principles of contractual capacity accordingly also apply to the contract of partnerships. An un-rehabilitated insolvent may conclude a partnership agreement with the permission of his trustee and a minor with the assistance of his natural guardian. South African law does not require that only natural persons be members of a partnership. A company as well as another partnership may become a party to a partnership agreement (Van der Merwe, Undated).

3.4.2. *Types of Partnerships*

There are three main types of partnerships, some of which may be entered into by youth and/or women led smallholder farmer enterprises. The three relatively common partnership types are: general partnership (GP), limited partnership (LP) and limited liability partnership (LLP).

(i) General Partnerships (GP)

A GP has only general partners where each general partner takes part in the management of the business and takes responsibility for the liabilities of the business. In this partnership arrangement, if one partner is sued, all partners are liable. Among youth and

women led smallholder farming enterprises in Limpopo Province, GPs tend to occur in some of the group enterprises that includes some irrigation schemes and group poultry projects. Common challenges in these enterprises include partners who do not show up during seasons of hard work and only return during time of harvest, which discourages the hard-working partners.

(ii) Limited Partnerships (LP)

A limited partner does not take part in the day-to-day management of the partnerships and his/her liabilities are limited. In many cases, limited partners are merely investors who do not wish to participate in the partnership other than only providing an investment and receiving a share of profits. In the Limpopo Province, a typical unique LP is perhaps that reported for Makuleke Irrigation Scheme. The design of the partnership model was for the community to provide land and labour, Government to provide infrastructure, and a 'Strategic Partner' to provide production inputs and market of produced crops, mainly potato and maize. In terms of the design, the community would work closely with the Strategic Partner and would receive some production and agribusiness knowledge and skills. At the end of the production season, the enterprise would pay dividends based on profits made and according to agreed profit-sharing model.

However, reports revealed that members of community abandoned the responsibility of providing labour and opted on receiving dividends based on their contribution of land. In this way, the members of community became limited partners who did not participate in the day-to-day management/operation of the farming enterprise. With the Government done on the issue of infrastructure development, the Strategic Partner remained a major (unlimited) partner who took responsibility for the day-to-day management of the farming enterprise.

(iii) Limited Liability Partnerships (LLP)

In the LLP, all partners have limited liability. An LLP combines characteristics of partnerships and corporations. As is the case with corporations, all partners in an LLP have limited liabilities, from errors, omissions, negligence, incompetence, or malpractice committed by other partners or by employees under the partnership arrangement. In LLPs any partners involved in wrongful or negligent acts are still personally liable and other partners are protected from liability for those acts.

(iv) Public Private Partnerships (PPP)

In addition to the three common types of partnerships, a PPP is a unique type of partnership defined in South African law as: (a) A contract between government institution and private party; (b) Private party performs an institutional function and/or uses state property in

terms of output specifications; (c) Substantial project risk (financial, technical, operational) transferred to the private party; and (d) Private party benefits through: unitary payments from government budget and/or user fees (National Treasury, Undated). The PPP is governed by the South African *National Treasury's PPP Manual, which is* a best practice guide for PPP practitioners. Each module of the *PPP Manual* is issued as a National Treasury PPP Practice Note in terms of the Public Finance Management Act (PFMA), 1999 (Act No. 1 of 1999). It should be read with *Standardised PPP Provisions*, issued as National Treasury PPP Practice Note Number 01 of 2004.

The PPP project cycle is the roadmap for the PPP process and the Manual and covers the two main periods of a PPP: the Preparation Period and the Project Term. The PPP Preparation Period covers the phases on: Inception, Feasibility Study and Procurement, and concludes with the signing of the PPP agreement. The Project Term spans covers: Development, Delivery and Exit. The *National Treasury's PPP Manual* is chiefly concerned with the Project Preparation period during which relevant treasury approvals are granted. The PPP project cycle clearly indicates when these approvals are required, and which modules of the *PPP Manual* are relevant for the distinct phases.

The *PPP Manual* also gives guidance on managing a PPP agreement, auditing PPPs, accounting treatment for PPPs, and project finance. Public Private Partnerships results in the public obtaining better, more cost-effective services while the private sector gets new business opportunities, and these are in the interests of the nation (*Finance Minister Trevor Manuel, 2004)*

3.4.3. Partnerships among youth and/or women owned smallholder farming enterprises

Smallholder farming partnerships that are not registered as legal entities are rather fewer (if any at all), especially at a single level of the value chain. The limited formation of these partnerships is probably a result of fear for the risk of committing resources in vain among prospective partnering enterprises. Partnerships involving smallholder farming enterprises are relatively more common across value chains, and common partnerships occur where one business enterprise supplies a farming enterprise with production inputs that are paid for at the end of the season when the smallholder farmers has harvested and sold the produce. Although the two (or more) businesses may not be registered as one legal entity, the partnership arrangement is often based on some legal agreement.

- *Relevance and adequacy of founding policies for sole proprietors and partnerships*

Sole proprietors and some partnerships have significant occurrence among smallholder farming enterprises in Limpopo Province, and this includes the enterprises owned/led by youth

and/or women. The results of the literature review suggests that there are no specific policies governing the founding of sole proprietors and partnerships. These entities are mainly regulated by the broader policies used by individual persons, and those may not strictly be on founding issues. Without having to go through all legislations that govern individuals on how to operate in their various spheres of life, it can be ascertained that there are relevant and sufficient policies in that regard. The establishment of sole proprietors and partnership is correctly a matter for the innovativeness of those involved.

3.5 Co-Operatives

3.5.1. *The Cooperatives Act 2005 (Act No. 14 of 2005)*

(a) Purpose

The purpose of the Cooperatives Act 2005 (Act No. 14 of 2005) is to provide for: (i) the formation and registration of co-operatives; (ii) the establishment of a Co-operatives Advisory Board; (iii) the winding up of co-operatives; (iv) the repeal of Act 91 of 1981; and (v) matters connected therewith.

The Act recognises: (i) the co-operative values of self-help, self-reliance, self-responsibility, democracy, equality and social responsibility; (ii) that a viable, autonomous, self-reliant and self-sustaining co-operative movement can play a major role in the economic and social development of the Republic of South Africa, in particular by creating employment, generating income, facilitating broad-based black economic empowerment and eradicating poverty; (iii) that the South African economy will benefit from increasing the number and variety of viable and sustainable economic enterprises; (iv) that government is committed to providing a supportive legal environment to enable cooperatives to develop and flourish.

The recognitions by the Act are important to: (i) ensure that international co-operative principles are recognised and implemented in the Republic of South Africa; (ii) enable co-operatives to register and acquire a legal status separate from their members; and (iii) facilitate the provision of targeted support for emerging co-operatives, particularly those owned by women and black people.

(b) Important concepts and their definitions

(i) 'Agricultural co-operative' means a co-operative that produces, processes or markets agricultural products and supplies agricultural inputs and services to its members;

(ii) 'Consumer co-operative' means a co-operative that procures and distributes goods or commodities to its members and non-members and provides services to its members;

(iii) 'co-operative' means an autonomous association of persons united voluntarily to meet their common economic and social needs and aspirations through a jointly owned and

democratically controlled enterprise organised and operated on co-operative principles;

(iv) 'co-operative principles' means the internationally accepted principles of co-operation, exemplified by the principles adopted by the International Co-operative Alliance;

(v) 'financial services co-operative' means a primary co-operative whose main objective is to provide financial services to its members or a secondary co-operative that provides financial services to a primary co-operative;

(vi) 'marketing and supply co-operative' means a co-operative that engages in the supply of production inputs to members and markets or processes their products, and also includes an agricultural marketing and supply co-operative;

(vii) 'member loan' means a loan made by a member to a co-operative;

(viii) 'membership share' means a share issued to a member of a co-operative as a requirement for membership of a co-operative;

(ix) 'ordinary resolution' means a resolution passed at a general meeting by the majority of the members present;

(x) 'special resolution' means a resolution passed at a general meeting by not less than two thirds of the members present, or such greater majority as may be specified in the constitution of a co-operative;

(xi) 'primary co-operative' means a co-operative formed by a minimum of five natural persons whose object is to provide employment or services to its members and to facilitate community development;

(xii) 'secondary co-operative' means a co-operative formed by two or more primary cooperatives to provide sectoral services to its members, and may include juristic persons;

(xiii) 'tertiary co-operative' means a co-operative whose members are secondary co-operatives and whose object is to advocate and engage organs of state, the private sector and stakeholders on behalf of its members, and may also be referred to as a co-operative apex;

(c) Major issues covered by the Act

The outline of the Co-operatives Act 2005 as presented under each Chapter of the Act include: Definitions, purpose and application of Act (Chapter 1); Registration, constitution, powers of co-operative and registered office and record keeping by co-operative (Chapter 2); Membership of co-operatives (Chapter 3); General Meetings (Chapter 4); Management of co-operatives (Chapter 5); Capital structure (Chapter 6); Audit of co-operatives (Chapter 7); Amalgamation, division, conversion and transfer (Chapter 8); Winding-up and de-registration of co-operatives (Chapter 9); Judicial management (Chapter 10); Administration of Act

(Chapter 11); Co-operatives Advisory Board (Chapter 12); and Miscellaneous provisions (Chapter 13).

3.5.2. Cooperative Development Policy for South Africa

In view of the importance of the roles they could play, government deemed it fit to also develop a policy (in addition to legislation) to guide the development of co-operatives in South Africa. A viable, dynamic, autonomous, self-reliant, and self-sustaining co-operative movement can play a major role in the economic, social, and cultural development of South Africa, through effective and efficient services extended by co-operative enterprises to their members. By doing so, co-operatives contribute to the creation of jobs, income generation, resources mobilization, and broad-based economic empowerment, thereby enhancing sustainable human development in South Africa (DTI, 2004).

(a) Objectives and purpose:

The Government believes that a clear, comprehensive, and widely agreed co-operative development policy, implemented successfully will: (1) Create an enabling environment for co-operative enterprises which reduces the disparities between urban and rural businesses, and is conducive to entrepreneurship; (2) Promote the development of economically sustainable co-operatives that will significantly contribute to the country's economic growth; (3) Increase the number and variety of economic enterprises operating in the formal economy; (4) Increase the competitiveness of the co-operative sector so that it is better able to take advantage of opportunities emerging in national, African and international markets; (5) Encourage persons and groups who subscribe to values of self-reliance and self-help, and who choose to work together in democratically controlled enterprises, to register cooperatives in terms of this Act; (6) Enable such co-operative enterprises to register and acquire a legal status separate from their members; (7) Promote greater participation by black persons, especially those in rural areas, women, and persons with disability and youth in the formation of and management of cooperatives; (8) Establish a legislative framework that will preserve the co-operative as a distinct legal entity; (9) Facilitate the provision of support programmes that target co-operatives, specifically cooperatives that create employment or benefit disadvantaged groups; and (10) Improve communication between government and the co-operative movement. Also, this policy: (11) Defines genuine co-operatives for targeted support purposes; (12) Points to specific support measures and programmes to support the development of a co-operative movement by all stakeholders; (13) Serves as a reference for co-operative members by explaining why and how the Government supports co-operatives and by determining the relationship between the state, co-operatives, civil society and the

private sector; (14) Establishes a code of conduct for co-operative promoters by stating the basic principles to be respected; and (15) facilitates the horizontal and vertical integration of co-operatives from different sectors by clarifying basic policy issues relevant to all sectors (DTI, 2004).

(b) Scope of the co-operative development policy

This Government co-operative development policy applies to ***all types and forms*** of cooperatives, in all sectors of the economy. Hence, it also applies to so-called established cooperatives, but the emphasis is on supporting emerging co-operative enterprises.

(i) Emerging co-operatives:

These co-operatives have been identified as struggling for survival and lacking training. A lot of the youth and women led smallholder farmer co-operatives fall under this category. As stated by the DTI (2004), the type of support needed is that which will strengthen these co-operatives in the form of building their capacity, financial support and assistance with marketing. Also, some of these co-operatives will require support for expansion and modernizing their operations, and institutions like NAMAC/Ntsika can utilize their diagnostic tools to come up with holistic solutions for this sector. Support for this sector is mostly emphasized in the policy. Thus, the co-operative development policy and strategy focus on emerging co-operatives as an important, albeit needful, category of co-operatives that deserves special attention.

(ii) Established co-operatives:

These are co-operatives that are mainly operating in agriculture and are, in the main, controlled by white South Africans. In the past, established co-operatives have been heavily supported by the state. After 1994, most of these co-operatives converted into private companies. Although this sector is also covered in government policy, the focus will mainly be on emerging co-operatives, mainly owned by black entrepreneurs. Both will benefit from specific support measures such as fiscal support and incentives, savings, credit and banking facilities, and external assistance that government will provide (DTI, 2004).

(c) Core principles of co-operation

The success and sustainability of co-operatives demands that all members know and agree on some principles of co-operation. The DTI (2004) provides the core principles that are the universally accepted guidelines by which cooperatives put their values into practice. Those principles are:

(i) Voluntary and open membership -

Co-operatives are voluntary organizations, open to all persons able to use their services and willing to accept the responsibilities of membership, without gender, social, racial, political or religious discrimination.

(ii) Democratic member control -

Co-operatives are democratic organizations controlled by their members, who actively participate in setting their policies and making decisions. Women and men serving as elected representatives are accountable to the membership. In primary co-operatives, members have equal voting rights (one member, one vote) and cooperatives at other levels are also organized in a democratic manner.

(iii) Member economic participation -

Members contribute equitably to, and democratically control, the capital of their cooperative. At least part of that capital is usually the common property of the cooperative. Members usually receive limited compensation, if any, on capital subscribed as a condition of membership. Members allocate surpluses for any or all of the following purposes: developing their co-operative, possibly by setting up reserves, part of which at least would be indivisible; benefiting members in proportion to their transactions with the co-operative; and supporting other activities approved by the membership.

(iv) Autonomy and independence -

Co-operatives are autonomous self-help organizations controlled by their members. If they enter into agreements with other organizations, including governments, or raise capital from external sources, they do so on terms that ensure democratic control by their members and maintain their co-operative autonomy.

(v) Education, training, and information -

Co-operatives provide education and training for their members, elected representatives, managers, and employees so they can contribute effectively to the development of their co-operatives. They inform the public – particularly young people and opinion leaders – about the nature and benefits of co-operation.

(vi) Co-operation among co-operatives -

Co-operatives serve their members most effectively and strengthen the cooperative movement by working together through local, national, regional and international structures.

(vii) Concern for community -

Co-operatives work for the sustainable development of their communities through policies approved by their members.

(d) Links of the co-operative development policy to other Government policies and programmes

The promotion of co-operatives is not to be viewed in isolation from wider national development policies and programmes. The Government is conscious of the link between co-operative development policy and national development plans into which co-operative development policy should be integrated. The promotion of co-operatives is considered one of the aspects of national economic and social development, and links with the following programmes were presented in the DTI (2004):

(i) Broad-based black economic empowerment strategy

Promoting co-operative enterprises is a key programme component of the Government's Broad-Based Black Economic Empowerment (BEE) strategy that seeks to address the imbalances of the past and equitably transfer the ownership and control of economic resources to the majority of its citizens. The BEE strategy will, among other things, encourage and support efforts by co-operatives and other forms of enterprise that support broad-based economic empowerment (Broad-based empowerment models-ESOPs, community trusts/groups, worker co-operatives, stokvels, burial societies, etc.) to assert ownership and control of economic activities in new and existing enterprises and break into new sectors of economic activity. The link of co-operative development and this strategy is important for successful youth and women led smallholder agricultural enterprises.

(ii) Small and medium enterprise strategy

All Government support programmes for small and medium enterprises as detailed in the Integrated Small Business Strategy shall also be extended to co-operative enterprises, considering the specific characteristics of and differences between such enterprises, and are expected to positively influence the success of agricultural enterprises led by youth and women, among others.

(iii) Integrated Manufacturing Strategy (IMS)

The above strategy identifies co-operative enterprises of all types and forms, particularly workers' co-operatives and consumer co-operatives, as types of enterprises that Government would promote. Government will work together with co-operative enterprises in

the identified growth sectors to ensure adequate enterprise representation and development of broad-based economic empowerment.

(iv) Local economic development and integrated sustainable rural development

Government recognises that co-operatives, especially those in the agricultural sector play an important role in the growth of the local economy. Local government has an important role to play in supporting co-operative development and providing an environment at the grassroots in which co-operative enterprises can flourish through existing programmes such as Integrated Sustainable Rural Development Strategy (ISRDS) and LED Strategy. In turn, co-operative enterprises enable local people to be directly involved in producing and delivering goods and services that their members and the community require.

(v) Skills Development Strategy

The DTI will facilitate and support the access of the co-operative sector to SETAs and learnership programmes that are critical for skills development. Agricultural co-operatives, especially those led by youth and by women are strategic for effective rural development and for promotion of equality, and should receive priority for such skills development initiatives.

(vi) Other Government policies

Macro-economic policies as well as measures such as trade liberalization, deregulation, commercialization and restructuring of state enterprises and public services will have an impact on co-operatives, in some instances creating opportunities and in others posing challenges for co-operatives. Policy alignment and incorporation of co-operatives across government will start growing the sector to benefit targeted sector of the society.

- *Relevance and adequacy of the Cooperative Act 2005 (Act No. 14 of 2005) and Cooperative Policy for smallholder farming enterprises*

Cooperatives are rather common among smallholder farming enterprises in Limpopo Province with some of those cooperatives owned/led by youth and/or by women. Such cooperatives include mostly primary and secondary cooperatives, and are involved in various commodities, both crop and livestock commodities.

The Cooperative Act 2005 (Act No. 14 of 2005) and the Cooperative Policy provide the basic policy framework and are relevant and adequate to govern the establishment (and indeed the operation) of cooperatives among smallholder farming enterprises in the province. As is the case with any other legislation, necessity for amendments arise with time, and such

amendments are effected, hence the Co-operative Amendment Act 2013 (Act No. 6 of 2013) already came into being. The Cooperative Policy is also to be amended when necessity arises.

3.6. Companies

3.6.1. Companies Act, 2008 (Act No. 71 of 2008)

This is a new Act of 2008 (Act 71 of 2008) which provides for all forms of companies which could be incorporated or registered under the Companies Act 61 of 1973 (Old Companies Act): private companies; public companies; personal liability companies (currently incorporated under section 53(b) of the Old Companies Act); non-profit companies (associations not for gain currently incorporated under section 21 of the Old Companies Act); and external companies. The Act (Act No. 71 of 2008) has also created the new category of "state-owned companies". A state-owned company is a company: listed as a public entity in schedule 2 or 3 of the Public Finance Management Act (for example, Airports Company of South Africa and the SA Post Office Limited); or owned by a municipality and otherwise similar to a public company described immediately above.

(a) Purpose

Specifically, the Companies Act 2008 (Act No. 71 of 2008) is to:

(i) Provide for the incorporation, registration, organisation, and management of companies, the capitalisation of profit companies, and the registration of offices of foreign companies carrying on business within the Republic;

(ii) Define the relationships between companies and their respective shareholders or members and directors;

(iii) Provide for equitable and efficient amalgamations, mergers, and takeovers of companies;

(iv) Provide for financial rescue of financially distressed companies;

(v) Provide appropriate legal redress of investors and third parties with respect to companies;

(vi) Establish a Companies and Intellectual Property Commission and a Takeover Regulation Panel to administer the requirements of the Act with respect to companies, to establish a Companies Tribunal to facilitate alternative dispute resolution and to review decisions of the Commission;

(vii) Establish a Financial Reporting Standards Council to advise on requirements for financial record keeping and reporting by companies;

(vii) Repeal the Companies Act, 1973 (Act No. 61 of 1973), and make amendments to the Close Corporations Act 1984 (Act No. 69 of 1984), as necessary to provide for a consistent and harmonious regime of business incorporation and regulation;

(viii) Provide for matters connected therewith.

(b) Important concepts and their definitions

(i) 'Profit company' means a company incorporated for the purpose of financial gain for its shareholders; "public company" means a profit company that is not a state-owned company, a private company or a personal liability company;

(ii) 'Accounting records' means information in written or electronic form concerning the financial affairs of a company as required in terms of this Act, including but not limited to, purchase and sales records, general and subsidiary ledgers and other documents and books used in the preparation of financial statements;

(iii) 'Acquiring party', when used in respect of a transaction or proposed transaction, means a person who, as a result of the transaction, would directly or indirectly acquire or establish direct or indirect control or increased control over all or the greater part of a company, or all or the greater part of the assets or undertaking of a company;

(iv) 'Agreement' includes a contract, or an arrangement or understanding between or among two or more parties that purports to create rights and obligations between or among those parties;

(v) 'Alterable provision' means a provision of this Act in which it is expressly contemplated that its effect on a particular company may be negated, restricted, limited, qualified, extended or otherwise altered in substance or effect by that company's Memorandum of Incorporation;

(vi) 'Amalgamation or merger' means a transaction, or series of transactions, pursuant to an agreement between two or more companies, resulting in (a) the formation of one or more new companies, which together hold all of the assets and liabilities that were held by any of the amalgamating or merging companies immediately before the implementation of the agreement, and the dissolution of each of the amalgamating or merging companies; or (b) the survival of at least one of the amalgamating or merging companies, with or without the formation of one or more new companies, and the vesting in the surviving company or companies, together with any such new company or companies, of all of the assets and liabilities that were held by any of the amalgamating or merging companies immediately before the implementation of the agreement;

(vii) 'Beneficial interest', when used in relation to a company's securities, means the right or entitlement of a person, through ownership, agreement, relationship or otherwise,

alone or together with another person to (a) receive or participate in any distribution in respect of the company's securities; (b) exercise or cause to be exercised, in the ordinary course, any or all of the rights attaching to the company's securities; or (c) dispose or direct the disposition of the company's securities, or any part of a distribution in respect of the securities, but does not include any interest held by a person in a unit trust or collective investment scheme in terms of the Collective Investment Schemes Act, 2002 (Act No. 45 of 2002);

(viii) 'Consideration' means anything of value given and accepted in exchange for any property, service, act, omission or forbearance or any other thing of value, including (a) any money, property, negotiable instrument, securities, investment credit facility, token or ticket; (b) any labour, barter or similar exchange of one thing for another; or (c) any other thing, undertaking, promise, agreement or assurance, irrespective of its apparent or intrinsic value, or whether it is transferred directly or indirectly;

(ix) 'Financial statement' includes (a) annual financial statements and provisional annual financial statements; (b) interim or preliminary reports; (c) group and consolidated financial statements in the case of a group of companies; and (d) financial information in a circular, prospectus or provisional announcement of results, that an actual or prospective creditor or holder of the company's securities, or the Commission, Panel or other regulatory authority, may reasonably be expected to rely on;

(x) 'Voting power', with respect to any matter to be decided by a company, means the voting rights that may be exercised in connection with that matter by a particular person, as a percentage of all such voting rights; "voting rights", with respect to any matter to be decided by a company, means (a) the rights of any holder of the company's securities to vote in connection with that matter, in the case of a profit company; or (b) the rights of a member to vote in connection with the matter, in the case of a non-profit company;

(c) Major issues covered by the Act

The main issues covered under various chapters of the Act are: Interpretation, purpose and application (Ch. 1); Formation, administration and dissolution of companies (Ch. 2); Enhanced accountability and transparency (Ch. 3); Public offerings of company securities (Ch. 4); Fundamental transactions, takeovers and offers (Ch. 5); Business rescue and compromise with creditors (Ch. 6); Remedies and enforcement (Ch. 7); Regulatory agencies and administration of Act (Ch. 8); and Offences, miscellaneous matters and general provisions (Ch. 9).

- *Relevance and adequacy of the Companies Act 2008 (Act No. 71 of 2008) for smallholder farming enterprises*

Companies are probably also found among smallholder farming enterprises in Limpopo Province, and some of those may be owned/led by youth and/or by women. The Companies Act 2008 (Act No. 71 of 2008) provide the basic policy framework and is relevant and adequate to govern the establishment (and indeed the operation) of companies among smallholder farming enterprises in the province. As is the case with any other legislation, necessity for amendments arise with time, and such amendments are affected following normal parliamentary processes.

Generally, the founding policies provide rather adequate guidelines for establishment and operationalization of smallholder farming enterprises in Limpopo Province of South Africa. The policies also suffice for regulating the establishment and operation of youth and women owned/led farming enterprises. Issues that are not regulated are those where regulation was not important, and decisions on such issues require the innovativeness of the owners/leaders of the farming enterprises.

3.7. Support Policies

Availability and adequacy of support policies are critical for smooth operation of smallholder agricultural enterprises led by youths and those led by women. The support policies should be able to address two major areas for effective operationalization of the smallholder agricultural enterprises, especially those led by youths and by women, viz. the financial and the human resource (labour) matters. The two areas have numerous aspects requiring compliance, hence the need for adequate and clear policies to guide farmers and other role players.

3.7.1. Finance and Related Policies

3.7.1.1. Financial Advisory and Intermediary Services Act (Act No. 37 of 2002)

(a) Purpose

The Act is meant to regulate the rendering of certain financial advisory and intermediary services to clients; to repeal or amend certain laws; and to provide for matters incidental thereto.

(b) Important concepts and their definition

(i) In terms of the Act, ‘advice’ includes, any recommendation, guidance or proposal of a financial nature furnished, by any means or medium, to any client or group of clients

(1) in respect of the purchase of any financial product; (2) in respect of the investment in any financial product; (3) on the conclusion of any other transaction, including a loan or cession, aimed at the incurring of any liability or the acquisition of any right or benefit in respect of any financial product; or (4) on the variation of any term or condition applying to a financial product, on the replacement of any such product, or on the termination of any purchase of or investment in any such product, and irrespective of whether or not such advice: is furnished in the course of or incidental to financial planning in connection with the affairs of the client; or results in any such purchase, investment, transaction, variation, replacement or termination, as the case may be, being effected.

(ii) The 'intermediary service', on the other hand, refers to any act other than the furnishing of advice, performed by a person for or on behalf of a client or product supplier: (1) the result of which is that a client may enter into, offers to enter into or enters into any transaction in respect of a financial product with a product supplier; or (2) with a view to: buying, selling or otherwise dealing in, managing, administering, keeping in safe custody, maintaining or servicing a financial product purchased by a client from a product supplier or in which the client has invested; collecting or accounting for premiums or other moneys payable by the client to a product supplier in respect of a financial product; or receiving, submitting or processing the claims of a client against a product supplier; The influence of the Act on smallholder farming enterprises led by youth and women is therefore at the level of regulation of the provision of financial advice to these enterprises. Where the rendering of financial services has not been done in accordance with the stipulations of the Act, there is provision for the owners of the farming enterprises to lodge complaints.

(iii) As defined in the Act, 'complaint' refers to a specific complaint relating to a financial service rendered by a financial services provider or representative to the complainant on or after the date of commencement of this Act, and in which complaint it is alleged that the provider or representative (1) has contravened or failed to comply with a provision of this Act and that as a result thereof the complainant has suffered or is likely to suffer financial prejudice or damage; (2) has wilfully or negligently rendered a financial service to the complainant which has caused prejudice or damage to the complainant or which is likely to result in such prejudice or damage; or (3) has treated the complainant unfairly.

The Financial Advisory and Intermediary Services Act (Act No. 37 of 2002) is therefore very important for ensuring that owners of smallholder farming enterprises (including youth and women) are provided with appropriate, quality financial advice that is critical for the profitability and sustainability of the farming operations.

(c) Major issues covered by the Act

Major issues covered by the Act include: (i) administration of the Act (Chapter 1), (ii) authorisation of financial services providers (Chapter 2), (iii) representatives of authorised financial services providers (Chapter 3), (iv) codes of conduct (Chapter 4), (v) duties of authorised financial services providers (Chapter 5), (vi) enforcement (Chapter 6), (vii) and miscellaneous (Chapter 7). The Financial Advisory Intermediary Services Act provides relevant and sufficient information to regulate the rendering of certain financial advisory and intermediary services to clients; and to provide for matters incidental thereto.

3.7.2. Financial Intelligent Centre Act 2001 (Act No. 38 of 2001)

(a) Purpose

The Financial Intelligence Centre Act – FICA (Act No. 38 of 2001) is 'to establish a Financial Intelligence Centre in order to combat money laundering activities and the financing of terrorist and related activities; to impose certain duties on institutions and other persons who might be used for money laundering purposes and the financing of terrorist and related activities; to provide for customer due diligence measures including with respect to beneficial ownership and persons in prominent positions; to provide for a risk based approach to client identification and verification; to provide for the implementation of financial sanctions and to administer measures pursuant to resolutions adopted by the Security Council of the United Nations; to clarify the application of the Act in relation to other laws; to provide for the sharing of information by the Centre and supervisory bodies; to provide for risk management and compliance programmes, governance and training relating to anti money laundering and counter terrorist financing; to provide for the issuance of directives by the Centre and supervisory bodies; to provide for the registration of accountable and reporting institutions; to provide for the roles and responsibilities of supervisory bodies; to provide for written arrangements relating to the respective roles and responsibilities of the Centre and supervisory bodies; to provide the Centre and supervisory bodies with powers to conduct inspections; to regulate certain applications to Court; to provide for administrative sanctions that may be imposed by the Centre and supervisory bodies; to establish an appeal board to hear appeals against decisions of the Centre or supervisory bodies; to provide for arrangements on consultation with stakeholders; to amend the Prevention of Organised Crime Act, 1998, and the Promotion of Access to Information Act, 2000; and to provide for matters connected therewith'. Although the FICA covers a wide range of issues, money laundering and identification of clients and other persons could be risk areas for smallholder farming enterprises.

(b) Important concepts and their definitions

(i) 'Business relationship' means an arrangement between a client and an accountable institution for the purpose of concluding transactions on a regular basis; 'cash' means (1) coin and paper money of the Republic or of another country that is designated as legal tender and that circulates as, and is customarily used and accepted as, a medium of exchange in the country of issue; (2) travellers' cheques.

(ii) 'Money laundering' or 'money laundering activity' means an activity which has or is likely to have the effect of concealing or disguising the nature, source, location, disposition or movement of the proceeds of unlawful activities or any interest which anyone has in such proceeds, and includes any activity which constitutes an offence in terms of section 64 of this Act or section 4, 5 or 6 of the Prevention Act.

(c) Major issues covered by the Act

(i) Money laundering

As stipulated in the FICA (Act No. 38 of 2001), any person who acquires, uses, or has possession of property, and who knows or ought reasonably to have known that it is or forms part of the proceeds of unlawful activities of another person, shall be guilty of an offence.

For instance, in terms of the FICA (Act No. 38 of 2001), a person who knows or ought reasonably to have known that property is or forms part of the proceeds of unlawful activities will have been involved in money laundering if he/she:

(1) enters into any agreement or engages in any arrangement or transaction with anyone in connection with that property, whether such agreement, arrangement or transaction is legally enforceable or not; or

(2) performs any other act in connection with such property, whether it is performed independently or in concert with any other person, which has or is likely to have the effect of: *(a)* of concealing or disguising the nature, source, location, disposition or movement of the said property or its ownership or any interest which anyone may have in respect thereof; or *(b)* of enabling or assisting any person who has committed or commits an offence to avoid prosecution, or to remove or diminish any property acquired as a result of the commission of an offence.

(ii) Identification of clients and other persons

As required by the FICA (Act No 38 of 2001), when an accountable institution engages with a prospective client to enter into a single transaction or to establish a business relationship, the institution must, in the course of concluding that single transaction or establishing that business relationship and in accordance with its Risk Management and Compliance Programme: (a) establish and verify the identity of the client; (b) if the client is acting on behalf of another person, establish and verify (i) the identity of that other person; (ii)

the client's authority to establish the business relationship or to conclude the single transaction on behalf of that other person; and (c) if another person is acting on behalf of the client, establish and verify (i) the identity of that other person; and (ii) that other person's authority to act on behalf of the client.

(iii) Other issues covered in the Act

Other issues covered in the FICA (Act No. 38 of 2001) are: Financial Intelligence Centre (Chapter 1); money laundering advisory council (Chapter 2); money laundering control measures (Chapter 3); Offences and penalties (Chapter 4), and miscellaneous (Chapter 5). Guided by the FICA (Act No. 38 of 2001), smallholder farming enterprises including those owned by youth and women are empowered to refrain from illicit financial activities. Also, the enterprises are made to understand and to appreciate the essence of all the information required by financial institutions when they must apply for funding.

Knowledge of and understanding of the FICA is important for them to be lawful and indeed active participants in the economic and financial sectors. The Act provides relevant and adequate information to guide smallholder farming enterprises.

3.7.3. Income Tax Act 1962 (Act No. 58 of 1962)

(a) Purpose

The purpose of the Income Tax Act 1962 (Tax No. 58 of 1962) is to consolidate the law relating to the taxation of incomes and donations, to provide for the recovery of taxes on persons, to provide for the deduction by employers of amounts from the remuneration of employees in respect of certain tax liabilities of employees, and to provide for the making of provisional tax payments and for the payment into the National Revenue Fund of portions of the normal tax and interest and other charges in respect of such taxes, and to provide for related matters.

(b) Important concepts and their definition

Proper understanding of the contents of the Income Tax Act 1962 (Act No. 58 of 1962) in reference to smallholder farming enterprises requires understanding of key pertinent concepts that are repeatedly used in the Act, and those include:

(i) person – includes an insolvent estate, the estate of a deceased person and any trust;

(ii) taxpayer – any person chargeable with any tax leviable under this Act and includes every person required by this Act to furnish any return;

(iii) income – the amount remaining of the gross income of any person for any year or period of assessment after deducting therefrom any amounts exempt from normal tax under Part I of Chapter II;

(iv) gross income – in relation to any year or period of assessment, means (1) in the case of any resident, the total amount, in cash or otherwise, received by or accrued to or in favour of such resident; or (2) in the case of any person other than a resident, the total amount, in cash or otherwise, received by or accrued to or in favour of such person from a source within or deemed to be within the Republic, during such year or period of assessment, excluding receipts or accruals of a capital nature, but including, without in any way limiting the scope of this definition, such amounts (whether of a capital nature or not) so received or accrued includes those received or accrued in respect of services rendered or to be rendered;

(v) tax or taxation – any levy or tax leviable under this Act; and for the purposes of Part IV of Chapter III includes any levy or tax leviable under any previous Income Tax Act;

(vi) taxable income – the aggregate of *(a)* the amount remaining after deducting from the income of any person all the amounts allowed under Part I of Chapter II to be deducted from or set off against such income; and *(b)* all amounts to be included or deemed to be included in the taxable income of any person in terms of this Act;

(vii) year of assessment – any year or other period in respect of which any tax or duty leviable under this Act is chargeable, and any reference in this Act to any year of assessment ending the last or the twenty-eighth or the twenty-ninth day of February shall, unless the context otherwise indicates, in the case of a company be construed as a reference to any financial year of that company ending during the calendar year in question.

(viii) South African Revenue Service – the South African Revenue Service established by section 2 of the South African Revenue Service Act, 1997;

(ix) trade – includes every profession, trade, business, employment, calling, occupation or venture, including the letting of any property and the use of or the grant of permission to use any patent as defined in the Patents Act, 1978 (Act 57 of 1978), or any design as defined in the Designs Act, 1993 (Act 195 of 1993), or any trade mark as defined in the Trade Marks Act, 1993 (Act 194 of 1993), or any copyright as defined in the Copyright Act, 1978 (Act 98 of 1978), or any other property which is of a similar nature;

(x) trading stock includes: *(1)* anything **produced**, manufactured, constructed, assembled, purchased or in any other manner acquired by a taxpayer for the purposes

of manufacture, sale or exchange by him or on his behalf; or (2) the proceeds from the disposal of which forms or will form part of his gross income.

(c) Major issues covered by the Act

Among the major issues covered by the Income Tax Act of 1962 (Act No. 58 of 1962) are:

(i) the administration of the Act – (1) Act to be administered by Commissioner (section 2), (2) exercise of powers and performance of duties (section 3), and (3) preservation of secrecy (section 4) (Chapter 1);

(ii) the taxes – (1) normal tax (section 5 to 37H), (2) special provisions relating to companies (section 38 to 40B) covering classification of companies, redetermination of company's status, objection and appeal, close corporations, and conversion of co-operative to company), (3) special rules relating to company formations, share-for-share transactions, amalgamation transactions, intra-group transactions, unbundling transactions and liquidation distributions (section 41 to 47), (4) undistributed profits tax (sections 48 to 53), (5) donations tax (sections 54 to 64), (6) levy on financial services (section 64A), and (7) secondary tax on companies (sections 64B and 64C) (Chapter 2);

(iii) General provisions – (1) returns, includes duty of companies to furnish returns (section 70), (2) assessments (sections 77 to 80), (3) objections and appeals (sections 81 to 88), (4) settlement of dispute (sections 88A to 88H), (5) payment and recovery of tax (sections 89 to 94), (6) representative tax payers (section 95 to 101), and (7) miscellaneous (section 102 to 112).

The Income Tax Act 1962 (Tax No. 58 of 1962) provides sufficient information to regulate the taxation of incomes and donations, to provide for the recovery of taxes on persons, to provide for the deduction by employers of amounts from the remuneration of employees in respect of certain tax liabilities of employees, and to provide for the making of provisional tax payments and for the payment into the National Revenue Fund of portions of the normal tax and interest and other charges in respect of such taxes. The Act suffices to regulate the operations of the smallholder farming enterprises, including those led by youth and women.

3.7.4. Value-added tax act 1991 (Act No. 89 of 1991)

(a) Purpose

To provide for taxation in respect of the supply of goods and services and the importation of goods; to amend the Transfer Duty Act, 1949, so as to provide for an exemption; to amend the Stamp Duties Act, 1968, so as to provide for an exemption from stamp duty and to discontinue the levying of certain stamp duties; to repeal the Sales Tax Act, 1978; and to provide for matters connected therewith.

(b) Important concepts and their definitions

(i) 'cash value' in relation to the supply of goods supplied under an instalment credit agreement, means -

(1) where the seller or lessor is a banker or financier, an amount equal to or exceeding the sum of the cost to the banker or financier of the goods, including any cost of erection, construction, assembly, or installation of the goods borne by the banker or financier and the tax leviable under section 7(1)(a) in respect of such supply by the banker or financier, or

(2) where the seller or lessor is a dealer, an amount equal to or exceeding the price (including tax) at which the goods are normally sold by him for cash or may normally be acquired from him for cash (including tax) and any charge (including tax) made by the seller or lessor in respect of the erection, construction, assembly or installation of the goods if such charge is financed by the seller or lessor under the instalment credit agreement.

(ii) 'connected persons' means -

(1) any natural person and any relative of that natural person or any trust fund in respect of which any such relative is or may be a beneficiary or any partnership or close corporation and any member thereof; or any company (other than a close corporation) and any person (other than a company) where that person, his spouse or minor child is or may be a beneficiary,

(2) any other company the shareholders in which are substantially the same persons as the shareholders in the first-mentioned company, or which is controlled by the same persons who control the first-mentioned company.

(iii) 'donated goods or services' means goods or services which are donated to an association not for gain and are intended for use in the carrying on or carrying out of the purposes of that association.

(iv) 'enterprise means' any enterprise or activity which is carried on continuously or regularly by any person in the Republic or partly in the Republic and in the course or furtherance of which goods or services are supplied to any other person for a

consideration, whether or not for profit, including any enterprise or activity carried on in the form of a commercial, financial, industrial, mining, farming, fishing or professional concern or any other concern of a continuing nature or in the form of an association or club;

(v) 'prescribed tax rate' means the rate of tax, expressed as a percentage, fixed by Parliament;

(vi) 'recipient' in relation to any supply of goods or services, means the person to whom the supply is made;

(vii) 'rental agreement' means *(1)* any agreement entered into before, on or after the commencement date for the letting of goods, and *(2)* any rental agreement, where such agreement is in force on or after the commencement date;

(viii) 'sale' means an agreement of purchase and sale and includes any transaction or act whereby or in consequence of which ownership of goods passes or is to pass from one person to another;

(ix) 'supplier' in relation to any supply of goods or services, means – the person supplying the goods or services;

(x) 'tax' means the tax leviable under section 7 of this Act;

(xi) For the purposes of this Act, the open market value of any supply of goods or services at any date shall be the consideration in money which the supply of those goods or services would generally fetch if supplied in similar circumstances at that date in the Republic, being a supply freely offered and made between persons who are not connected persons.

(c) Major issues covered by the Act

The major issues covered by the Value Added Tax Act 1991 (Act No. 89 of 1991) include:

(i) Administration of the Act – covers aspects of (1) responsibility of Commissioner to administer the Act, (2) exercise of powers and performance of duties, and (3) secrecy (sections 4 to 6) (Part I);

(ii) Value added tax – covers aspects of (1) imposition of value-added tax, (2) certain supplies of goods or services deemed to be made or not made, (3) time of supply, (4) value of supply of goods or services, (5) zero rating, (6) exempt supplies, (7) collection of tax on importation of goods, determination of value thereof and exemptions from tax, (8) collection of value-added tax on imported services, determination of value thereof and exemptions from tax, (9) accounting basis, (10) calculation of tax payable, (11) permissible deductions in respect of input tax, (12) adjustments, (13) goods or services acquired before incorporation, (14) tax invoices, (15) credit and debit notes, and (16) irrecoverable debts (sections 7 to 22) (Part II);

(iii) Registration – covers aspects of (1) registration of persons making supplies in the course of enterprises, (2) cancellation of registration, (3) vendor to notify change of status, and (4) liabilities not affected by person ceasing to be vendor (sections 23 to 26) (Part III);

(iv) Returns, payments and assessments – covers (1) tax period, (2) returns and payments of tax, (3) special returns, (4) other returns, and (5) assessments (sections 27 to 31) (Part IV);

(v) Objections and appeals – addresses (1) objections to certain decisions or assessments, (2) appeals to special court, (3) appeals against decisions of special court, (4) members of special court not disqualified from adjudicating, (5) payment of tax pending appeal, and (6) burden of proof (sections 32 to 37) (Part V);

(vi) Payment, recovery and refund of tax – guides on (1) manner in which tax shall be paid, (2) penalty and interest for failure to pay tax when due, (3) recovery of tax, (4) liability for tax in respect of certain past supplies or importations, (5) evidence as to assessments, (6) security for tax, (7) refunds, and (8) interest on delayed refunds (sections 38 to 45) (Part VI);

(vii) Special provisions – covers aspects of (1) separate enterprises, branches and divisions, (2) bodies of persons, corporate or unincorporate (other than companies), (3) pooling arrangements, (4) death or insolvency of vendor, (5) agents and auctioneers (sections 50 to 54) (Part VIII); and

(viii) Compliance – deals with (1) records, (2) information, (3) powers of entry and search, (4) offences, (5) offences and penalties in regard to tax evasion, (6) additional tax in case of evasion, (7) recovery of tax from recipient, (8) publication of names of tax offenders, and (9) reporting of unprofessional conduct (sections 55 to 63) (Part IX).

The Value Added Tax Act 1991 (Act No. 89 of 1991) provides adequate information to govern taxation in respect of the supply of goods and services and the importation of goods, and accordingly suffices for regulation of the operation of smallholder farming enterprises including those owned by youth and women in Limpopo Province.

3.7.5. *Collective Investment Schemes Control Act 2002 (Act No. 45 of 2002)*

(a) Purpose

To regulate and control the establishment and administration of collective investment schemes; to amend or repeal certain laws; and to provide for incidental matters.

(b) Important concepts and their definitions

(i) 'administration' means any function performed in connection with a collective investment scheme including (1) the management or control of a collective investment scheme, (2) the receipt, payment or investment of money or other assets, including income accruals, in respect of a collective investment scheme; (3) the sale, repurchase, issue or cancellation of a participatory interest in a collective investment scheme and the giving of advice or disclosure of information on any of those matters to investors or potential investors; and (4) the buying and selling of assets or the handing over thereof to a trustee or custodian for safe custody

(ii) 'assets' means the investments comprising or constituting a portfolio of a collective investment scheme and includes any income accruals derived or resulting from the investments in the portfolio which are held for or are due to the investors in that portfolio.

(iii) 'close corporation' means a close corporation incorporated in accordance with the Close Corporations Act, 1984 (Act No. 69 of 1984);

(iv) 'collective investment scheme' means a scheme, in whatever form, including an open-ended investment company, in pursuance of which members of the public are invited or permitted to invest money or other assets in a portfolio, and in terms of which (1) two or more investors contribute money or other assets to and hold a participatory interest in a portfolio of the scheme through shares, units or any other form of participatory interest; and (2) the investors share the risk and the benefit of investment in proportion to their participatory interest in a portfolio of a scheme or on any other basis determined in the deed, but not a collective investment scheme authorised by any other Act;

(v) 'open-ended investment company' means a company with an authorised share capital, which is structured in such a manner that it provides for the issuing of different classes of shares to investors, each class of share representing a separate portfolio with a distinct investment policy;

(vi) 'portfolio' means a group of assets including any amount of cash in which members of the public are invited or permitted by a manager to acquire, pursuant to a collective investment scheme, a participatory interest or a participatory interest of a specific class which as a result of its specific characteristics differs from another class of participatory interests;

(c) Major issues covered by the Act

The major issues covered by the Collective Investment Schemes Control Act 2002 (Act No. 45 of 2002) include:

(i) Collective investment schemes – the issues included are (1) definitions, (2) principles for administration of collective investment scheme, (3) disclosure of information, (4) duties of manager, (5) requirement for administration of collective investment schemes, (6) prohibition of misleading names and acts, (7) registrar and deputy registrar of collective investment schemes (8) collective investment schemes Advisory Committee: appointment, functions, meetings, sub-committees, and remunerations (sections 1 to 13) (Part 1);

(ii) Functions of Registrar – the issues included are: (1) inspections and on-site visits, (2) powers of registrar, (3) cancellation or suspension of registration of manager, (4) declaration of certain practices as irregular, (5) exemptions, (6) annual report by registrar, and (7) Board of Appeal (sections 14 to 24) (Part II);

(iii) Association of Collective Investment Schemes – includes issues of: (1) application for association licence, (2) issue or renewal of association licence, (3) refusal of renewal of association licence, (4) cancellation or suspension of association licence, (5) restriction on use of name or description implying connection with association, (6) delegation of functions of executive committee, (7) suspension of administration of collective investment scheme, (8) rules of association, (9) power of court to declare member disqualified, (10) voluntary dissolution of association, (11) winding-up of association by court, (12) business rescue of association, (13) appointment of liquidator, and (14) report by association to registrar (Sections 25 to 38) (Part III);

(iv) Collective Investment Schemes in Securities (sections 39-46) (Part IV);

(v) Collective Investment Schemes in Property (sections 47 to 51) (Part V);

(vi) Collective Investment Schemes in Participation Bonds (sections 52 to 61) (Part VI);

(vii) Declared Collective Investment Schemes (sections 62 to 64) (Part VII);

(viii) Conversion of Collective Investment Scheme (sections 76 to 84) (Part XI); etc.

Some of the smallholder farming enterprises led by youth and women in the Limpopo Province could have been formed as a result of collective investment, and for those the Collective Investment Schemes Control Act 2002 (Act No. 45 of 2002) provides pertinent and sufficient information to regulate their operations.

- *Relevance and adequacy of the financial support policies for smallholder farming enterprises*

Generally, the financial support policies provide relevant and sufficient guidelines for smooth operation of smallholder farming enterprises in Limpopo Province of South Africa. The policies

also suffice for regulating the functioning of youth and women owned/led farming enterprises. As is the case with any other legislation, necessity for amendments arise with time, and such amendments are affected following normal parliamentary processes. Issues that are not regulated are those where regulation was not important, and decisions on such issues require the innovativeness of the owners/leaders of the farming enterprises.

3.8. Human Resource and Labour Related Policies

3.8.1. Basic Conditions of Employment Act 1997 (Act No. 75 of 1997)

(a) Purpose

To give effect to the right to fair labour practices referred to in section 23(1) of the Constitution by establishing and making provision for the regulation of basic conditions of employment; and thereby to comply with the obligations of the Republic as a member state of the International Labour Organisation; and to provide for matters connected therewith. As stipulated in section 2, the purpose of this Act is to advance economic development and social justice by fulfilling the primary objects of this Act which are: (i) to give effect to and regulate the right to fair labour practices conferred by section 23(1) of the Constitution (1) by establishing and enforcing basic conditions of employment, and (2) by regulating the variation of basic conditions of employment; and (ii) to give effect to obligations incurred by the Republic as a member state of the International labour Organisation.

(b) Important concepts and their definitions

(i) 'Basic conditions of employment' means a provision of this Act or sectoral determination that stipulates a minimum term or condition of employment.

(ii) 'Child' means a person who is under 18 years of age.

(iii) 'Collective agreement' means a written agreement concerning terms and conditions of employment or any other matter of mutual interest concluded by one or more registered trade unions, on the one hand and on the other hand (1) one or more employers, (2) one or more registered employers organisations, or (3) one or more employers and one or more registered employers' organisations.

(iv) 'Domestic worker' means an employee who performs domestic work in the home of his/her employer and includes (1) a gardener, (2) a person employed by a household as driver of a motor vehicle, (3) a person who takes care of children, the aged, the sick, the frail or the disabled, but does not include a farm worker.

(v) 'Employee' means: (1) any person, excluding an independent contractor, who works for another person or for the State, and who receives, or is entitled to receive any

remuneration; and (2) any other person who in any manner assists in carrying on or conducting the business of the employer.

(vi) 'Employers' organisation' means any number of employers associated together for the purpose, whether by itself or with other purposes, of regulating relations between employers and employees or trade unions.

(vii) 'Farm worker' means an employee who is employed mainly in or in connection with farming activities and includes an employee who wholly or mainly performs domestic work in a home on a farm.

(viii) 'Ordinary hours of work' means the hours of work permitted in terms of section 9 or in terms of any agreement in terms of sections 11 and 12.

(ix) 'Overtime' means the time that an employee works during a day or a week in excess of ordinary hours of work.

(x) 'Public holiday' means any day that is a public holiday in terms of the Public Holidays Act 1994 (Act No. 36 of 1994).

(xi) 'Remuneration' means any payment in money or in kind, or both, made or owing to any person in return for that person working for any other person, including the state.

(xii) 'Temporary employment service' means any person who, for reward, procures for, or provides to, a client, other persons (1) who render services to, or perform work for the client, and (2) who are remunerated by the temporary employment service.

(xiii) 'Trade union' means an association of employees whose principal purpose is to regulate relations between employees and employers, including any employers' organisations.

(xiv) 'Wage' means the amount of money paid or payable to an employee in respect of ordinary hours of work or, if they are shorter, the hours an employee ordinarily works in a day or week.

(xv) 'Week' in relation to an employee, means the period of seven days within which the working week of that employee ordinarily falls.

(c) Major issues covered by the Act

The major issues covered by the Basic Conditions of Employment Act 1997 (Act No. 75 of 1997) include: (i) definitions, purpose and application of this Act (Chapter 1), (ii) regulation of working time (Chapter 2), (iii) leave (Chapter 3), (iv) particulars of employment and remuneration (Chapter 4), (v) termination of employment (Chapter 5), (vi) prohibition of employment of children and forced labour (Chapter 6), (vii) variation of basic conditions of employment (Chapter 7), (viii) sectoral determinations (Chapter 8), (ix) employment conditions commission (Chapter 9), (x) monitoring, enforcement and legal proceedings (Chapter 10), and (xi) general matters (Chapter 11).

The Basic Conditions of Employment Act 1997 (Act No. 75 of 1997) is a critical piece of legislation to business enterprises as it lays down the ground rules with regards to basic conditions to be observed when engaging in employment.

Smallholder farming enterprises are one of the important providers of employment in rural areas, and this Act regulates on the basic conditions to be met when employment is properly agreed on. Failure by smallholder farming enterprises, including those led by youth and women, to comply with this legislation may put them is a risk of litigation, and such may put the prospects of the sustainability of these enterprises in jeopardy. The Act provides sufficient coverage of all pertinent issues.

3.8.2. Employment Equity Act 1998 (Act No. 55 of 1998)

(a) Purpose

The Employment Equity Act 1998 (Act No. 55 of 1998) recognises the fact that as a result of apartheid and other discriminatory laws and practices, there are disparities in employment, occupation and income within the national labour market; and that these disparities create such pronounced disadvantages for certain categories of people that they cannot be redressed simply by repealing discriminatory laws. The Act therefore aims to promote the constitutional right of equality and the exercise of true democracy; eliminate unfair discrimination in employment; ensure the implementation of employment equity to redress the effects of discrimination; achieve a diverse workforce broadly representative of the population; promote economic development and efficiency in the workforce; and give effect to the obligations of the Republic as a member of the International Labour Organisation. In simpler terms, the Employment Equity Act 1998 (Act No. 55 of 1998) aims to provide for employment equity and to provide for matters incidental thereto.

As clearly stipulated in section 2, the purpose of this Act is to achieve equity in the workplace by (1) promoting equal opportunity and fair treatment in employment through the elimination of unfair discrimination; and (2) implementing affirmative action measures to redress the disadvantages in employment experienced by designated groups, in order to ensure their equitable representation in all occupational categories and levels in the workforce.

(b) Important concepts and their definitions

(i) ‘Designated groups mean black people, women and people with disabilities.

(ii) ‘Black people’ is a generic term for Africans, Indians, and Coloureds.

(iii) ‘Collective agreement’ means a written agreement concerning terms and conditions of employment or any other matter of mutual interest concluded by one or more registered trade unions, on the one hand and on the other hand (1) one or more

employers, (2) one or more registered employers organisations, or (3) one or more employers and one or more registered employers' organisations.

(iv) 'Designated employer' means (1) an employer who employs 50 or more employees; (2) an employer who employs fewer than 50 employees, but has a total annual turnover that is equal to or above the applicable annual turnover of a small business in terms of Schedule 4 of this Act; (3) a municipality, as referred to in Chapter 7 of the Constitution; (4) an organ of state as defined in section 239 of the Constitution but excluding local spheres of government, the National Defence Force, the National Intelligence Agency and the South African Secret Service; and (5) an employer bound by a collective agreement in terms of section 23 or 31 of the Labour Relations Act, which appoints it as a designated employer in terms of this Act, to the extent provided for in the agreement.

(v) 'Family responsibility' means the responsibility of employees in relation to their spouse or partner, their dependent children or other members of their immediate family who need their care or support.

(vi) 'People with disabilities' means people who have long-term or recurring physical or mental impairment which substantially limits their prospects of entry into, or advancement in employment.

(vii) 'Pregnancy' includes intended pregnancy, termination of pregnancy and any medical circumstances related to pregnancy.

(viii) 'Reasonable accommodation' means any modification or adjustment to a job or to the working environment that will enable a person from a designated group to have access to or participate or advance in employment.

(ix) 'Registered employers' organisation' means the employers' organisation as defined in section 213 of the Labour Relations Act and registered in terms of section 96 of this Act.

(x) 'Registered trade union' means a trade union as defined in section 213 of the Labour Relations Act and registered in terms of section 96 of that Act.

(xi) 'Remuneration' means any payment in money or in kind, or both, made or owing to any person in return for that person working for any other person, including the state.

(xii) 'Representative trade union' means a registered trade union, or two or more registered trade unions acting jointly, that are sufficiently representative of the employees employed by an employer in a workplace.

(c) Major issues covered by the Act

The major issues covered by the Employment Equity Act include: (i) definitions, purpose, interpretation, and application (Chapter 1), (ii) prohibition of unfair discrimination

(Chapter 2), (iii) affirmative action (Chapter 3), (iv) Commission for Employment Equity (Chapter 4), (v) monitoring, enforcement, and legal proceedings (Chapter 5), and (vi) general provisions (Chapter 6). Considering the major issues covered by the Employment Equity Act 1998 (Act No. 55 of 1998), this legislation is very important for all business entities, including smallholder farming enterprises. The legislation regulates on steps to be taken to promote employment equity, and as a result the inclusion of women in smallholder farming enterprises in the Limpopo Province has become a priority. Even though the Act does not include youths among designated groups, the young people have of late received much attention in terms of being encouraged to participate in the farming enterprises, and this has become more important with increasing unemployment that has made the young people to be the ones mostly unemployed.

3.8.3. Labour Relations Act 1995 (Act No. 66 of 1995)

(a) Purpose

The purpose of the Labour Relations Act 1995 (Act No. 66 of 1995) is to change the law governing labour relations and, for that purpose: (i) to give effect to section 23 of the Constitution; (ii) to regulate the organisational rights of trade unions; (iii) to promote and facilitate collective bargaining at the workplace and at sectoral level; (iv) to regulate the right to strike and the recourse to lock-out in conformity with the Constitution; (v) to promote employee participation in decision-making through the establishment of workplace forums; (vi) to provide simple procedures for the resolution of labour disputes through statutory conciliation, mediation and arbitration (for which purpose the Commission for Conciliation, Mediation and Arbitration is established), and through independent alternative dispute resolution services accredited for that purpose; (v) to establish the Labour Court and Labour Appeal Court as superior courts, with exclusive jurisdiction to decide matters arising from the Act; (vi) to provide for a simplified procedure for the registration of trade unions and employers' organisations, and to provide for their regulation to ensure democratic practices and proper financial control; (vii) to give effect to the public international law obligations of the Republic relating to labour relations; (viii) to amend and repeal certain laws relating to labour relations; and (ix) to provide for incidental matters.

(b) Important concepts and their definitions

(i) 'Dismissal' means that (1) an employer has terminated a contract of employment with or without notice; (2) an employee reasonably expected the employer to renew a fixed term contract of employment on the same or similar terms but the employer offered to renew it on less favourable terms, or did not renew it; (3) an employer refused to allow an employee to resume work after she took maternity leave in terms of any law,

collective agreement or her contract of employment; (4) an employer who dismissed a number of employees for the same or similar reasons has offered to re-employ one or more of them but has refused to re-employ another; or (5) an employee terminated a contract of employment with or without notice because the employer made continued employment intolerable for the employee; (6) an employee terminated a contract of employment with or without notice because the new employer, after a transfer in terms of section 197 or section 197A, provided the employee with conditions or circumstances at work that are substantially less favourable to the employee than those provided by the old employer.

(ii) 'Unfair labour practice' means any unfair act or omission that arises between an employer and an employee involving (1) unfair conduct by the employer relating to the promotion, demotion, probation (excluding disputes about dismissals for a reason relating to probation) or training of an employee or relating to the provision of benefits to an employee; (2) the unfair suspension of an employee or any other unfair disciplinary action short of dismissal in respect of an employee; (3) a failure or refusal by an employer to reinstate or re-employ a former employee in terms of any agreement; and (4) an occupational detriment, other than dismissal, in contravention of the Protected Disclosures Act, 2000 (Act No. 26 of 2000), on account of the employee having made a protected disclosure defined in that Act.

(iii) 'Automatically unfair dismissals' – A dismissal is automatically unfair if the employer, in dismissing the employee, acts contrary to section 51 or, if the reason for the dismissal is (1) that the employee participated in or supported, or indicated an intention to participate in or support, a strike or protest action that complies with the provisions of Chapter IV; (2) that the employee refused, or indicated an intention to refuse, to do any work normally done by an employee who at the time was taking part in a strike that complies with the provisions of Chapter IV or was locked out, unless that work is necessary to prevent an actual danger to life, personal safety or health; (3) to compel the employee to accept a demand in respect of any matter of mutual interest between the employer and employee; (4) that the employee took action, or indicated an intention to take action, against the employer by exercising any right conferred by this Act; or participating in any proceedings in terms of this Act; (5) the employee's pregnancy, intended pregnancy, or any reason related to her pregnancy; (6) that the employer unfairly discriminated against an employee, directly or indirectly, on any arbitrary ground, including, but not limited to race, gender, sex, ethnic or social origin, colour, sexual orientation, age, disability, religion, conscience, belief, political opinion, culture, language, marital status or family responsibility; (7) a transfer, or a reason related to a transfer, contemplated in section 197 or 197A; or (8) a contravention of the Protected

Disclosures Act, 2000, by the employer, on account of an employee having made a protected disclosure defined in that Act.

(iv) 'Dismissals based on operational requirements' When an employer contemplates dismissing one or more employees for reasons based on the employer's operational requirements, the employer must consult (1) any person whom the employer is required to consult in terms of a collective agreement; (2) if there is no collective agreement that requires consultation, a workplace forum or registered trade union whose members are likely to be affected by the proposed dismissals; or (3) if there is no trade union, the employees likely to be affected by the proposed dismissals or their representatives nominated for that purpose.

(v) 'Disciplinary records' – Employers should keep records for each employee specifying the nature of any disciplinary transgressions, the actions taken by the employer and the reasons for the actions.

(vi) 'Guidelines in cases of dismissal for misconduct' – Any person who is determining whether a dismissal for misconduct is unfair should consider (1)whether or not the employee contravened a rule or standard regulating conduct in, or of relevance to, the workplace; and (2) if a rule or standard was contravened: whether or not the rule was a valid or reasonable rule or standard; the employee was aware, or could reasonably be expected to have been aware, of the rule or standard; the rule or standard has been consistently applied by the employer; and dismissal was an appropriate sanction for the contravention of the rule or standard.

(vii) 'Guidelines in cases of dismissal for poor work performance' – Any person determining whether a dismissal for poor work performance is unfair should consider (1) whether the employee failed to meet a performance standard; and (2) if the employee did not meet a required performance standard, whether or not: the employee was aware, or could reasonably be expected to have been aware, of the required performance standard; the employee was given a fair opportunity to meet the required performance standard; and dismissal was an appropriate sanction for not meeting the required performance standard.

(viii) 'Incapacity due to ill health or injury' – Incapacity on the grounds of ill health or injury may be temporary or permanent. If an employee is temporarily unable to work in these circumstances, the employer should investigate the extent of the incapacity or the injury. If the employee is likely to be absent for a time that is unreasonably long in the circumstances, the employer should investigate all the possible alternatives short of dismissal. When alternatives are considered, relevant factors might include the nature of the job, the period of absence, the seriousness of the illness or injury and the

possibility of securing a temporary replacement for the ill or injured employee. In cases of permanent incapacity, the employer should ascertain the possibility of securing alternative employment or adapting the duties or work circumstances of the employee to accommodate the employee's disability.

(ix) 'Guidelines in cases of dismissal arising from ill health or injury' – Any person determining whether a dismissal arising from ill health or injury is unfair should consider (1) whether or not the employee is capable of performing the work; and (2) if the employee is not capable: the extent to which the employee is able to perform the work; the extent to which the employee's work circumstances might be adapted to accommodate disability, or, where this is not possible, the extent to which the employee's duties might be adapted; and the availability of any suitable alternative work.

(c) Major issues covered by the Act

The major issues covered by the Act include: (i) purpose, application and interpretation (Chapter 1), (ii) freedom of associations and general protections (Chapter 2), (iii) collective bargaining (Chapter 3), (iv) strikes and lock-outs (Chapter 4), (v) workplace forums (Chapter 5), (vi) trade unions and employers' organisations (Chapter 6), (vii) dispute resolution (Chapter 7), (viii) unfair dismissal and unfair labour practice (Chapter 8), and (ix) regulation of non-standard employment and general provisions. Considering the major issues covered by the Labour Relations Act 1995 (Act No. 66 of 1995), this legislation is very important for all business entities, including smallholder farming enterprises.

- *Relevance and adequacy of the humane resource and labour related support policies for smallholder farming enterprises. The human resource and labour related support policies also provide relevant and sufficient guidelines for smooth operation of smallholder farming enterprises in Limpopo Province. The policies are also adequate for regulating the functioning of youth and women owned/led farming enterprises in the province. As is the case with any other policy, necessity for amendments arise with time, and such amendments are effected following normal administrative, and where necessary, parliamentary processes.*

  Issues that are not regulated are those where regulation was not important, and decisions on such issues require the innovativeness of the owners/leaders of the farming enterprises.

3.9. Conclusions and Recommendations

The policy review revealed that there are a lot of policies in place to regulate the establishment and operation of smallholder farming enterprises in South Africa including the Limpopo Province, and this study purposively selected those that were regarded to be basic and are likely to be most used by the enterprises. The policies are well detailed with clear stipulations presented for all pertinent issues. The policies seem very appropriate and sufficient to properly regulate (guide) the establishment and operation of smallholder farming enterprises, including those led by youth and/or by women. Any poor performance of the smallholder farming enterprises is therefore unlikely to be a result of inappropriate or lack of policy direction and where the poor performance occurs, efforts should be made to identify the causes.

The study was limited to policy review and did not assess the extent to which these policies are accessed and/or understood by prospective users. Such an investigation is recommended as it will affirm whether the policies are available to the populace or they are confined to office files. Where the policies are available to users, the investigation will determine the reasons for their non-implementation, and where necessary the constraints will be addressed, and policies found to be inappropriate may be amended.

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CHAPTER 4

CHARACTERIZATION OF WOMEN AND YOUTH SMALLHOLDER AGRICULTURAL ENTREPRENEURS IN RURAL IRRIGATION SCHEMES IN VHEMBE DISTRICT, SOUTH AFRICA

Abstract. The purpose of the study was to characterize irrigated smallholder agricultural enterprises (ISAEs) in selected areas of Vhembe District, Limpopo Province. The characterization focused on the geophysical environment and on participants in ISAEs. Precipitation was at most 460 mmpa for villages along Madimbo Corridor and 701-1380 mmpa for those along Mutale Valley, and temperatures were 38.1℃-44.0℃ (Madimbo) and 30.0℃-40.0℃ (Mutale). Groundwater supplemented surface water and was utilized more at Madimbo Corridor compared to Mutale Valley. The study area was characterized as semi-arid to sub-humid, hence technologies for efficient irrigation should be promoted. Participants in ISAEs were female (94.9%), and adult (52.72%) with low education levels (67.7% ≤ secondary education). The majority (88.65%) were not formally employed (54.61% self-employed, 34.04% full-time farmers). Participants experienced some level of poverty, 68.03% received low household incomes (R1001-R5000/month), 77% received social grants. Interestingly, the majority (65.31%) stayed in multiple-roomed houses, had cement brick walls, and corrugated iron roofs (54.42%), and all had electricity, a stove, and a fridge. Also, majority-owned radio (96.67%), DSTV (87.45%), vehicles (65.56%), and cell phones. Participants mostly provided adequate food supply (91.84%) with three meals/day (79.38%) except during hard times where 49.56% provided fewer meals mostly due to delayed readiness of farm produce. Strategies to empower ISAE participants to be more effective should consider their gender, age, education, and economic status estimated by income, asset ownership, and food security.

Keywords: *Vhembe District, Characterization, Geo-physical environment, Irrigated smallholder agricultural enterprise, Madimbo Corridor, Mutale Valley*

4.1. Introduction

Improving household livelihood through smallholder-irrigated agriculture will remain a key strategy for rural poverty alleviation in most of the low-income countries, where most of the rural poor depend directly or indirectly on agriculture. In support of the above, Water Research Commission (WRC, 2009) indicated that for many decades' smallholder irrigated agriculture has been considered to have the potential to generate economic development in poor and under-developed rural areas. The antiquity of smallholder-irrigated agriculture in

South Africa specifies that it suffered considerable neglect and was a mixture of success and failure. Those may have been caused by the adverse effect of water unavailability, which resulted in decreasing agricultural production leading to food insecurity, unemployment, and poverty. With improvements in infrastructure done over the years, it was anticipated that access to reliable water for irrigated smallholder agricultural enterprises (ISAEs) would lead to increased productivity and greater returns from farming. Coupled with the improved ability of ISAEs owners to innovate socially and technologically it was postulated that new opportunities would be opened for both on-farm and off-farm income.

Hussain et al. (2004) corroborated the prospects for improvement of livelihoods and the quality of life in rural areas. However, the lack of information on ISAEs is still dire. The objectives of this study were to:

(1) Characterize the geophysical environment in which the ISAEs operated in the area under study with a focus on the existence of rivers, rainfall distribution, temperature, and the aridity index of the area under study; and

(2) Characterize the participants in ISAEs based on attributes such as demography, household livelihoods, and household food security.

The characterization of ISAEs would inform the development of (a) relevant technologies for improving production under the existing geophysical environment and (b) pertinent empowerment strategies for participants in the ISAEs.

4.2. Methodology

4.2.1. Study Area

The study was carried out in the Vhembe District Municipality of Limpopo Province. The specific areas were Madimbo Corridor under Musina Local Municipality and Mutale Valley under Thulamela Municipality. The focus was on irrigated enterprises that were reliant on private water supply (Madimbo Corridor) and those, which depended on communal water supply infrastructure that irrigated a huge cluster of plots (Mutale Valley). The main villages covered under Madimbo Corridor were Ha-Gumbu, Malale, Masea, Ngwele, Tshipise, and Nwanedi while those under Mutale Valley were Tshiombo, Matangari, and Maraxwe. The study area covered more than 2 270 ha of land.

4.2.2. Sampling Procedure

Stratified random sampling was used to obtain a representative sample of villages and households for interview (Leedy et al., 2005) with the target population being women and youth SHAEs. A two-stage random sampling process was conducted using the *SURVEYSELECT* procedure of SAS. The *PROC SURVEYSELECT* allowed for probability-

based random sampling where sampling in a category or class depended on the number of units within that class. The sampling was regarded as appropriate for handling selection bias.

4.2.3. Data Collection

A semi-structured household questionnaire was used to survey with an emphasis on women and youth ISAEs. The total number of ISAE owners interviewed was two hundred and ninety-four (N=294) with a response rate of 75%. The sample was comprised of 71 youths aged 18 to 35 years old (56 females and 15 males) and 223 women of whom 153 were adults (36-59 years) and 70 pensioners (≥ 60 years old).

4.2.4. Data analysis

The Statistical Package for the Social Sciences (SPSS) version 22 was used to analyse quantitative data. Descriptive statistics included frequency tables and measures of central tendency. Qualitative data were analysed using MS Excel, themes for each question were created according to participant's responses and each response was coded accordingly. In some cases, these themes were further broken down into one or more relevant sub-themes.

4.3. Results and Discussions

According to Randela et al. (2006) characterization of the geophysical environment of location of the ISAEs and of participants in these enterprises have some influence on the design and implementation of policies regulating the establishment of these enterprises. As alluded to earlier, the characterization could guide the development of relevant technologies to improve agricultural production under the existing geophysical environment and the design of pertinent strategies for the empowerment of participants in the ISAEs.

4.3.1. Characterization of participants in women and youth smallholder agricultural enterprises

The characterization of participants in women and youth ISAEs was based on (1) **demography** with a focus on (a) farmer position at the household, (b) farmer gender and age, (c) educational status of the head of household, household monthly income status, and (d) employment status farmer; (2) **household livelihood** with a focus on (a) household accommodation, (b) household source of energy, and (c) household appliances and cell phone owned; and (3) **household food security** with a specific focus on (a) daily food security and (b) seasonal food security.

4.3.1.1. Demography

The demographic features of participants in the ISAEs are explored in this section.

(a) Participant position in the household.

Most participants in ISAEs (59.52%) were heads of their household, followed by those who were spouses (19.39%) and children (13.95%) in the households (Table 4.1).

Table 4.1. Position of participants of irrigated smallholder agricultural enterprises in households in Vhembe District, Limpopo Province

Position in household	Number of respondents	
	Frequencies	**%**
Head of the household	175	59.52
Spouse to the head of household	57	19.39
Child to the head of household	41	13.95
Others	21	7.14
Total	**294**	**100**

According to Bembridge and Tshikolomo (1998), heads of households are the main decision-makers in rural farming households and as a result, the information they provide is more likely to reflect on farming and other developmental decisions of the household.

(b) Gender and age

The gender and age of participants in ISAEs are likely to influence their capacity to adapt to changes in the geo-climatic environment (IFPRI, 2015). In this study, women constituted 94.9% of participants with men only constituting 5% (Table 4.2). The study was, however, biased towards females in terms of sampling. Mulinyac (2017) reported that farmers within the ages of 30-34 years are likely to better understand issues involved in farming and are therefore regarded more armed with necessary information. Only 24.15% of the owners of ISAEs interviewed were youth between the ages of 18 to 35 years. In the same category of youth, 9% were found to be heads of households.

Table 4.2. Gender and age of participants in irrigated smallholder agricultural enterprises in Vhembe District, Limpopo Province

Demographic factor		Frequency	%
Gender of the farmer			
	Male	15	5.10
	Female	279	94.9
	Total	**294**	**100**
Age of the farmer			
	18-35 years	71	24.15
	36-59 years	155	52.72
	>60 years	68	23.13
	Total	**294**	**100**
Age of the head of household			
	18-35 years	26	8.97
	36-59 years	156	53.79
	>60 years	108	37.24
	Total	**290**	**100**

The majority (52.72%) of the ISAEs were adults between the ages of 36 to 59 years. Farmers older than 60 years were the second-highest category at 37.24%. This observation supports Simotwo et al. (2018) who revealed that farmers were ageing. Older farmers could be resistant to change and thus may not see the need of employing new technologies and would prefer the traditional models of farming that they are familiar with other than adopting new methods (Fussel and Klein, 2006).

Farm productivity has been shown to deteriorate with the farmer's age, especially among the smallholders who largely rely on their physical labour to execute many farming responsibilities (Uddin et al., 2014, Labbe et al., 2016).

(c) Educational status and income of participants in irrigated smallholder agricultural enterprises

The importance of education in successful developmental activities such as farming cannot be overemphasized. The level of education has a strong influence on the extent to which a farmer can access new information and technology, not only through improved literacy that enables the farmers to access written information but also through the increased ability to

search for information using modern information technologies. Citing Appleton and Balihuta (1996), Oduro-Ofori et al. (2014) described the effect of education on agricultural productivity as cognitive and non-cognitive. Cognitive effects reportedly emphasize basic literacy and numeracy that farmers achieve from education while non-cognitive effects emphasize the change in the attitude of farmers who attended school due to improved discipline introduced by formal schooling.

About one in five (18.81%) participants in ISAEs were completely illiterate, 27.84% had primary education at most, with two in five (39.86%) having had some secondary/high school education. Only 11.34% of respondents had a college or university education (Table 4.3). Reading and writing are basic conditions for farmers to have the ability to access information available in written and electronic media (O'Brien et al., 2004a). As depicted in Table 4.3, the majority (68.3%) of ISAEs had an income of between R1001 to R5000. The immediate second was the category that earned an income of R5001 to R8000. As stated by Ijatuyi et al. (2017), income is a potent proxy for livelihood.

As highlighted, literature is explicit about the five pillars of livelihood which includes financial capital (stocks of money or assets in liquid form), natural capital (land, water, and biological resources), social capital (rights or claim derived from group membership), physical capital (infrastructure, resources created through economic production), and human capital (Ijatuyi et al., 2017).

Table 4.3. Education and income levels of participants in irrigated smallholder agricultural enterprises in Vhembe District, Limpopo Province

Education and income categories		Frequency	%
Educational information			
	Never went to school	46	15.81
	ABET	15	5.15
	Primary Education	81	27.84
	Secondary school	116	39.86
	Tertiary Education	33	11.34
	Total	**291**	**100**
Monthly income status (Rand)			
	≤ 1000	25	8.50
	1001-5000	200	68.03
	5001-8000	44	14.97
	8001-15000	12	4.08
	15001-30 000	12	4.08
	>30 000	1	0.34
	Total	**294**	**100**
Household received social grant			
	Receive social grant	221	77.00
	Do not receive social grant	66	23.00
	Total	**287**	**100**
Type of Grant received			
	Child grant	147	63.36
	Pension grant	85	36.64
	Total	**232**	**100**

Since more participants in ISAEs were women the majority (77%) were receiving grants. Of the grant recipients, the majority (63.36%) were child grant beneficiaries. The second type of grant (36.64%) was a pension grant that is offered to those participants in ISAEs that are over 60 years.

(d) Employment status of participants in irrigated smallholder agricultural enterprises

The employment status of participants in ISAEs tends to have some influence on their adaptive capacity to adverse effects of business risks. The participants in ISAEs may need to be employed elsewhere to supplement the farming income and be able to buy required inputs to mitigate the adverse effects of business risks. For these participants, involvement in additional employment increases their adaptive capacity and makes their agricultural enterprises recover faster from the occurrence of an adverse event. In this study, 54.61% of participants in ISAEs were self-employed with an associated 34.04% being full-time farmers (Table 4.4).

Table 4.4. Employment status of participants in irrigated smallholder agricultural enterprises in Vhembe District, Limpopo Province

Employment status	Frequency	Percent
Self-employment	154	54.61
Full-time Farmer	96	34.04
Public servants	10	3.55
Unemployed	8	2.84
Other	14	4.96
Total	**282**	**100**

A lesser number of the participants were employed in the public service (3.55%) with 2.84% describing themselves as unemployed.

4.3.1.2. Household livelihoods

(a) Type of housing

The type and quality of a house owned by a farmer tend to be positively influenced by the amount of income earned and may positively be associated with the capacity of the farmer to manage his/her agricultural enterprise. Farmers earning higher incomes are expected to afford better houses compared to their lower-income counterparts. Accordingly, ISAE participants with higher incomes are expected to reside in better quality houses than their lower-income counterparts.

The Housing accommodation of participants in irrigated smallholder agricultural enterprises in Vhembe District, Limpopo Province is shown in Table 4.5.

Table 4.5. Housing accommodation of participants in irrigated smallholder agricultural enterprises in Vhembe District, Limpopo Province

Type of housing accommodation		**Frequency**	**%**
	Single roomed house	7	2.38
	Cluster of rondavels	1	0.34
	Multiple roomed house	192	65.31
	Multiple roomed house with separate rondavels	94	31.98
	Total	**294**	**100**
Type of building material used			
	Walls of forest timber with thatch roof	5	1.70
	Walls of mud bricks with thatch roof	5	1.70
	Walls of mud bricks with a roof of corrugated iron	29	9.86
	Walls of cement bricks with thatch roof	25	8.50
	Walls of cement bricks with a roof of corrugated iron	160	54.42
	Walls of cement bricks with tile roof	70	23.81
	Total	294	100
	Total		
Number of rooms			
	≤ 4	54	18.43
	5-8	197	67.24
	9-12	40	13.65
	>13	2	0.68
	Total	293	100
Location of toilets			
	Outside pit toilet	263	89.46
	Inside flushing toilet	6	2.04
	Outside pit and inside flushing toilets	22	7.48
	No toilets	3	1.02
	Total	**294**	**100**

The ISAE participants and other members of the community may, however, be beneficiaries of the government housing scheme and own higher-quality houses even if their income levels are low, hence the interest on the source of funding for house construction. The majority of ISAE participants had multiple roomed houses (65.31%) and some (31.98%) had multiple roomed houses with separate rondavels (Table 4.5). The building materials used were cement bricks with roof corrugated iron (54.42%) and walls of cement bricks with tile roofs (23.81%). The majority (67.24%) had between five and eight rooms followed by 18.43% with less than four rooms. The toilets were located outside in most households (89.46%) and only 7% had inside flushing toilets and an outside pit toilet.

(b) Energy supply

Energy supply to households in the study area is shown in Table 4.6. Electricity allows access to information through TV media and telephone. Adaptive capacity is highly dependent on the capacity of farmers and their families to access key information and to collectively self-organize (Jones and Boyd, 2011).

Table 4.6. Energy supply to households of participants in irrigated smallholder agricultural enterprises in Vhembe District, Limpopo Province

Energy supply		**Frequency**	**%**
Access to electricity in the household			
	Access to electricity	294	100
	No access to electricity	0	0
	Total	294	100
Type of electricity			
	Metered	34	11.56
	Prepaid	260	88.44
	Total	294	100
Cost of electricity (Rand/months)			
	≤500	258	89.58
	501-1000	18	6.25
	1001-2000	10	3.47
	>2001	2	0.69
	Total	**288**	**100**

All participants in ISAEs had access to electricity. About 88.44% used prepaid electricity which was a sign of good management to their household cash-flows. Only 11.56% had metered electricity. The majority (89.58%) paid at most R500 per month with about 10% paying over R500.00 per month (Table 4.6).

(c) Household equipment

Table 4.7 shows the equipment that was owned by households of participants in ISAEs in the area under study. All participants interviewed owned a stove and refrigerator. Also, 96.76% owned a radio, 78.61% had an aerial TV set while 87.45% owned a DSTV set. The participants in ISAEs would therefore be expected to have easy access to radio and TV transmitted information.

Table 4.7. Household equipment owned by participants in irrigated smallholder agricultural enterprises in Vhembe District, Limpopo Province

	Yes		No		Total	
	Frequency	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Stove	258	100	0	0	258	100
Fridge	294	100	0	0	294	100
Radio	261	96.67	9	3.33	270	100
Aerial TV set	147	78.61	40	21.39	187	100
DSTV set	223	87.45	32	12.55	255	100
Donkey cart	62	36.26	109	63.74	171	100
Bicycle	27	13.57	172	86.43	199	100
Motorbike	21	26.58	58	73.42	79	100
Sedan	49	48.51	52	51.49	101	100
LDV	99	65.56	52	34.44	151	100

Perhaps important for transport provision in running their agricultural enterprises, 65.56% of participants in ISAEs owned a light delivery vehicle, 48.51% owned a sedan, 36.26% had a donkey cart while 26.58% owned a motorbike.

(d) Communication equipment

Table 4.8 depicts the extent to which participants in ISAEs owned the means of communication and a door to the digital world cell phone.

Table 4.8. Ownership of communication equipment (cell phones) by participants in irrigated smallholder agricultural enterprises in Vhembe District, Limpopo Province

Cell phone equipment ownership		Frequency	%
Number of males owning cell phones			
	Zero	18	6.19
	One	113	38.83
	Two	97	33.33
	Three	55	18.90
	≥ Four	8	2.75
	Total	291	100
Number of females owning cell phones			
	Zero	2	0.69
	One	83	28.63
	Two	127	43.79
	Three	43	14.83
	≥ Four	35	12.07
	Total	**290**	**100**

Some 38.83% of male participants in ISAEs owned one cell phone compared with 28.63% of female participants. Some 33.3% of males owned two cell phones compared to 43.79% of their female counterparts. The likelihood of having more than one cell phone was due to lack of network which varied with the type of service providers. At the most, it was still significant to note that 18.90% of the male participants in ISAEs had three phones compared to 14.83% of the females. As reported, 12.07% of female participants owned more than four cell phones. The means of communication seems to be more with female than male smallholder entrepreneurs.

4.3.2 Household food security

Access to food is an important aspect of characterizing participants in ISAEs and may be assessed using various indicators. The choice of an indicator is informed by factors such as the feasibility of the measure and the capability to provide a multidimensional scale (Frangillo, 2000). Some indicators are categorized as process indicators reflecting both food supply and food access whereas others are regarded as outcome indicators used as proxies for food consumption (Frankenberger, 1992). The study investigated seasonal and daily food supplies for households of participants in ISAEs.

(a) Seasonal food supply

Respondents were asked pertinent questions to assess the level of household food supply across seasons as guided by Bickel et al. (2000). Based on Frangillo et al. (1999), households with low levels of supply of nutritious food were regarded as food insecure.

Table 4.9. Seasonal supply of food to households of participants in irrigated smallholder agricultural enterprises in Vhembe District, Limpopo Province

	Yes		No		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Adequate food supply	270	91.84	24	8.16	294	100
Seasons with fewer meals	60	20.91	227	79.09	287	100
Skip meals	36	14.46	213	85.54	249	100
Go to bed without meals	7	2.92	233	97.08	240	100

In this study, up to 91.84% of the ISAE participants indicated that they had adequate food supply. The majority of participants (79.09%) also pointed out that they had no seasonal shortage of food (Table 9). Accordingly, the participants revealed that they never experienced situations where they had to skip a meal (85.54% of respondents) or go to bed without a meal (97.08%). Perhaps rather unexpected were the responses of 81.15% of participants who felt summer was the most difficult season for food supply while 11.48% thought the winter season was rather difficult. With summer being the production season of most crops even under rainfed conditions, one would not expect it to be the most difficult season for food supply in the area under study.

(b) Daily food supply

With regards to the daily supply of food to ISAE households, respondents were asked to provide general perceptions on the number of meals per day and numbers during difficult periods.

Table 4.10. Daily supply of food to households of participants in irrigated smallholder agricultural enterprises in Vhembe District, Limpopo Province

		Frequency	%
Number of meals per day			
	One	1	0.34
	Two	54	18.56
	Three	231	79.38
	Four	3	1.03
	Five	2	0.69
	Total	291	100
Meals per day hardest period			
	None	1	0.44
	One	18	7.96
	Two	112	49.56
	Three	91	40.27
	Four	4	1.77
	Total	**226**	**100**
Meals per day other period			
	None	1	0.44
	One	7	3.08
	Two	44	19.38
	Three	172	75.77
	Four	3	1.32
	Total	**227**	**100**

About four in five (79.38%) of participants indicated that they generally had three meals per day with two in five (40.27%) having received the same number of meals during difficult times while three in four (75.77%) participants had the same number of meals outside the difficult times (Table 4.10). The provision of three meals per day in the majority (79.38%) of ISAE households tends to support their earlier view that food supply was generally adequate. It is worth noting, however, that half (49.56%) of respondents received two meals per day during difficult periods with fewer (19.38%) of them having received the same number of meals outside the difficult periods.

(c) Reasons for fewer meals

Table 4.11 indicates the reasons for fewer meals in some households of participants in irrigated smallholder agricultural enterprises in Vhembe District, Limpopo Province. As alluded to, half (49.56%) of participants in ISAEs received only two meals per day during difficult periods with one in five (19.38%) of them having received the same number of meals outside the difficult periods. It was therefore deemed necessary to establish the main reasons for those ISAE households not being able to provide three meals that would cater for breakfast, lunch, and dinner.

Table 4.11. Reasons for fewer meals in some households of participants in irrigated smallholder agricultural enterprises in Vhembe District, Limpopo Province

Reason		Frequency	Percent
	Lack of enough money to buy food	55	25.20
	Shortage of Food	3	1.10
	Summer days are longer and require more food than other seasons	43	19.30
	Produce on the farm are not yet ready	116	54.40
	Total	**217**	**100**

The majority (54.4%) of ISAE households provided fewer meals because the produce on their farms was not yet ready for consumption (Table 4.11). One in four (25.2%) of the respondents indicated that they lacked the money to buy food, hence the provision of fewer meals as a survival strategy. About one in five (19.3%) of the respondents suggested that they provided fewer meals as summer days are longer and require more food, a reason that seemed to contradict the expectation.

4.4 Conclusions

Considering the geophysical environment, the study area had variable precipitation with low rainfall (at most 460 mmpa) received by villages along the Madimbo Corridor and medium to high rainfall (701 to 1 380 mmpa) received by those along the Mutale Valley. The annual maximum temperatures ranged from 38.1℃ to 44.0℃ (Madimbo Corridor) and 30.0℃ to 40.0℃ (Mutale Valley). The study area relied on surface water supplemented by groundwater which was utilized more at Madimbo Corridor compared to Mutale Valley. The area was characterized as semi-arid to sub-humid, hence technologies for efficient use of irrigation water should be promoted.

With regards to demography, participants in ISAEs were mostly female (94.9%), and adults of 36-59 years (52.72%) with rather little education where 27.84% possessed primary while 39.86% had secondary education. The majority of participants (88.65%) were not formally employed (54.61% were self-employed and 34.04% were full-time farmers). Participants in ISAE probably experienced some level of poverty with 68.03% receiving low household incomes (R1 001 to R5 000/month) and 77% dependent on social grants. It was interesting to note that 65.31% of participants stayed in houses with multiple rooms mostly with cement brick walls and corrugated iron roofs (54.42%). They all had access to electricity and possessed a stove and fridge. Majority owned radio (96.67%), digital satellite television (87.45%), and vehicle (65.56%). They all had cell phones except for 6.19% of males.

Also worth noting is the fact that 91.84% of ISAE participants reported having had an adequate food supply with 79.38 having provided three meals per day. However, the situation was different during hard times where most (49.56%) provided two meals with only 40.27% maintaining three meals. As revealed by participants, the reason for the provision of fewer meals was mostly delayed maturity of farm produce.

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CHAPTER 5

THE IMPACT OF MULTIPLE STAKEHOLDERS ON WOMEN & YOUTH AGRICULTURAL ENTERPRISES (W-Y SHAE)

SECTION 1: ANALYSIS OF MULTIPLE STAKEHOLDERS: A CASE OF SUBTROPICAL FRUITS – SMALLHOLDER AGRICULTURAL ENTREPRENEURS IN THE LIMPOPO PROVINCE OF SOUTH AFRICA

Abstract. The study was conducted on subtropical fruits smallholder entrepreneurs producing (SFSHE) (Avocado, Macadamia and Mango) in Mopani and Vhembe Districts. The purpose of the study was to determine the contributions and impacts of multiple stakeholders. Primary data was collected from 374 SFSHE using self-administered structured questionnaire designed to capture information on stakeholder identification, roles, interactions, and main challenges. The key stakeholders were: Limpopo Department of Agriculture and Rural Development (LDARD), South African Mango Growers Association (SAMGA), Agricultural Research Council (ARC) and National Agriculture Marketing Council (NAMC). The roles of key stakeholders were: SAMGA provides fertilizer application and spraying information (86%), LDRARD provides farm management and marketing (57%), ARC provides research information (92%) while NAMC provides market information (59%). The interactions for information sharing between SFSHE and key stakeholders were mainly through ARC bi-monthly meetings (12%) and emails (9%), LDARD monthly meetings (11%) and bi-monthly visits (41%), SAMGA bi-monthly meetings (70%) and visits (23%), and NAMC meetings (10%) and visits (11). Transformation and budget were the main challenges of SFSHE experienced when interacting with stakeholders. It is recommended that Extension Program Coordinating Units be established to mainstream the contribution that External Stakeholders and Government make to SFSHE.

5.1. Introduction

Consumption of fresh fruits is increasing, both locally and abroad, and is expected to continue rising as consumers are willing to pay higher prices especially for out-of-season fresh fruits. The European Union is by far the largest importer of fresh fruit from South Africa. Agriculture makes a significant contribution to economies of most African countries. As mentioned by Martey, Etwire, Wiredu and Dogbe (2014), agriculture is the key sector for economic development in most African countries and is highly reliant on production by smallholder farmers. The statement by Martey et al. (2014) affirmed Engel and Solomon (1997) who revealed that the agriculture sector is a primary source of income for the rural

population and contributes to foreign exchange earnings for African economies. South Africa covers 1.2 million square kilometres of land, and has seven climatic regions that include Mediterranean, subtropical and semi-desert. This biodiversity favours the production of a highly diverse range of agricultural products, and these include subtropical fruits. South Africa has a dual agricultural economy with both well-developed commercial farming and subsistence-based production in the rural areas. In accordance with statements by various authors for the continent, agriculture was described as the primary economic activity in rural areas of South Africa.

Limpopo Province is one of South Africa's richest agricultural areas. More than 45% of the R2-billion annual turnover of the Johannesburg Fresh Produce Market comes from Limpopo. The province is endowed with abundant agricultural resources and is one of the country's prime agricultural regions noted for production of various commodities, mostly subtropical and citrus fruits, vegetables and livestock. Approximately 2.7% of the Limpopo value added Gross Geographic Product comes from agriculture with about 1.1% of the population in the province working in this sector. Lawrence, Barr and Haylor (1999) and Adekunle & Fatunbi (2012) revealed that farmers, especially the smallholder farmers are confronted with multiple challenges. These authors argued that the involvement of multiple stakeholders in farming has the potential to address the multiple challenges faced by smallholder farmers. A multi-stakeholder approach is essential to map out the challenges, understand, and articulate appropriate options for the farmers (Odhiambo, Nyangito, & Nzuma, 2004). Stakeholders are actors, target group and partners (Zimmermann & Maennling, 2007) and are influential in the implementation of farming activities. As affirmed by Nesamvuni and Tshikolomo (2014), there should be a considerable interaction between farmers and various stakeholders, and those include public organizations, private companies, and none profit organizations.

Acknowledging the essence of stakeholder involvement in farming, the statement by Karim, Rahman, Berawi and Jaarpar (2007) who revealed that farming involves multiple stakeholders from the start of production to the end of the value chain presents some relief. This was supported by Dodds (2015) who indicated that since the 1990s stakeholders have become an integral part of many organizations and that each of them (the stakeholders) bring vital capability, knowledge and skills, thereby building synergies to co-create something new and show impact. Knowledge and understanding of stakeholder and their influence on farming requires a comprehensive stakeholder analysis. Stakeholder analysis should be flexible and allow for continuous improvement. Stakeholder analysis involves participation by team members where participation is an engagement processes involving stakeholders in identification, planning, implementation, and evaluation of projects and program.

This paper was therefore intended to identify key stakeholders influencing smallholder producers of subtropical fruits in the Limpopo Province of South Africa, and to establish the roles of each of the stakeholders, describe the nature of interactions between the smallholder farmers and the multiple stakeholders, and identify the main challenges related to such interactions.

5.2. Research Methodology

5.2.1. Study Area

The study was conducted in the Limpopo Province of South Africa and focused on smallholder famers producing subtropical fruits (Avocado, Macadamia and Mango) in communal lands in the Mopani and Vhembe District (Figure 5 1).

Figure 5.1. Map of Limpopo Province showing the location of Vhembe (blue colour) and Mopani (pink) Districts that constitute the study area (Source: Limpopo web: local info.)

5.2.2. Sampling frame and sampling procedures

The population for a study is that group about whom the researcher wants to draw conclusions (Babbie & Mouton, 2010). As stated by Melville and Goddard (1996), a population is any group that is the subject of research interest. The population of the study comprised of 436 SFSHE producing subtropical fruits in the Limpopo Province. According to Welman, Kruger and Mitchell (2005) a sampling frame is a complete list of units of analysis in which each unit is mentioned only once, and a sample should be representative of the sampling frame. The unit of analysis for the study was selected through purposive sampling as defined as a sampling where researchers rely on their experience, ingenuity and previous research findings to deliberately obtain units of analysis that are regarded as representative of the relevant population (Welman et al*.,* 2005 as cited by Tshikolomo, Nesamvuni, Walker and Stroebel, 2012). For this study, all the 436 smallholder subtropical fruit growers available in the database of the researcher were interviewed. The study collected both quantitative and qualitative data and was therefore described as a mixed research (Hurmerinta-Peltomaki & Nummela, 2006).

5.2.3. Data collection

Primary data was collected for the purpose of this study using a self-administered structured questionnaire. The questionnaire was used to interview individual SFSHE producing subtropical fruits. The questionnaire was designed to capture information relating to issues that included stakeholder identification, roles, types of interactions, level of importance and contributions made. The questionnaire had open-ended and closed-ended questions that collected both qualitative and quantitative data. Before large-scale administration of the instruments, a pre-testing session was conducted to determine instrument validity. After validation of the instruments, the researcher obtained data directly from SFSHE by interviewing twenty one (21) (SFSHE with 374 questionnaires captured for final analysis. Secondary data information was collected through literature review from relevant documents, reports, journals and other literature. The research approach used was a combination of both quantitative and qualitative data, referred to as a mixed study (Hurmerinta-Peltomaki & Nummela, 2006 and Leedy & Ormrod, 2010).

5.2.4. Data Analysis

Quantitative data was analysed using the Statistical Package for the Social Sciences (SPSS) version 22. Descriptive statistics included frequency tables and measures of central tendency Findings were presented in the form of frequency tables and graphs that were discussed based on objective interpretations. Qualitative data was analysed using MS Excel,

themes for each question were created according to participant's responses and each response was coded accordingly. (In some cases these themes were further broken down into one or more relevant sub-themes.). Qualitative data was summarized according to thematic issues and was discussed based on subjective interpretations (Leedy & Ormrod, 2010)

5.3. Results and Discussions

5.3.1. Identification of stakeholders in smallholder production of subtropical fruits

Stakeholders are actors, target group and partners and include those who are influential and important. The establishment and implementation of any project requires active stakeholders to provide human and social capital (Zimmermann & Maennling, 2007). The first task in the multi-stakeholder analysis was to identify stakeholders. The first step in identifying stakeholders was to develop an inventory of preliminary list of all potential stakeholders, and such process could require some brainstorming (Morris & Biddache, 2012). According to Vos and Achterkamp (2006), identifying stakeholders could be regarded similar to drawing a line between parties involved and parties not involved. Identification of stakeholders could be done by knowledgeable people who work in the system, by the researcher who already understand some different groups and organizations involved, by the other stakeholders and by conducting value chain analysis to consider all stakeholders involved in the commodity production cycle from production to consumption, from inputs, technical skills, personnel required, finance and markets (Adekunle & Fatunbi, 2012; Stevens & Letty, 2014).

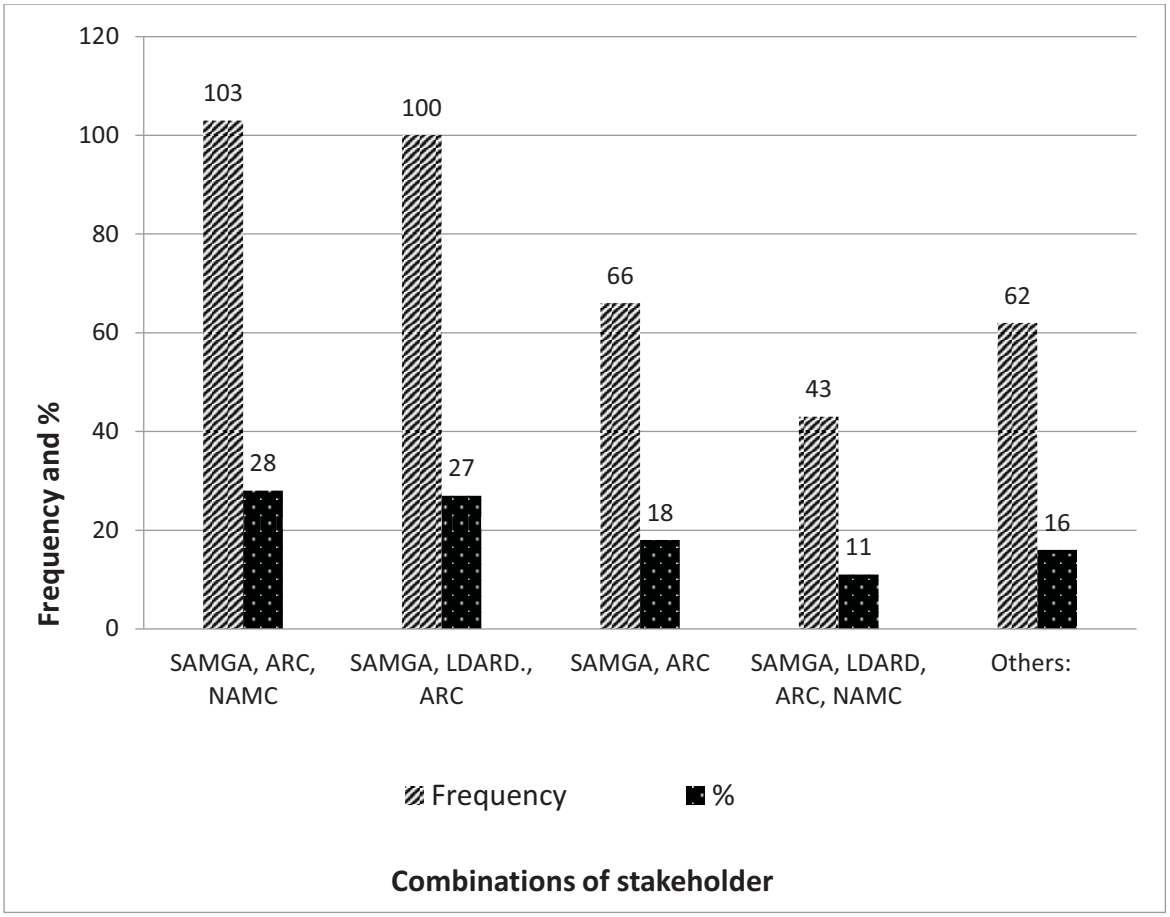

Figure 5.2. Perception of smallholder subtropical fruit producers on important stakeholders

Combinations of names of stakeholders reportedly involved in the smallholder subtropical fruit industry as perceived by the respondents were variable (Figure 2). Twenty eight percent (28%) of the respondents regarded a combination of SAMGA, ARC, and NAMC as important stakeholders for the fruit industry while 27% opted for a combination of SAMGA, LDARD, and ARC. Eighteen percent (18%) of the respondents reported a combination of SAMGA and ARC as important stakeholders while one in ten (11%) respondents felt a combination of SAMGA, LDARD, NAMC, and ARC were important stakeholders for their industry. Four stakeholders (SAMGA, ARC, NAMC and LDARD) were regarded important for the fruit industry. As evident in Figure 5.2, combinations of stakeholders such as inputs suppliers, equipment companies, markets and financial institutions were not mentioned among those vital to the smallholder subtropical fruit industry. Stakeholders that are not mentioned were probably not directly involved in the smallholder production of subtropical fruits. The study also revealed rationales for selection of identified stakeholders as key for production of smallholder subtropical fruits. Accordingly, SAMGA was selected for their study groups and provision of recent information (74% of respondents), LDARD was regarded an

important source of information (54%), the ARC was valued for sharing new research information (51%) while NAMC was selected for their provision of market information (19%).

5.3.2. Stakeholder roles

Table 5.1 shows the frequency and associated percentage of stakeholder roles. According to MacArthur (1997), the roles of stakeholders vary depending on the stakeholder's advocacy.

Table 5.1. Frequency and associated per cent of stakeholder and their roles

Stakeholder	Roles	Frequency	%
ARC	Provide information on research; conduct study groups	345	92
SAMGA	Provide recent information on fertilization & spraying	320	86
NAMC	Provide market information and learning materials	223	59
LDARD	Provide information on marketing and on how to run a farm	215	57

All the respondents regarded the stakeholders to have an important role of providing information. Specifically, nine in ten (92%) of respondents reported that the ARC provided research information, 86% regarded SAMGA an important source of fertilizer application and spraying information, six in ten (59%) felt that NAMC provided market information with almost the same number (57%) of respondents associating LDARD with farm management and marketing information (Table 1). When asked about the main contributions of the stakeholders to smallholder production of subtropical fruits, respondents highlighted study groups and training by ARC (89% of respondents), daily visits by LDARD (64%), study groups by SAMGA (56%) and provision of learning material by NAMC (42%). Although the interviewed SFSHE did not provide identical responses, contributions made were related to roles of the stakeholders. For instance, the ARC contribution was conducting study groups (also highlighted under roles) and training sessions in which provision of research information as emphasized under roles probably occurred.

5.3.3. Types and frequency of interactions between SFSHE and stakeholders

The types and frequency of interactions between SFSHE and stakeholders are important for successful production of subtropical fruits by smallholder farmers.

Table 5.2. Stakeholder type and frequency of interactions with smallholder subtropical fruit producers

Stakeholder	Type of interactions	Frequency of interactions	Frequency	Percent
LDARD	Visits	Bi-monthly	152	41
	Meetings	Monthly	42	11
SAMGA	Meetings	Bi-monthly	262	70
	Visits	Bi-monthly	85	23
ARC	Emails	Bi-Monthly	35	9
	Meetings	Bi-Monthly	46	12
NAMC	Meetings	Other	39	10
	Visits	Other	40	11

Except for the ARC who interacted through meetings (12%) and emails (9%), the rest of the stakeholders interacted through meetings and visits. LDARD had monthly meetings (11%) followed by bi-monthly visits (41%), SAMGA had bi-monthly meetings (70%) followed by visits (23%), while NAMC had meetings at other levels of frequency (10%) followed by visits (11%). Generally, visits and meetings were common types of interactions with the frequency spread between monthly and bi-monthly (Table 5.2). In the various interactions, it would be expected for each stakeholder to contribute in accordance with its knowledge base (Kennon, Howden, and Hartley, 2009). In this regard, the study revealed that the ARC was strong in research (91% of respondents), SAMGA was strong in facilitating study groups (48%) and provision of information (32%), NAMC was strong in marketing (11%) while LDARD seemed not be strong in one specific field as they dealt with the various fields.

In accordance with the stakeholder areas of strength, it was reported in the study that the ARC provided leadership in research (35% of respondents), NAMC led in marketing (35%), while SAMGA led in production (32%). The area of leadership of the stakeholders seemed to align with their main mandates.

5.3.4. Stakeholder and their respective contribution

According to MacMillian dictionary, contribution is something that could help achieve or make success, contribution can be valuable or outstanding. Depending on the needs, stakeholder contribution can be valuable and help SFSHE to be successful. Contribution can also be done to satisfy one's goal and objective, forgetting the needs of the receiver. Contributions should be beneficial on operations core activities and should address the needs

of farmers. Contributions by stakeholders in the fruit industry could be in the form of donations financially, capacity building and skills development.

Table 5.3. Frequencies and associated percentages for Stakeholders and their contributions

Stakeholder	Contribution	Frequency	Percent
ARC	Conduct study groups and training	333	89
LDARD	Daily visits	240	64
SAMGA	Conduct study groups	211	56
NAMC	Provide learning material	158	42

Table 5.3 shows ARC as mentioned by 89% respondents for its contribution towards conducting study groups and training. Similarly, 56% of the respondents also indicated that SAMGA contribution was in the form of conducting study groups. NAMC's contribution was mentioned as that of providing learning materials to SFSHE but its role was to provide marketing information and it could be that the learning materials has marketing information.

5.3.5. Stakeholders and their respective leadership

Leadership of stakeholders determine the quality of service that can be provided to farmers. It should also be noted that leadership becomes central to the ability to resolve conflicts between SFSHE and stakeholders. The frequencies and associated percentages for stakeholders and their area of leadership is shown in Table 5.4. The ARC and NAMC were perceived to be by the 35% of SFSHE in research and marketing respectively. The SAMGA was viewed as leaders by (32%) of SFSHE in production practices. The LDARD was mentioned as the leader in provision of training (9%) by the farmers.

Table 5.4. Frequencies and associated percentages for Stakeholders and their area of leadership

Stakeholder	Area of leadership	Frequency	Percent
ARC	Research	131	35
NAMC	Marketing	131	35
SAMGA	Production	118	32
LDARD	Training	34	9

5.3.6.Stakeholders and their respective knowledge base

Stakeholders are wealth of knowledge about current processes and industry insight. Kennon, Howden, & Hartley (2009) said that stakeholders should have correct information, consultation done and involvement in decision making. For the SFSHE it was seen as prudent to (a) prioritize stakeholders that are critical in helping deliver outcome of the farming enterprises; (b) associate with influential stakeholders who have direct or indirect power over the success of the project including on financial, authority and decision making; and also prioritize important stakeholders who are opinion leaders, experts, and innovators. Table 5 indicates the frequencies and associated percentages for stakeholders and their knowledge base.

Table 5.5. Frequencies and associated percentages for Stakeholders and their knowledge base

Stakeholder	Knowledge base	Frequency	Percent
ARC	Research	342	91
SAMGA	Knowledge of study groups	179	48
	Give information	118	32
NAMC	Marketing	40	11
LDARD	Provide skills of farming	6	2

SFSHE (91%) perceived ARC to have the research knowledge base with SAMGA known to be a base of information through study groups. The association of the knowledge base and the method of delivery seems to be key to the farmer's perception as they interact with stakeholders. The study group method used by both ARC (Table 1) and NAMC (Table5) seems to be the vehicle to transfer the knowledge and information to the farmers. This was corroborated by results of Table 6 that indicated that 89% of framers received information regularly through Study Groups. According to (Mittal and Mehar, 2015), empowering SFSHE start with information. They also indicated that often SFSHE are treated as homogenous group when disseminating information. Agricultural productivity and increase in yield can be enhanced through information (Opara, 2008).

Table 5.6. Frequencies and associated percentages for Source of information regularly used by respondents

Source of information	Frequency	Percent
Study group	333	89
Others	41	11

5.3.7. Challenges experienced by smallholder SFSHE when interacting with stakeholders

It is important for the challenges between SFSHE and stakeholders to be understood because they need to be addressed if improved smallholder production of subtropical fruits is to be realized.

Table 5.7. Challenges experiences by smallholder SFSHE when interacting with stakeholders

Stakeholder	Challenges SFSHE experience when interacting with stakeholders	Frequency	Percent
SAMGA	Transformation	357	95
ARC	Budget	308	82
NAMC	Budget	135	56
LDARD	Standard of extension officers	36	10

The main challenge reported by smallholder SFSHE in their interaction with SAMGA was transformation (probably lack thereof – 95% of respondents), the challenges associated with ARC (82%) and NAMC (47%) were budget (lack thereof), while the respondents had issues with LDARD standard of extension officers (10%) and budget (9%) as evident in Table 7. The adverse effects of these challenges were probably exacerbated by the perceived lack of feedback on the side of the stakeholders. As revealed in the study, only one in five (20%) of stakeholders were reported to provide feedback with the majority (80%) reportedly not doing so.

5.4. Model for Multi-Stakeholder: A case of Youth Agricultural Entrepreneurs in Limpopo Province of South Africa

A trend on multi-stakeholder interaction for Subtropical Agricultural Entrepreneurs is shown in Figure 5.3. Meetings seemed to be dominating the way stakeholders interact with Subtropical Agricultural Entrepreneurs. All four major stakeholders interact through meetings with the farmers. LDARD interact with SFSHE through visits as showed by 152 of the respondents, the visits are done bi-monthly (once in two months). Two hundred and sixty two (262) respondents indicated that SAMGA interact with them through meetings once in two months. Only 9% interact with ARC through emails. Proctor & Lucchesi, 2012 added that aging SFSHE are less likely to introduce technology and it is not a surprise when only 9% interact using emails. This could mean that ARC is not reaching many smallholder SFSHE as most of them do not have smart cell phones that can be used to access emails and even those that have are unable to them. NAMC interact with SFSHE through visits and meetings but it was indicated how often the interaction was done and only 11% of the respondents attended those meetings and visits.

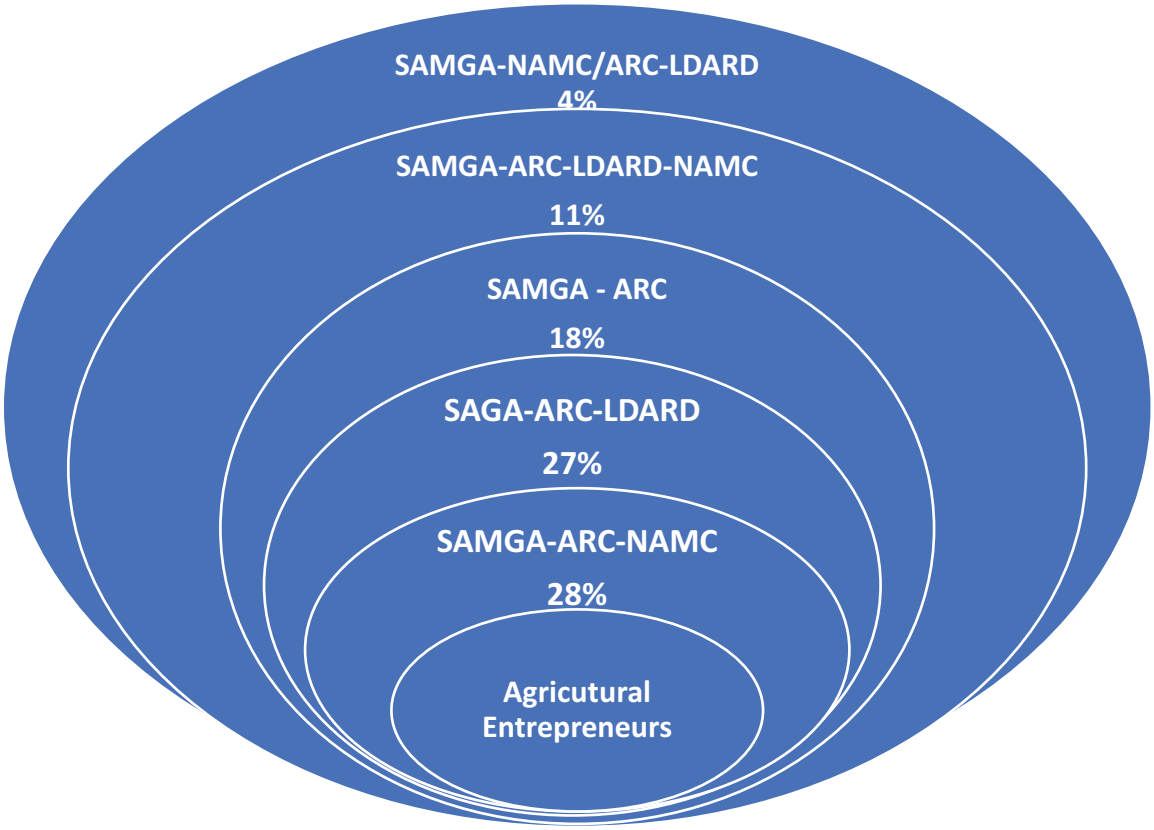

Figure 5.3. Model for Multi-stakeholder Interaction for Subtropical Agricultural Entrepreneurs and other stakeholders

Respondents regarded certain combinations of these stakeholders to be important, namely: SAMGA, ARC, and NAMC (28%), SAMGA, LDARD, and ARC (27%), SAMGA and ARC (18%), SAMGA, LDARD, NAMC, and ARC (11%). The four stakeholders were regarded as key by 100% of the respondents because they all provide information to smallholder SFSHE producing subtropical fruits. For instant, SAMGA and LDARD provide information on farming, ARC provide information on research and NAMC provide information on marketing. Information plays an important role and it is a valuable resource because it guides SFSHE for effective decision making in their farms.

5.5. Conclusions

The stakeholders regarded as key for success of smallholder production of subtropical fruits in the study area were: Limpopo Department of Agriculture and Rural Development (LDARD), South African Mango Growers Association (SAMGA), Agriculture Research Council (ARC) and National Agriculture Marketing Council (NAMC). The roles of these four stakeholders were also to provide information perceived by 100% of the respondents. As for challenges, the main issue reported for stakeholders were: SAMGA – (probably lack of) transformation (95% of respondents), ARC – (lack of) budget (82%), NAMC – (lack of) budget (47%), and LDARD – standard of extension officers (10%) and budget (9%). Increased production of subtropical fruits by SFSHE in the study area requires clarification of the roles of each of the stakeholders to the farmers. Strategies should be developed to strengthen the knowledge base of each stakeholder in accordance with confirmed roles as this will enable the stakeholders to improve their contribution to increased production and transformation of the subtropical fruits industry. Also, stakeholders should be assigned leadership of tasks based on their roles and knowledge base to avoid unnecessary duplication and conflicts. The need for addressing challenges related to transformation in line with new policies of government and sourcing of financial resources (budget) cannot be overemphasized. It is recommended that Extension Program Coordinating Units be established to mainstream the contribution that External Stakeholders and Government make to smallholder farmers.

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SECTION 2: ANALYSIS OF MULTI-STAKEHOLDER: A CASE OF YOUTH AGRICULTURAL ENTREPRENEURS IN LIMPOPO PROVINCE OF SOUTH AFRICA

Abstract. The sustainability of agriculture is dependent on the characterization of project participants. The study investigated selected characteristics of participants in youth agriculture projects and constraints faced and proposed strategies for increased project productivity. Three in four (74%) of the projects were male owned and half (50%) of the owners only had primary education. As for project members, 53.8% were females with 59.3% of them in mixed vegetable and field crop projects. The project members were youthful with 84.4% aged 18-35 (25.3% were 18-25 years old, 25.3% were 26-30 and 33.8% were 31-35). Four in five (78.2%) project members were permanently employed. The projects had constraints that reduced their productivity, and those were mainly: (1) weak relationships with other stakeholders resulting in limited access to information, (2) lack of access to funding, and (3) poor land tenure. To improve productivity: (a) youth projects should be encouraged to form (or be part of) cooperatives, (b) initiatives such as NYDA and Mafisa should be strengthened to be more effective in servicing the youth projects, and (c) traditional authorities should establish committees with clear mandate and guidelines for improved land allocation. Strategies to improve productivity of youth projects should consider the described characteristics of participants in terms of gender, age, education and employment status.

Key words: Characterization, youths, agricultural projects, Limpopo Province, constraints

5.7. Introduction

Though agriculture has been identified as one of the pillars for economic development for most developing countries; youth participation in the sector is still a great challenge. Agriculture continues to be a significant employer in the Limpopo Province of South Africa. The agricultural sector has the potential to contribute towards alleviation of poverty in rural areas of the province. According to Office of the Premier [OTP] (2009), agriculture remains a key strategic driver for economic growth and rural development and is a major absorbent of labour. Russell (2001) indicated that the involvement of youths in agricultural production has declined in recent years, especially in rural areas. The poor involvement of youths in agriculture could largely be due to negative perceptions towards the sector. Agriculture is seen as either a dirty job, a poor man's job or a non-income generating job. Observations are that these negative perceptions held by youths towards agriculture tend to lead to a problem of lack of succession.

Cook (1996) argued that the future of agriculture may be bleak if production was left in the hands of aged subsistence farmers. There is therefore an urgent need for the agricultural sector to attract youths. According to the World Bank Report (2007), youth participation in the agricultural sector has the potential to promote the implementation of new technologies. The implementation of new technologies leads to an increase in agricultural production, and this is enhanced by the youths' ability to understand and use the technologies as compared to their aged counterparts. This study was done with the purpose of characterizing participants in youth agricultural projects and subsequently proposing strategies for increasing their productivity.

5.8. Research Methodology

5.8.1. Study area

The study was conducted in Limpopo Province of South Africa and focused on youth agricultural projects supported by the Limpopo Department of Agriculture (LDA). Limpopo as a province is comprised of five districts (Figure 5.4), namely: (1) Capricorn (yellowish colour), (2) Mopani (greyish), (3) Vhembe (bluish), (4) Waterberg (greenish) and (5) Sekhukhune District (pinkish) with a total of 25 local municipalities within the five districts. The Province lies at the far north of the Republic of South Africa and is one of the provinces dominated by rural communities.

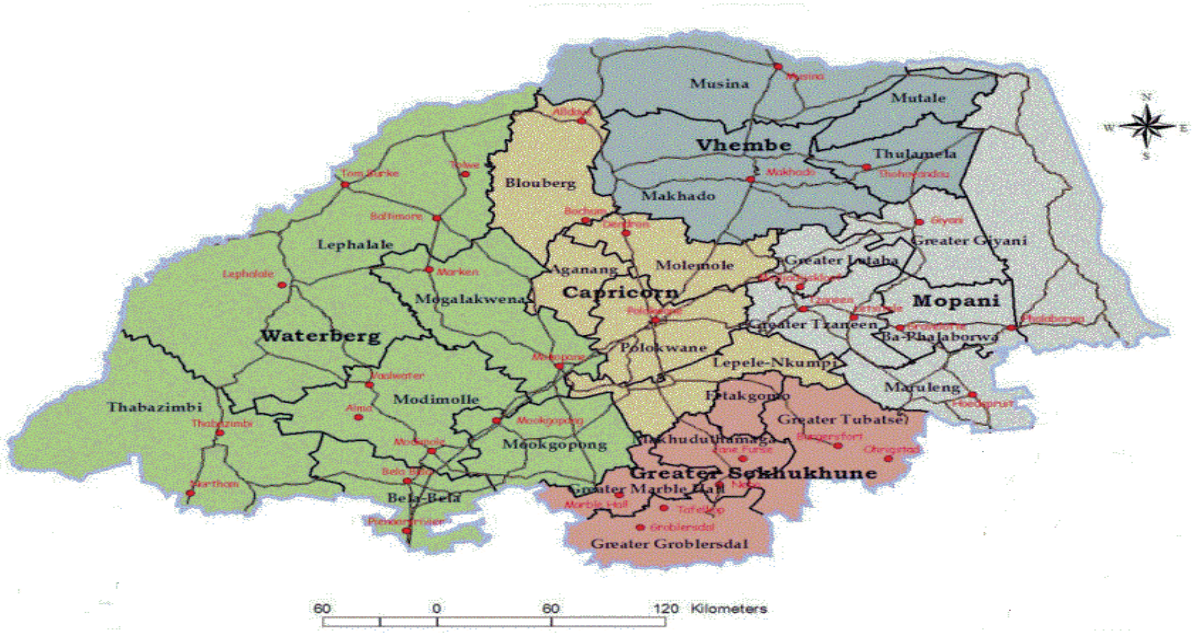


Figure 5.4. Map of Limpopo Province showing the five district and 25 local municipalities, road infrastructure and the main towns

Although Limpopo is regarded to be generally rural (OTP, 2009), the province has some established infrastructure such as road network and some towns where the youths participating in agricultural projects could buy production inputs and market their farm produce.

5.8.2. Sample frame and sampling procedure

Selection of a representative sample requires correct determination of sample frames (Tshikolomo, Nesamvuni, Stroebel & Walker, 2012). Unless a sample frame is borne in mind, it is impossible to properly judge the representativeness of the selected sample (Welman, Kruger & Mitchell, 2005) and the trustworthiness of the obtained results (Leedy & Ormrod, 2010). The sample frame of the study was rural based youth agricultural projects in the five districts of the province. However, because of a variety of challenges, only a few youth agricultural projects were functional. There was a total of 139 functional youth projects distributed in the five districts of the Limpopo province. Two youth projects were sampled per municipality for this study. Sampling was stratified based on hierarchical administrative structures, and those were: (i) district municipalities, (ii) local municipalities, and (iii) the youth agricultural projects. The projects were purposively sampled based on their proximity to the place of residence of enumerators.

The selected sample was comprised of 50 out of the 139 (36%) projects in the 25 local municipalities of Limpopo Province. The representative sample of 50 youth projects was selected from all the 5 districts where 10 were from Capricorn, 10 from Mopani, 10 from Sekhukhune, 8 from Vhembe and 12 from Waterberg.

5.8.3. Data Collection and analysis

Data was mainly collected through interviews using a structured questionnaire with both open ended and closed ended questions. The data was collected from project owners and from other project members. To augment the sample focused interviews, group discussions and consultative workshops were also conducted with different stakeholders and project beneficiaries. Data collected was analysed using a Statistical Analysis System (SAS, 2009). Basic statistics were computed to determine frequencies of each major variable. Such variables included gender, age, educational level, and relationships with other stakeholders, access to funding and to land tenure. The priority commodities produced by the projects were field crops, vegetables, poultry and a combination of field crops and vegetable production.

5.9. Results and Discussions

Any intervention that is meant to improve youth participation in the agricultural sector should be informed by the *status quo* regarding youth projects. In order to gain a broader understanding of the *status quo*, the study (1) characterized participants in youth agricultural projects and (2) investigated the constraints experienced by the projects and proposed remedial strategies.

5.9.1. Characterization of youth agricultural project participants

The main participants in youth agricultural projects were the owners and other members involved in various project activities.

5.9.2. Characterization of youth agricultural project owners

The youth owners included managers of the agricultural projects and were characterized in terms of gender, age, and educational status.

(a) Gender

Women generally play a major role in the agricultural sector (Asuamah, 1993) and were reported to dominate agricultural activities in African countries (Ugwumba & Lamidi, 2011; Ukwuaba & Inoni, 2012). Of the 50 youth agricultural projects sampled for the study, about three in four (74%) were male owned (Table 5.8), and hence men were majority at ownership level.

Table 5.8. Gender distribution of youth owners of agricultural projects in Limpopo Province

Gender	Number	Percentage
Male	37	74.00
Female	13	26.00
Total	**50**	**100.00**

The finding that men were majority owners of agricultural projects affirmed Bembridge & Tshikolomo (1998) who revealed that 90% of fruit growers in the Phaswana area of the Limpopo Province were males. As stated by Bembridge & Tshikolomo (1998), gender has influence on decision making with males responsible for major while females were responsible for relatively minor decisions. Resultantly, male youths in this study dominated as project owners.

Females would reportedly dominate decisions on production activities and related technology adoption and efficient use of production resources (Echebiri, Igwe & Okwun, 2006). The democratic government promotes women empowerment and their equal participation in socio-economic activities and hence strategies should be sought for their increased participation in youth agricultural projects.

(b) Age

Dagada, Nesamvuni, Van Rooyen, and Tshikolomo (2013) revealed that age plays an important role in the life of a person and determines how an individual behaves. In affirmation, Bembridge, Graven, Hough, and Van Rooyen (2008) indicated that age has an influence on decision making and the physical ability of individuals.

Table 5.9. Age category of youth owners of agricultural projects in Limpopo Province

Age Category	Number	Percentage
18-25	20	40.00
26-30	25	45.00
31-35	5	15.00
Total	**50**	**100.00**

The majority (45%) of youth owners of agricultural projects were 26-30 years of age (Table 5.9). Some two in five (40%) of the youth project owners were aged 18-25 while only 15% fell under the 31-35 age category.

(c) Educational status

According to Dagada et al. (2013), human development is influenced by the level of education. Improvement of human resource capacity is essential to meet the challenges of agricultural production and food security. More years of schooling are associated with higher rates of adoption of new technologies (Olaiton, 1984; Tompson, 2008). It was therefore necessary for this study to investigate the educational status of the respondents.

Table 5.10. Educational levels of youths owning agricultural projects in Limpopo Province

Educational level	No of respondents	Respondents %
Tertiary education	5	10.00
Secondary education	15	30.00
Primary education	25	50.00
No response	5	10.00
Total	**50**	**100.00**

Half (50%) of the youth owners of agricultural projects had only primary education while an additional 10% probably had primary or no education as they did not respond to questions on educational status (Table 5.10). Only 10% of the youth owners of agricultural projects had tertiary education. The youths with only primary education together with those who did not even disclose their educational status were about three in five (60%) and were the majority. The youths with only primary education would at best possess very basic literacy skills and would not easily access print agricultural and other information, especially those in languages other than their mother tongue. The youths with low levels of education would also lack numeracy skills and would therefore not be able to determine whether their agricultural businesses are making profit or not.

The prospects for access to information and for success in the agricultural business would likely be higher for the 10% of the youths who attained tertiary education. Approximately 67% of individuals with tertiary education qualifications complained that they were under-utilized by the youth agricultural projects. Some 15% of the youths with tertiary education reportedly took interim responsibilities in agricultural projects while they sought for preferred jobs aligned to their qualifications.

5.9.3. Characterization of members of youth agricultural projects

In addition to gender, age and educational status, members of the youth agricultural projects were also characterized in terms of employment status. The characterization also considered the types of agricultural commodities produced.

(a) Gender

As was highlighted for owners of youth agricultural projects, the gender of members is also important for increased production. Contrary to the result for project owners, female members were slightly more (average 53.8%) than their male counterparts (46.2%). Different from the result regarding project ownership, women provided more of the work force required by the youth agricultural projects.

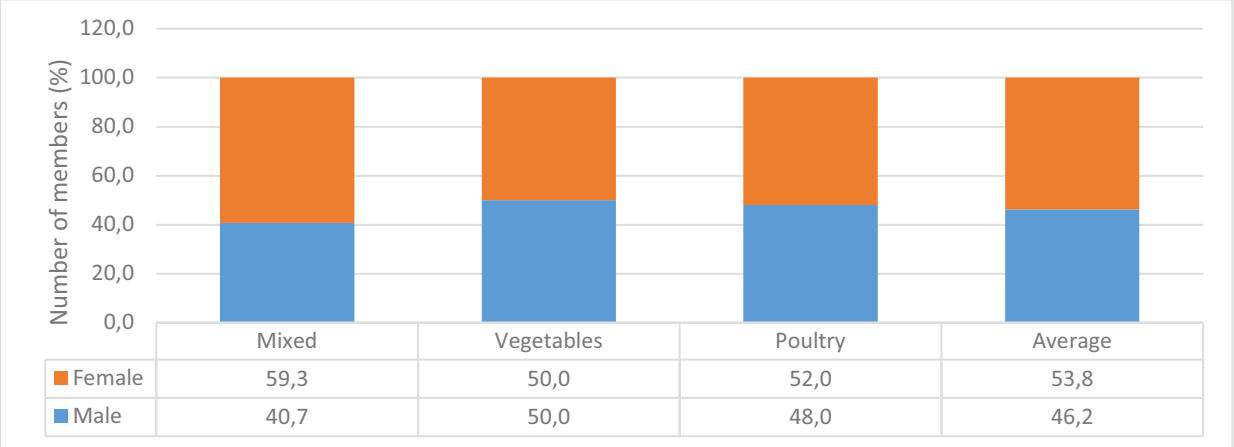
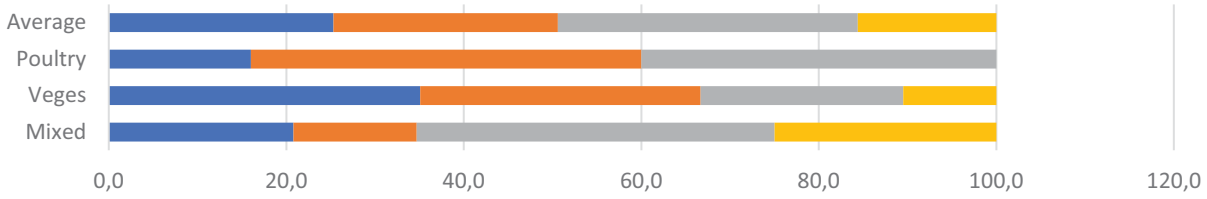


Figure 5.5. Gender distribution of youth agricultural project members (%) producing various commodities in Limpopo Province

Of the average 53.8% female youth members in agricultural projects, the majority (59.3%) where in projects producing a mix of vegetable and field crops (referred to as 'mixed'), half (50%) where in projects producing vegetable only (referred to as 'vegetables') while 52% were in those producing poultry only (referred to as 'poultry'). Of the male members (46.2%), only two in five (40.7%) were in mixed projects, half were in vegetables and 48% were in poultry projects (Figure 5.5). Gender representation of agricultural project members was near equity and both gender groups would have a good share of the economic benefits of the youth enterprises.

(b) Age

The influence of age on the success of an agricultural project cannot be overemphasized. On average, one in four (25.3%) of youth agricultural project members were 18-25 years old with the same number (25.3%) reported for members 26-30 years of age. Most of the members (average 33.8%) were 31-35 years old while only 15.6% were over 35 years of age (Figure 5.6).



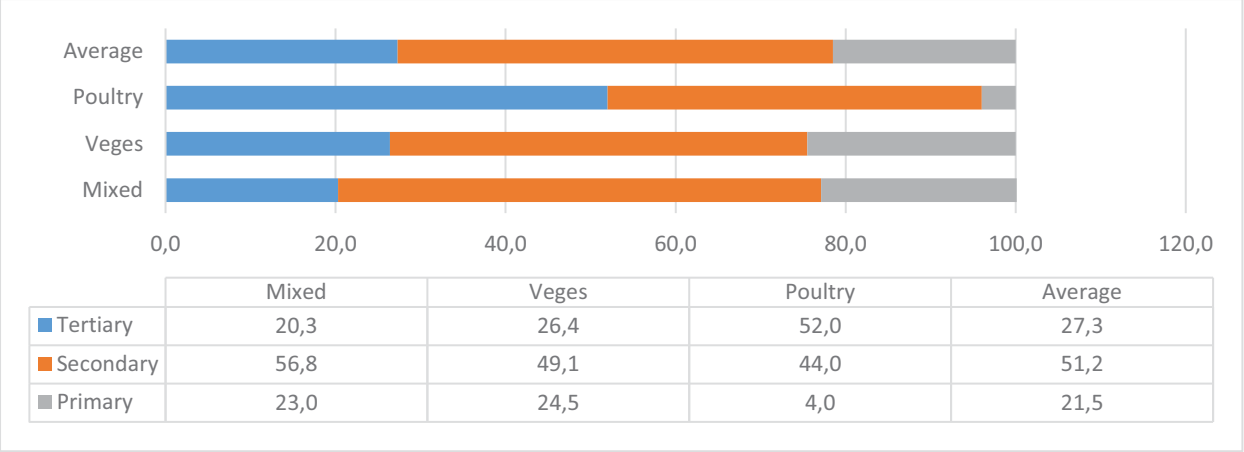
	Mixed	Veges	Poultry	Average
18-25	20,8	35,1	16,0	25,3
26-30	13,9	31,6	44,0	25,3
31-35	40,3	22,8	40,0	33,8
>35	25,0	10,5	0,0	15,6

Figure 5.6. Age distribution (%) of members of youth agricultural projects producing various commodities in Limpopo Province

The majority (40.3%) of members in mixed farming projects were 31-35. Compared to mixed farming, project members in vegetable production were younger with the majority (35.1%) within the age groups 18-25. Project members in poultry production were mainly (44% of members) in the middle age category of 26-30. Although decisions on commodities produced would mainly be the responsibility of project owners, the members would probably have some influence. The major involvement of relatively older members in mixed crop farming projects suggests that they were concerned about inclusion of field crops such as maize for promotion of household food security. Relatively younger members were probably driven by income generation potential of commodities and favoured vegetables and poultry. Instead of producing the vegetables and poultry as single commodities in the projects, the members (and indeed the owners) could be advised to produce in a mixed setup.

(c) Education

The improvement of human resource capacity is essential to meet the challenges of agricultural production and food security. On average, 27.3% of the project members had tertiary education, half (51.2%) had secondary while one in five (21.5%) had primary education (Figure 5.7). Only 10% of project owners had tertiary, 30% had secondary and about 60% had primary education (Table 3), suggesting that they were generally less educated than project members who would therefore probably have strong influence on production decisions.



	Mixed	Veges	Poultry	Average
Tertiary	20,3	26,4	52,0	27,3
Secondary	56,8	49,1	44,0	51,2
Primary	23,0	24,5	4,0	21,5

Figure 5.7. Distribution (%) of members of youth agricultural projects producing various commodities in Limpopo Province according to level of education

The majority of members involved in crop commodities had secondary education where 56.8% were in mixed crop farming while 49.1% were in vegetable production. The majority (52%) of the members involved in poultry production had tertiary education (Figure 5.7). The involvement of more members with higher level of education (tertiary) in poultry production was probably a result of the commodity requiring specialized attention. Poultry production requires specialized attention with regards to correct feeding, provision of water (for drinking), vaccination, temperature management and selling time and need specialized knowledge and skills. The crop commodities had relatively more tolerance to production and related inaccuracies and could therefore be practiced by members with relatively less education.

(d) Employment

The employment status of members of the youth agricultural projects plays an important role in the economic wellbeing of their families. Project members that are permanently employed would be economically well off compared to their temporarily employed counterparts.

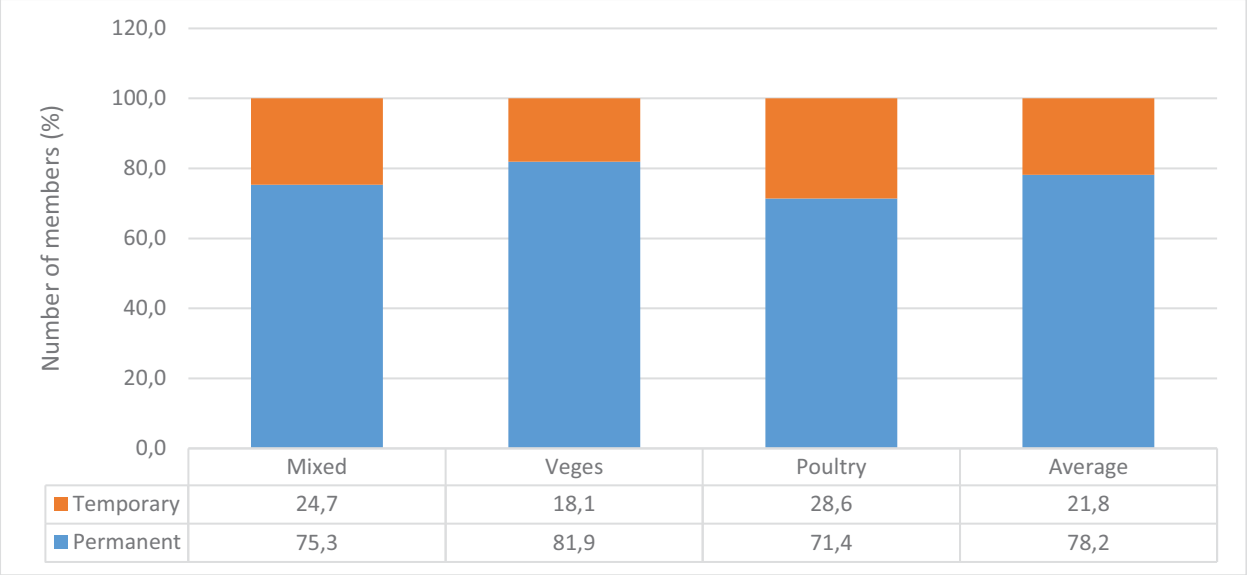


Figure 5.8. Distribution (%) of members of youth agricultural projects producing various commodities in Limpopo Province according to type of employment

On average, four in five (78.2%) members of the youth agricultural projects were employed permanently while 21.8% were temporarily employed. The same trend where the majority of the members were permanently employed occurred for all investigated agricultural commodities. The number of permanently employed project members were three in four (75.3%) for mixed crop projects, four in five (81.9%) for vegetable projects and seven in ten (71.4%) for poultry projects (Figure 5.8). The fact that youth agricultural projects provided permanent employment to the majority of the members suggests that the projects were important sources of livelihood to those members. Other possible sources of income were government social grants for deserving members.

Project members that were temporarily employed would probably seek alternative employment, create self-employment, or where deserved fall back on social grants for the period when they were not employed. The characterization of participants in youth agricultural projects revealed the project owners to be mostly male, youthful and less educated compared to the project members who were mostly female and relatively more educated. There was need for promotion of gender equity and increased productivity of youth projects and this could be achieved through empowerment of young women to own agricultural projects and provision of training to both owners and members to address identified skills gaps. Some participants, more so project owners would lack basic education and may have to be capacitated through programs such as adult basic education and training (ABET). Participants were generally youthful and would be easy to train.

5.9.4. Constraints faced by youth agricultural projects

Youth agricultural projects face many constraints, and those include lack of access to information and lack of finance. The constraints have a negative influence on the competitiveness of the youth agriculture projects. Competitiveness was defined as the ability to supply goods and services in the location, form, and time they are sought by buyers and at prices that are as good as or better than those of potential suppliers, while earning at least the opportunity cost of returns on resources employed (Freebairn, 1986).

(a) Lack of strong relationships and information flow

Figure 5.9 shows the relationships and information flow between youth agricultural projects and other stakeholders. The existence and strength of relationships between youth agriculture projects and other stakeholders influence the projects' access to information and their productivity. According to Baloyi (2011), increased access to relevant information is positively related to adoption of new technologies and efficient production. The quality of information obtained is influenced by the sources of such information, and the willingness of participants to share information is dependent on the existence of sound relationships among them. Important role players to serve as sources of information to youth agricultural projects included youth cooperatives, Department of Agriculture, banks, NYDA, NGO's and traditional leaders (Figure 5.9).

The youth projects related strongly with youth cooperatives while the relationships with the rest of the stakeholders were reportedly weak. The youth projects and cooperatives were strongly related and would be expected to share information with a lot of ease. The youth cooperatives would therefore likely be the most important source of information to the youth agricultural projects. Weak relationships were reported with the rest of the stakeholders and hence the stakeholders could not serve as important sources of information to the projects. Youth cooperatives reportedly had strong relationships with all the identified stakeholders and would be expected to have received information from all the role players.

The stakeholders other than youth projects and cooperatives also shared some information both directly and indirectly, and this increased the probability for the youth cooperatives to access all the information that each role player possessed. Where the stakeholder might have withheld the information, another role player (with whom it was shared) would have released it to the youth cooperative who would likely share it with the youth projects. The youth cooperatives should therefore be regarded very important for information dissemination to youth projects, and projects that are not members of the cooperatives should where feasible be encouraged to acquire membership.

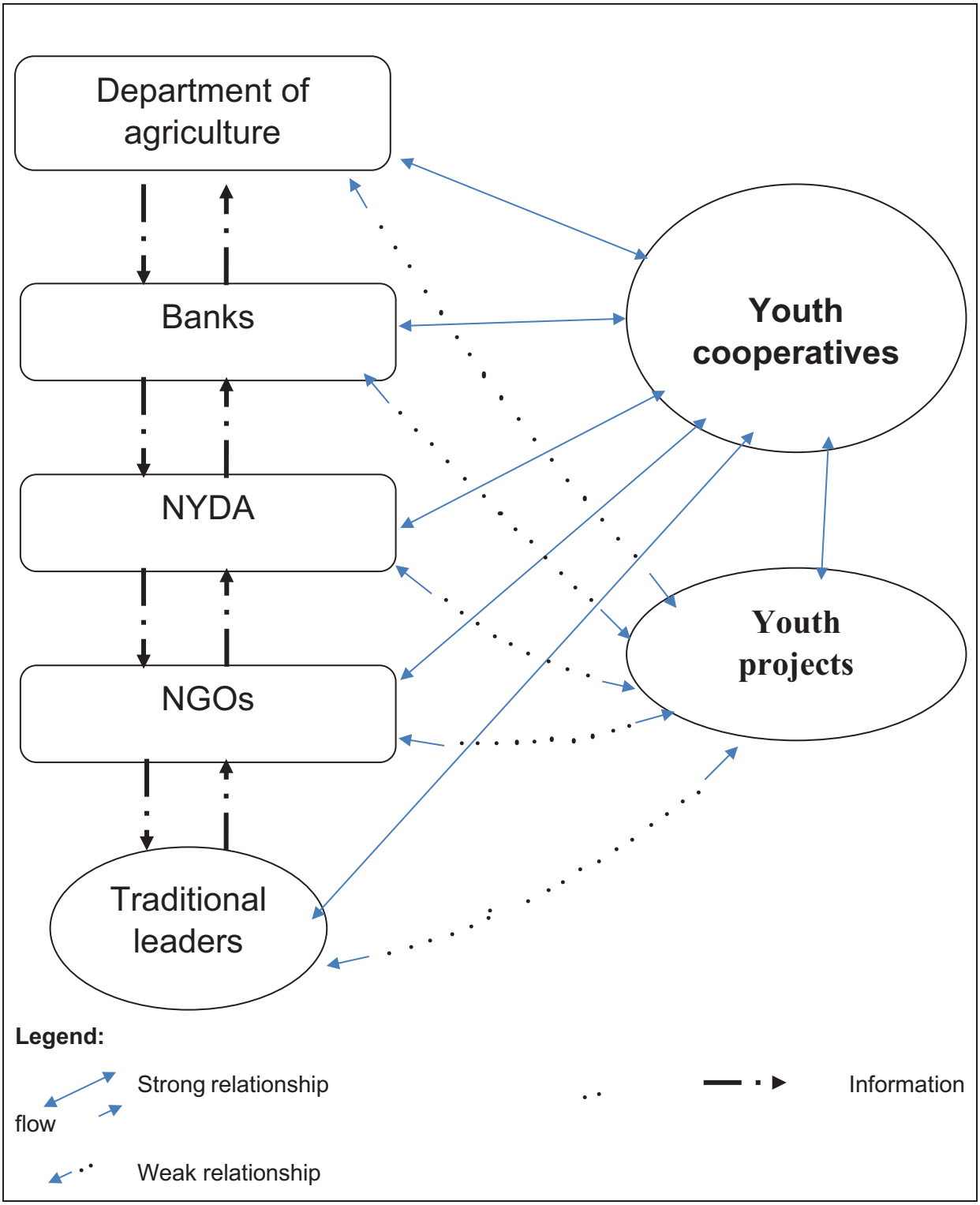


Figure 5.9. Relationships and information flow between youth agricultural projects and other stakeholders

(b) Funding

Mpandeli (2006) emphasized the need for farmers to have access to all the required inputs to increase production. Government made its contribution through financial support, inputs supply, infrastructure development and capacity development. The funding from government alone cannot provide for all operational needs of youth projects. According to Ezeh, Anyiro and Obioma (2012), access to affordable credit contributes to efficient and effective production.

Table 5.11. Distribution of youth agricultural projects according to their access to funding other than government support

Variable	Frequency	Percentage
Additional funding	8	16.0
No additional funding	28	56.0
No response	14	28.0
Total	**50**	**100.0**

Other than the prospect for government support, only 16% of the projects had additional funding from NGOs and other organizations (Table 5.11). Organizations such as NYDA and programs such as Mafisa were established to address the funding needs of youth projects, however it was reported that these initiatives were ineffective as the funding opportunities remained inaccessible to most rural youth. Increased funding of the rural agricultural youth projects would enable them to improve their on-farm infrastructure and provision of production inputs and would therefore result in increased production. Strategies should therefore be developed to increase youth access to NYDA, Mafisa and other financial support programs.

(c) Access to land

Access to land has been regarded a major constraint to farmer's productivity and it is linked to historical and political issues. According to Mpandeli (2006), the question of land tenure is relevant in South Africa due to the country's political and historical complexity of land issues, rights, and entitlement. Most landholders are unable to invest in infrastructural development of their projects as they do not have secure tenure through title deed or certificate of occupancy or ownership. Secure land tenure is a necessary pre-requisite for adoption of long-term sustainability of farming practices (Makhura, 2001).

Only one in four (24%) of the youth projects investigated had title deeds (Table 5.12), and only a 12% of the title deeds were registered in the name of the youth project owners. Landholding households that are no longer using their allocated land should make their land available to interested and capable youth seeking access to more land.

Table 5.12. Distribution of youth agricultural projects according to the tenure under which they acquired land

Land tenure	Frequency	Percentage
Title deed	12	24.0
Communal & other	24	48.0
No response	14	28.0
Total	**50**	**100.0**

The local chief was responsible for allocation of land and 43.9% of the study participants felt that the system was not fair at times as there were cases of nepotism and favouritism when allocating land. Some youth projects claim that even though they had the potential and produced good quality products their request for land extension was declined. As stated by Nkuhlu (1985), traditionalism in rural areas tends to hamper agricultural development as it still harbours values, norms and attitudes that contradict rational behaviours in a modern economic sense. To improve on land allocation, traditional authorities should establish committees for that purpose with clear mandate and land allocation guidelines.

5.10. Conclusion

The majority (74%) of youth agricultural projects were male owned and female participation should be promoted. Half (50%) of the youth project owners only had primary education. Youth project owners with only primary education would have low levels of literacy and numeracy, would struggle to access and analyse information and would less likely succeed in their farming business. As for project members, 53.8% were female with the majority (59.3%) in mixed vegetable and field crop projects. Project members were youthful with 25.3% in the age category of 18-25 years, same number was 26-30, up to 33.8% were 31-35 while only 15.6% were over 35 years old.

Four in five (78.2%) of the project members were permanently employed, and most members across commodity groups belonged to this employment category and this made the youth projects an important source of livelihood. Important constraints faced by youth

agricultural projects included (1) weak relationship between youth projects and other stakeholders resulting in limited access to information, (2) lack of access to funding with, and (3) poor land tenure. Youth projects had strong relationships with youth cooperatives, and those should be used to disseminate information to the projects. In order to improve productivity, (a) youth projects should be encouraged to form (or be part of) cooperatives, (b) initiatives such as NYDA and Mafisa should be strengthened to be more effective in servicing the youth projects, and (c) traditional authorities should establish committees with clear mandate and guidelines for improved land allocation. Strategies to improve productivity of youth projects should consider the described characteristics of participants in terms of gender, age, education, and employment status.

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CHAPTER 6

AGROECOLOGICAL CHARACTERIZATION OF THE SMALLHOLDER SUBTROPICAL FARMERS. A CASE OF VHEMBE DISTRICT MUNICIPALITY, LIMPOPO PROVINCE, SOUTH AFRICA

Abstract. Spatial characterization of the farming features is fundamental attainment towards the appraisal of the prominent variables that regulate the prospects of the farming ventures in the quest to comprehend, unlock, and amplify the sustainability of the farming ventures. A study to characterize the agroecological variables of the smallholder subtropical farms (avocado, litchi, citrus, and mango) was conducted with the notion to improve the potential and optimizing the sustainability of these entities. The approach employed incorporated the integrated overlay of the subtropical farms to the reclassified agro-ecological variables such as include topography (slope and altitude), climate (rainfall and temperature), surface water resource (proximity to stream), groundwater resource, and soil attributes (pH, Organic Carbon, and soil-depth). The variables were rasterized and reclassified into a four-class system based on how each class promotes crop development. The descriptional narratives were then generated from the characterization. The reclassified agroecological variables were then subjected to the factor analysis and spatial farm clusters.

The variables overlay generated the rainfall, streams, groundwater, and temperature as the significant underlying factors for the spatiality of the smallholder farmers. Meanwhile, the subsequent factor model simplified the data into four latent factors. Factor 1 was dominated by thPe loading of the rainfall (0.801), factor 2 (groundwater) and Factor 3 has a high loading of proximity to streams (0.860). The factor model revealed rainfall as the most prominent factor in crop distribution. All other water sources were also integral. The potential could be optimized through; the development of the gravity-based irrigation system, establishment of the smart intercropping system, promulgation, government support, and increased access to financial institutions.

6.1. Introduction

Characterization of smallholder farming is fundamental attainment towards the appraisal of the prominent variables that regulate its potential (Devotha et al., 2019; Goswani et al., 2014). This is particularly important in the quest to comprehend, unlock and amplify the profitability of the farming ventures (Devotha et al., 2019). Such accomplishments inaugurate the essential variables that define potential and their magnitudes (where possible) which are critical for the smallholder operators to thrive (Riesgo et al., 2016).

In the quest to comprehend the fundamental factors defining the spatial potential and the opportunity within the farming sector, researchers conduct the characterization of these entities (Devotha et al. (2019). The exercise of the characterization is carried out to fulfil a specific objective (Mengistu, 2014). Broadly, the characterization of the farming entities may be interpreted as the classification of the farming variables such that each variable corresponds to different interrelated attributes (Devotha et al., 2019). The common purpose of executing this exercise is the description of the production categories existing in a particular geographical, socio-economic or political context to introduce appropriate technology, initiation of the support programmes, the promulgation of the policy by the central government (Goswami et al., 2014).

The exercise of the smallholder characterization is imperative in the establishment of prominent parameters that influence the smallholder farmers, which are also known as topologies (Goswami et al., 2003). The review of the variables incepting the potentiality of the sector is imperative to the conciliation of the spatial distribution and the probable opportunity within the sector (Mengistu, 2014; Goswami et al., 2014). One of the most significant challenges regarding the characterization of the smallholder farmers is the multi-dimensional nature of the topologies, instituting these enterprises (Khapayi & Celliers, 2016). According to Goswami (2014), the most effective way of dealing with the complexities of the farming system is the apportion the smallholder farmers into subgroups (Goswami et al., 2014).

Understanding the key attributes defining the spatial distribution of the smallholder farmer is critical towards economic and sustainable agricultural practices (Bowman & Zilberman, 2013; Li et al., 2020). Usually, it is the background and the expertise of the researcher that guides the approach (Stoorvogel et al., 2004). However, this does now always yield to the adoption of an effective approach. Nevertheless, the majority of the smallholder characterization studies are conducted with the mandate to classify the farmers in terms of the demographic and the socioeconomic variables (Madima, 2010; Vink et al., 2002; Esterhuizen & Van Rooyen, 2006; and Venter & Horsthemke, 1999).

However, very little effort is directed towards the ascertainment of agroecological attributes and their influence on the potentiality and spatial characterization of smallholder farming. The agroecological potential is founded on the climatic condition (rainfall and temperature), topographic attributes (elevation and slope), and soil attributes (soil type, porosity, carbon content, and soil pH) (Harvest-Chocie, 2010). Consequently, this study was aiming to characterize the agroecological variables with the notion of unlocking potential and optimizing the profitability and sustainability of the smallholder subtropical farmers of the Vhembe District, Limpopo Province.

6.2. Research Methodology

6.2.1.Description of the study area

The study was conducted in the eastern side of the Vhembe District Municipality, which comprises the Musina, Thulamela, and the eastern part of Makhado Municipality. Vhembe is one of the 5 districts (Waterberg, Greater Giyani, Capricorn, and Sekhukhune) that constitutes the Limpopo Province of the Republic of South Africa. The map in Figure 6.1 depicts the spatial confinement, geographical coordinates, and the extent of the study area in the Limpopo Province and South Africa.

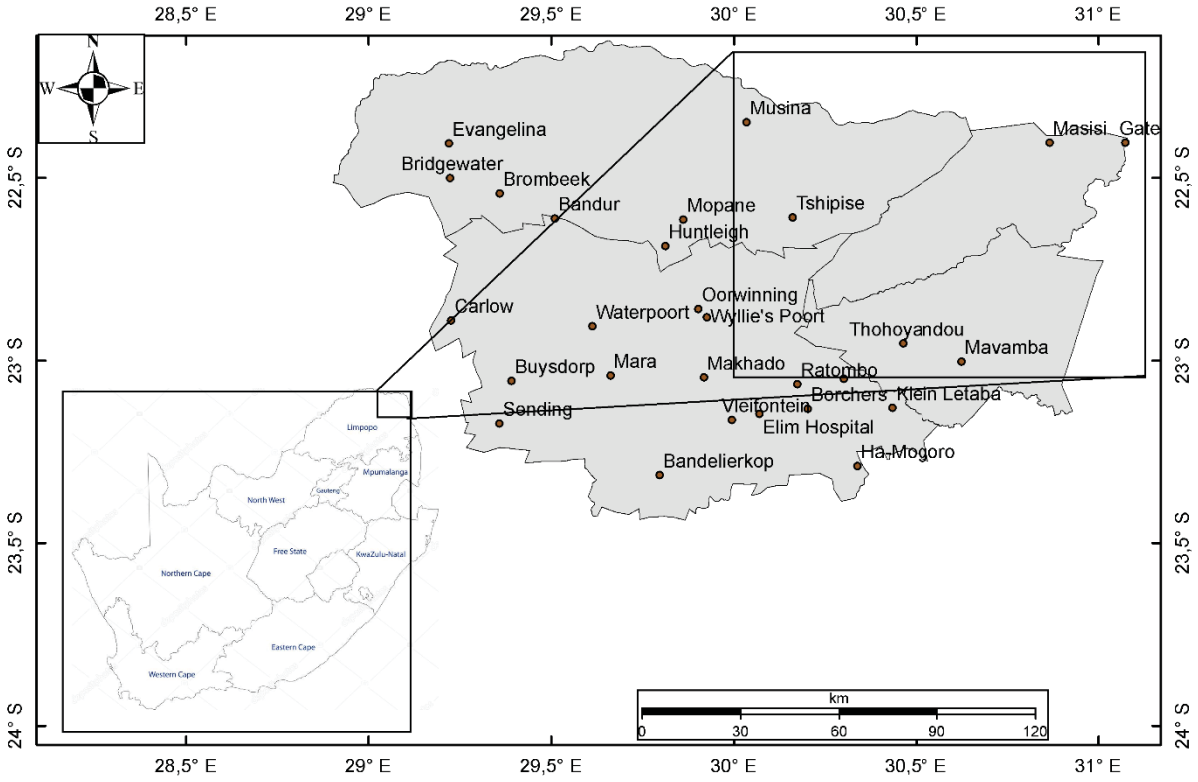

Figure 6.1. The locality map of the study area

This district is situated on the northern tip of the country. It is attributed to significant variability in the climatic setting (Mpandeli & Maponya, 2014). The escarpment from the Kruger through Musina experiences the low mean annual rainfall that ranges from 300 to 600 mmpa. On the other hand, the south-west part of the Thulamela, (Makonde, and Thohoyandou to Tshakhuma) experiences the optimal amount of rainfall that averages at around 800-1400 mmpa. There are also minor patches of the microclimatic regions (Madimbo Corridor, Tshiombo, and Khalavha). According to Mpandeli and Maponya (2014), Vhembe is mainly located within the semi-arid regions that experience rainfall in summer and dry winter. The district is primarily comprised of rural build-up with a low population density (< 80 people per km^2). The economical setup of the district is mainly based on agriculture. Vhembe is renowned

for intensive agricultural productions that are instituted by smallholder and commercial entities. Some of their prominent agricultural commodities include banana, mango, litchi, citrus, macadamia as well as livestock (sheep, cattle, and goats). The key issue that is limiting the optimization of agricultural production is the limited rainfall.

6.2.2. Data collection

The study adopted the mixed research approach that comprised of the qualitative and quantitative research design. Geographical coordinates of the farmers were appraised from the locational database of the previous projects. Specifically, 474 smallholder farmers constituted Avocado (61), citrus (58), macadamia (42), and mango (311). The reliance on the auxiliary data was motivated by the budget of the project and the restrictive time frame for the generation of the primary data. The agroecological variables that comprised the climate data (rainfall and temperature) were obtained from the South African Weather Services. Elevation data (slope and elevation), and was received from the water resource 2012, soil attributes (soil type, soil pH, and soil depth) were generated from the Agriculture Research Council-Institute for Soil, Water and Climate (ARC-ISWC, 2016).

6.2.3. Data Processing

According to Carl (1996), data processing incorporates the gathering and manipulation of the data to generate meaningful and descriptive information. The input data comprised of the spreadsheet defining the localities of the farmers and the shapefiles data of the agroecological parameters. The geodatabase was created for all the spatial data of the projects and converted to the World Geodetic System (WGS84). The localities of the smallholder farms spreadsheet were converted to the point map (shapefile) in ArcGIS.

6.2.4. **The** *Role of Topography in crop farming*

Topography and slopes are essential attributes of crop farming and production. The two parameters highly correlate to the sun rays that an area experience. The north-facing slopes optimize the repose angle with the sun, which increases the sunlight to promote good health and growth (Inger et al., 2015). According to Smith & Donahue, (1991); Terashima et al. (1995); Sakata and Yokoi, (2002), elevation is a critical variable for the growth and yield potential of the crops. Gale (2004) infers that although this variable is often overlooked in crop potential assessment, it contributes immensely to good health and plant growth. The elevation shapefile was interpolated using the inverse weight distance tool of the ArcGIS. The subsequent raster image was then treated as an input on the slope generation of the area, which was then reclassified on the intensity of the slope.

$$m = \frac{y_2 - y_1}{x_2 - x_1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..2$$

where m is the slope, and y_n is the altitude value at a point and x_n is the longitude coordinates.

The ranking of the slope was conducted based on the steepness. Flat or near-flat slopes are ideal for crop farming, subsequently, they were assigned higher scores and steep slopes are assigned lower scores. Because of this, flat topographic relief (0-4^{o}C) was assigned a score of 4, near-flat (4-9^{o}C) score of 3, slightly steep (9-20^{o}C) were allocated a rank of 2 and steep (>20^{o}C) was assigned a rank of 1. The slope raster was superimposed with the localities of the smallholder farmers.

6.2.5. The importance of climate in crop farming

Climate is the primal variable for the suitability of the subtropical fruit potential (Chapman et al., 2020). Agricultural production is correlated to the climatic setting of an area. The two sub-sections of the climate are rainfall and temperature. The climate data contains the daily rainfall and temperature data that dated back as early as 1970. The weather stations that had records constituting at least 70% of the records were considered for the study.

6.2.5.1. The relationship between rainfall and smallholder farming

Rainfall (trend and quantity) are powerful tools that reflect the state of the water resource at any given locality (Omokanye et al., 2018). There is strong affirmation between precipitation and the prevalent agroecological setting (Kala, 2012). According to He (2013), rainfall is a primal factor in rain-fed agriculture. Daccache et al. (2012) infer that the distribution and the quantity of precipitation influence the crop yields within the semi-arid regions. Elwell (1994) established a linear relationship between the production yields and the precipitation quantity.

The daily rainfall data were summed to issue the annual total rainfall for the area. The annual data were summed to issue the mean annual rainfall, which was subsequently interpolated using the IDW to produce the mean annual rainfall of the study area. The rainfall map was categorized into four classes, very low rainfall (<500 mm), moderate rainfall (500-800 mm), high rainfall (800-1000 mm), and very high rainfall (>1000 mm). The 4 classes from the least to the highest corresponds to the rank of 1-4 successively.

6.2.5.2. The importance of temperature to the distribution of the subtropical farming

The temperature data was splinted into the hot and the cold months. The period of 7 months was considered hot (September to March). While the cold months were considered a period of 4 months (May to August). The mean temperature for each of the months of the year was determined. This was succeeded with the mean of the period that was considered hot and cold. The consequent means were superimposed with the smallholder farmers. The temperatures within the hot season were also categorized, mild temperatures (18-25^{o}C), warm (25-28^{o}C), hot (28-33^{o}C), and very hot (>33^{o}C). Contrary to the rainfall, the ranks were inverse to the temperature ranges. The thermal maps were overlaid with the subtropical farmers.

6.2.6. The role of water resources to agriculture

6.2.6.1. The proximity of farmers to streams

Irrigation is a significant component of smallholder farmers, particularly within the subtropical regions of the world. This resource is the lifeline of the smallholder practices in sub-Saharan Africa, as the area receives the mean annual precipitation that is less than the global average (860 mmpa), subsequently, the majority of the streams are periodic. Therefore, only meaningful hope to enhance the smallholder operations to ensure there are irrigations, which in turn result in increased crop production (Lipton et al., 1996; Bembridge, 2000). The multiple buffering (4 class) was performed to the river system. The distance interval for each of the subsequent classes was developed, first-class (<1 km), second class (1-2 km), class 3 (2-4 km), and the fourth class (>4 km). The resultant multiple buffering maps were superimposed with the smallholder farmers.

6.2.6.2. *Groundwater availability for smallholder farmers*

Groundwater resource is widely applied for irrigation throughout the world (Gowing et al., 2019). This resource is of paramount significance particularly in the subtropical zones where there is minimal precipitation. Subsequently, crop production is a function of the groundwater resource (Gowing et al., 2019).The groundwater resource in the area was categorized into four classes depending on the mean annual sustainable abstraction. The groundwater quantity was converted from the volumetric units to mmpa for integrational purposes with the rainfall. The areas that had the least sustainable abstraction (<180 mm) were assigned to rank 1, rank 2 (180-300 mm), rank 3 (300-400 mm), and rank 4 (>400 mm).

6.2.7. Farming and aridity of the area

One of the most important parameters for deciding which crop to plant in a particular environment is the aridity index. The aridity index is the measure of the ratio of evapotranspiration to the precipitation at a particular location (Derya et al., 2009). The application of the aridity index that is based on the temperature and precipitation is a common practice in reconnaissance crop suitability (Croitoru et al., 2013; Hrnjak et al., 2013; Moral et al., 2015). While the rainfall reveals the water resource that is received in the environment, the aridity reflects how much of the water remains available for use after evapotranspiration. The map in the aridity map was adopted from Nesamvuni et al. (2020).

The map classified the aridity of the area into four categories namely, semi-arid, arid, dry sub-humid, and moist sub-humid. The categories were superimposed with the smallholder farmers.

6.2.8. The association of the smallholder subtropical farmers and soil

The soil parameters were generated from the ARC_ISWC. The soil attributed that were adopted incorporated the soil pH, soil depth, and organic carbon. The soil pH was divided into 4 classes, class 1 (<4,5pH and >9), class 2, (4,5-5 and 8-9 pH), class 3 (5-6 and 7,5-8), class 4 (6-7,5). The soil depth was also converted into 4 categories; category 1 (<50 cm); category 2 (50-80 cm), category 3 (80-100 cm) and category 4 (>100 cm). Each category conforms to the lass rank as it reflects how the crop relishes the corresponding attribute. Lastly, the organic carbon was also classified, rank 1 (<0,5%), rank 2 (0,5-0,8%), rank 3 (0,8-1%), and rank 4 (>1%).

6.3. Factor analysis of the agroecological parameters

The Factor Analysis was employed as a multivariable statistic for reduction of the dimensionality of the data into a few dimensions of the correlated latent factors retains the important attributes of the original data (Otitoju, 2013). International Business Machine (IBM) SPSS was used for the factor analysis. FA is applied because it can issue the descriptive framework of the variables that include the correlation and the covariance. The agroecological parameters that were into spreadsheets were then treated as the input data for the factor analysis. The data were subjected to the Kaiser-Meyer-Olkin (KMO) and the Bartletts Test to measure its suitability for factor analysis. The communalities were also performed to identify the important variable that can be used as input in the factor analysis. The variables that were found inadequate for analysis were excluded from the datasets. The significant parameters defining the spatial distribution of the smallholder farms were derived from the loadings of the

input parameters to different factors. The Eigenvalues reflected the variance accounted by each of the subsequent factors.

6.4. Results and Discussions

This section presents the results of the superimposition of the smallholder farms to the agroecological maps that include the topography (elevation and slope), climate (rainfall and temperature), proximity to streams, aridity, and soil attributes (pH, organic carbon, and soil depth). There is also a factor modelling that appraised the prominent ago-ecological variables that defined the spatial distribution of the smallholder farmers.

6.4.1.The relationship of Agroecological parameters to the smallholder farmers

Agroecological parameters are essential measures of the potential of the subtropical crop production (He et al., 2011; Mu, 2006), as such, they are expected to be the prime driving factors for the spatiality of smallholder farmers (Pan & Pan, 2012). Therefore, the appraisal of those variables and the measure of their contribution to the spatiality of the subtropical farmers are instrumental in the quest to optimize the potentiality and unlocking the full potential of the sector.

6.4.2. Topographic relief and Slopes

The map in Figure 6.2 shows the topographic relief of the Vhembe District Municipality. The district is attributed with variable topographic relief. There is an extensive occurrence of the flat (light blue to green) and low topographic relief (300-500 m AMSL). These low elevation areas surround the steep elevation of what appears to be the Soutpansberg Mountain Range that emerges towards Tshipise Musunda and Lambani and extends towards the southwest beyond the vicinity of the study area. The flat topographic relief (north of Musina, Mutale, and southern part of the Thulamela Municipality portray insignificant occurrence of the smallholder operations. This pattern contradicts the normal conception that the farming operations are concentrated in flat terrains (Li, et al., 2015), as such areas are associated with substantial percolation, moisture retention, and little soil erosion (Condon & Maxwell, 2015).

The smallholder farmers are common throughout the central section of Vhembe District, however, significant concentration is prominent on the sloppy terrains (Fefe, Mabila, Dzimauli, and Ha-Mutsha). There are also significant occurrences of the smallholder farmers on the slightly steep elevation, along the foot of the Soutpansberg through Sanari, Mavunde, Makonde, Vondwe, Tshakhuma, and Murunwa. There are fewer smallholder farms along the steep slopes that surround the Soutpansberg Mountain, which may be correlated to shallow soil profiles and poor nutrients. Thus despite the quality and quantity of the sunrays available for photosynthesis in the north-facing slopes.

Macadamia appears to correlate with high topographical relief (Ha-khakhu, Dzimaulu, Ha-Mutsha, and Mabila) although there are also minor low relief occurrences (Tshimbupfe, Tshino, and Ha-Khakhu). Avocado appears to coincide with the incline topographic relief as it is prominent in Ha-Mutsha, Belemu, and Matshavhawe, as the crop requires a shallow soil profile (ARC-ISWC, 2016). Citrus appears to disapprove undulating and high topographic reliefs as no smallholder farmers are underlain with the high relief and elevation, this may be due to the deep soil profile that the crop requires (ARC-ISWC, 2016). Whereas mango does not exhibit any spatial trending throughout the study area. The spatial distribution of the farming operations is not conforming to the topographic relief. There is randomness in the localities of the farmers and the topographic relief and slopes. This implies this is not an ultimate variable to define the spatiality of the farming operations.

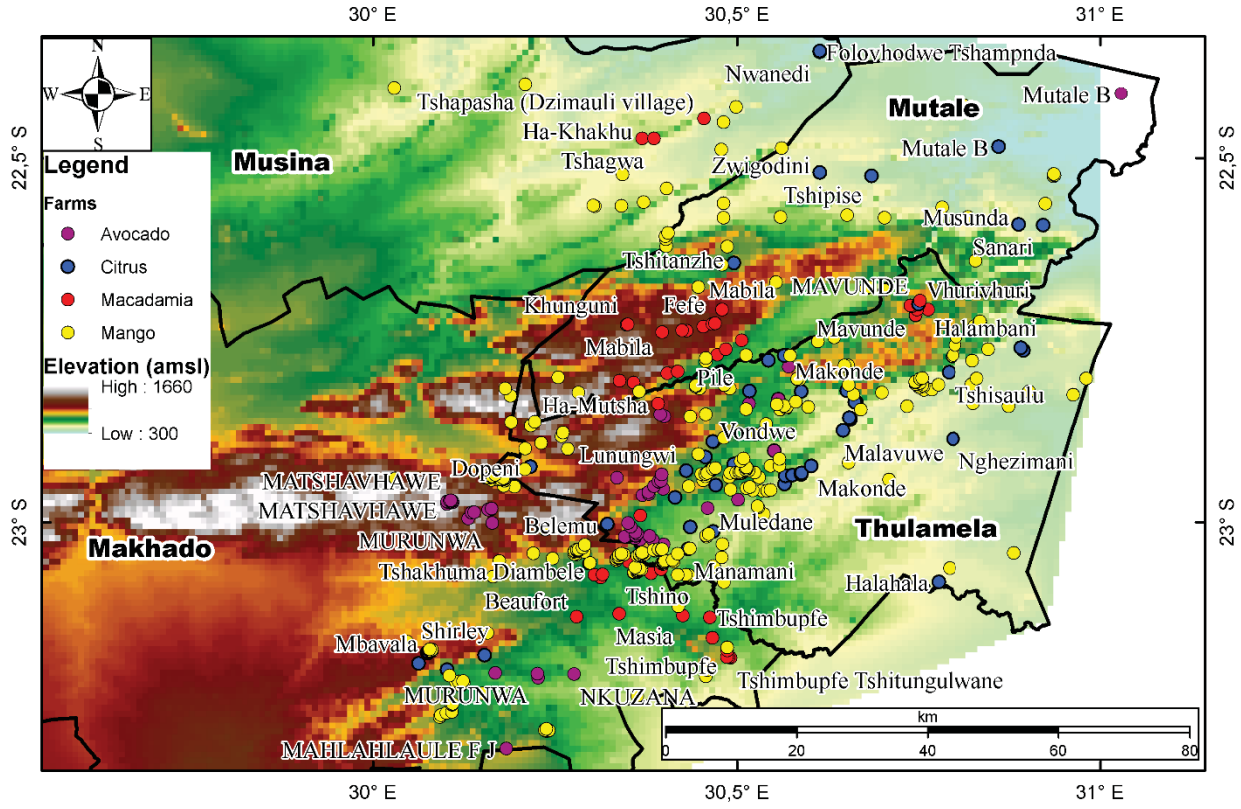

Figure 6.2. The overlay of the smallhlder farmers to the elevation map

6.4.3. Climate

Climate plays a crucial role in the productivity of the agricultural industry (Chapman, 2020). If the operational environment of the farms is conducive, then the yield is optimized but if it is marginal then the yields become poor (Mestre-Sanchís & Feijóo-Bello, 2009). The prevalent climatic setting affects productivity which in turn translates to the sustainability of the smallholder operations. Besides, the climate constitutes a significant component of the agroecological crop requirements (ARC-ISWC, 2016). The components of climate change which include, rising temperatures and altered rain-trends are key drivers for the performance of the smallholder farmers (Campbell et al., 2016).

6.4.3.1. Rainfall

The map in Figure 6.3 shows the spreading of the smallholder operation on the mean annual precipitation. The colour contrast from blue, yellow to brown conforms to the low, medium, and high rainfall intensity. Blue depicts the area that receives the low mean annual rainfall that ranges between 200 to 550 mmpa. The entirety of the Musina and Mutale Municipality is confined to this category. Such amount is insignificant to suffice the agricultural needs of the subtropical fruit. Butler (2005), infers that if the precipitation an area experiences do not exceed 400 mmpa, then the area will be dry.

Hence the smallholder farmers are widely dispersed in these areas. However, the prospect of establishing high-yielding crops should be founded on the development of the groundwater resource for irrigations. There is a considerate occurrence of the mango that occurs in a linear arrangement (Sanari Musunda, Tshipise, and Tshagwa as well as Nwanedi, Zwigodini and Tshitanzhe). According to the ARC-ISWC (2016), mango has the adaptive capacity to extreme climatic conditions (low rainfall and high temperature). Considering the comparatively low return on investment and the adaptability of the crop to different climatic conditions, the farmers may be revolting to this crop as the last resort to participating in agriculture.

On another note, the occurrence of the citrus farms and macadamia in Nwanedi, Ha-Khakhu, Mabila, and Musunda insinuates the occurrence of localized rainfall that can suffice these crops. Thulamela and the eastern part of Makhado Municipality have high occurrences of subtropical smallholder farmers. These farms correlate to the high rainfall intensity that ranges from 700-1400 mmpa, although the peak rainfall does not necessarily confine to the nucleus of the farmers. Nonetheless, the high rainfall areas coincide with the high cluster of avocado farmers that exhibits intensification as moving to the west. Low operations are in Makonde and increases in Ha-Mutsha, Vondwe, and are only prominent in Lunungwi,

Lwamondo, and Murunwa. According to Elwell (1994), agricultural productivity correlates to the mean annual precipitation, hence the high farmer's density in these areas.

Macadamia are prominent in Dzimauli (Fefe, Pile and Mabila) Masia, Tshimbupfe, Vhurivhuri and Ha-Khakhu. The citrus conforms to the rainfall range of 700-800 mmpa. Rainfall strongly correlates to the highly clustered smallholder operations. The smallholder farmers exhibit a strong affinity to the rainfall trend in the district. This is following He (2013) that rainfall is a primal factor in rain-fed agriculture. The smallholder farmers are distributed following the rainfall. The area that experiences low mean annual rainfall is attributed to dispersed farming, meanwhile, the high rainfall conforms to the high density of the farming operations. Moreover, the optimal rain areas are conforming to the high-water demand avocados. Similarly, the farmers in dry areas are highly participating in mango production.

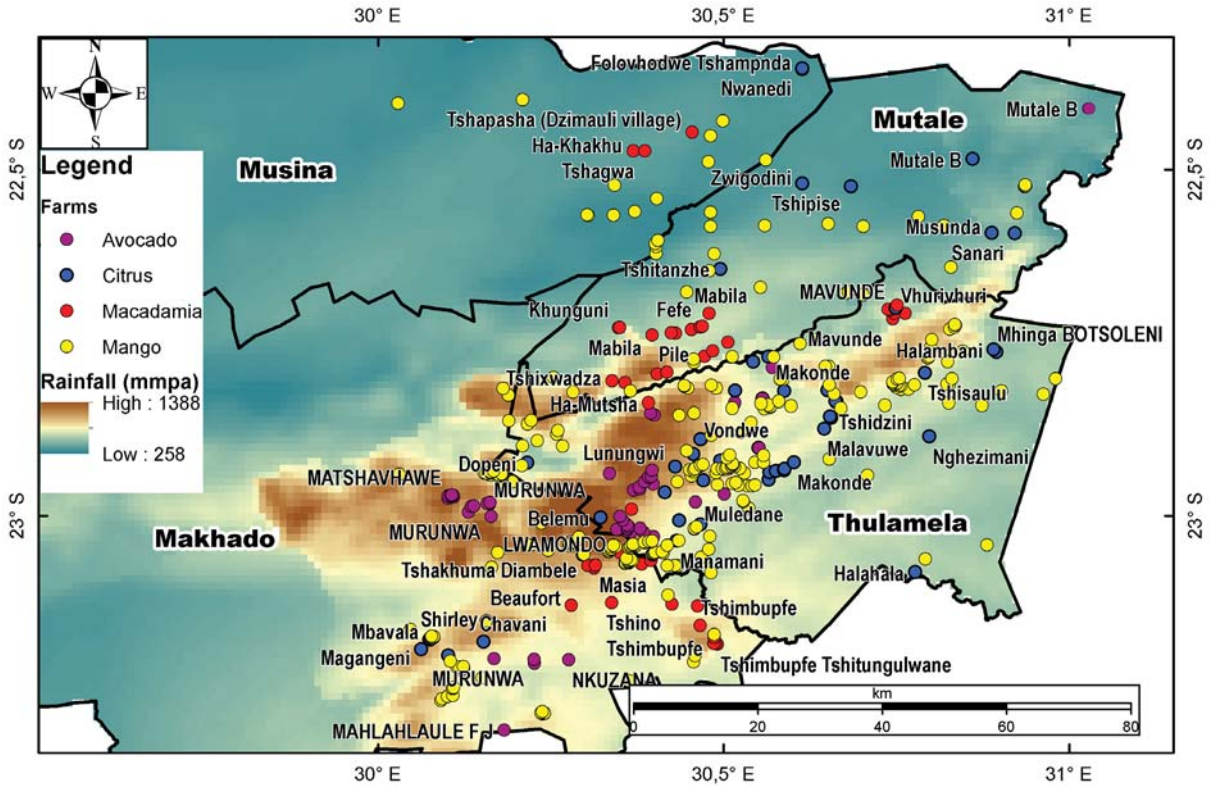

Figure 6.3. The superimposition of the smallholder farmers to the mean annual rainfall

6.4.3.2. Temperature

Temperature dictates the tempo of the evapotranspiration of an area, which directly influences the soil moisture content and surface water resources (Tang & Chen, 2017). Figure 6.4 depicts the spatial variability of the mean temperatures through the summer season. The tonal variation of the map reflects the spatial variability of the temperatures. The pinch of the blue colour corresponds to the mean low summer temperatures (19 to 23°C) that commence

at Tshitanzhe (the boundary between Musina and Mutale) and extend to Makhado through (Mabila, Pile, Tshixwadza, Lunungwi, Hamutsha, and Dopeni). According to the ARC-ISCW (2016), the optimal mean temperatures for the subtropical fruit range between 20 and 30°C and coincided with these areas.

The areas that coincide with the Soutpansberg are ideal for the subtropical fruit suitability based on the conducive temperatures that range from 19 to 25°C. This implies that the subtropical fruit farms are optimally located for high-yielding crops, as the entirety of Thulamela and the southern segment of Mutale and Musina are ideal for subtropical fruit farming. Conforming to the ARC-ISCW (2016), the northern part is only suitable for drought and temperature-resistant crops (mango). The extreme temperature that is experienced in the northern part of the Makhado, Musina, and Mutale is extreme for the subtropical fruit but the mango.

Hence there is a significant occurrence of the mangoes in the same area. Farming can only be considered in extreme temperature only if there is sufficient water resource in the area. Moreover, Van Koppen (2017), reveals the low existence for irrigations within the smallholder farmers. However, the same areas that experience a significant level of temperatures above 33°C are also attributed to low rainfall (Maponya & Mpandeli, 2014). Extreme temperatures reduce the production yield of the crops ((Tang & Chen, 2017). In such areas, the only logical prospect for the expansion of agriculture is dependent on groundwater resources.

The mean winter temperatures are shown in a map in Figure 6.5. The map reflects the spatial trend that is denoted with a drop as moving to the west. The map reflects that the winter does not have much influence on the spatiality of the crops. It is also worth noting that the winter is generally warm hence the season is conducive to the selected crops. On the other hand, the shortfall of the winter is that the season is extremely dry as the precipitation strictly occurs in the summer.

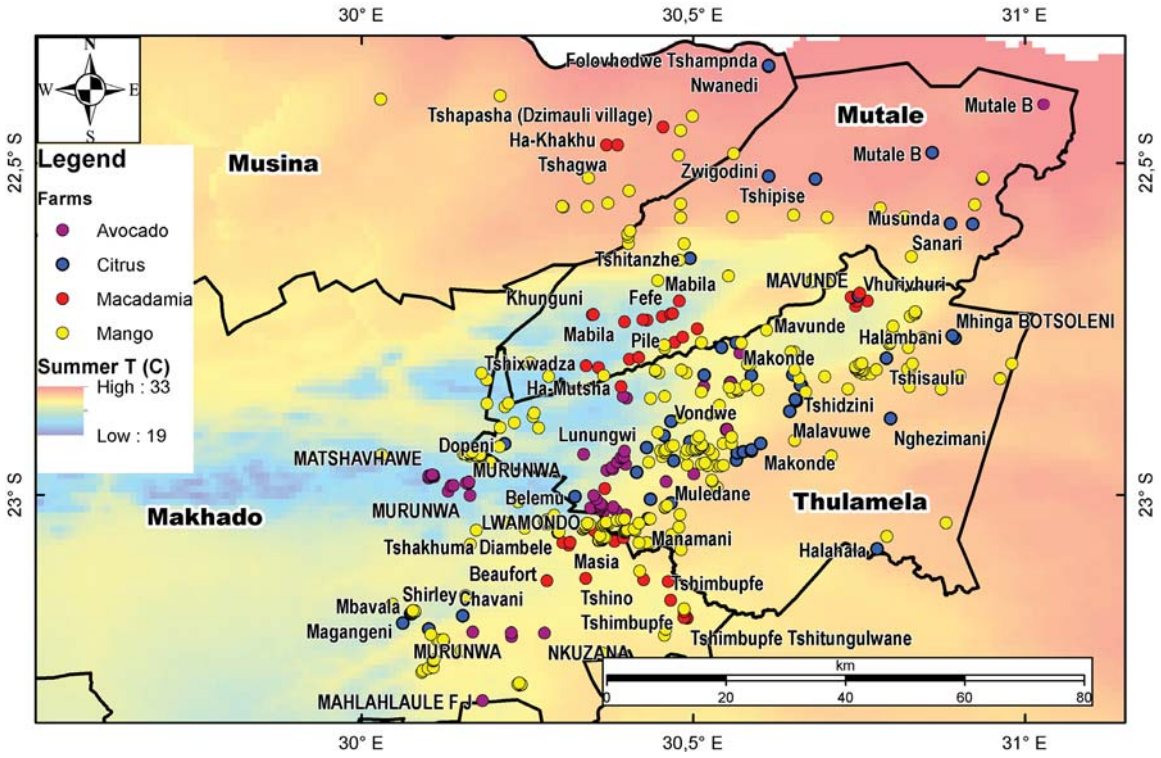

Figure 6.4. The integration of the smallholder farmers to the mean summer temperatures

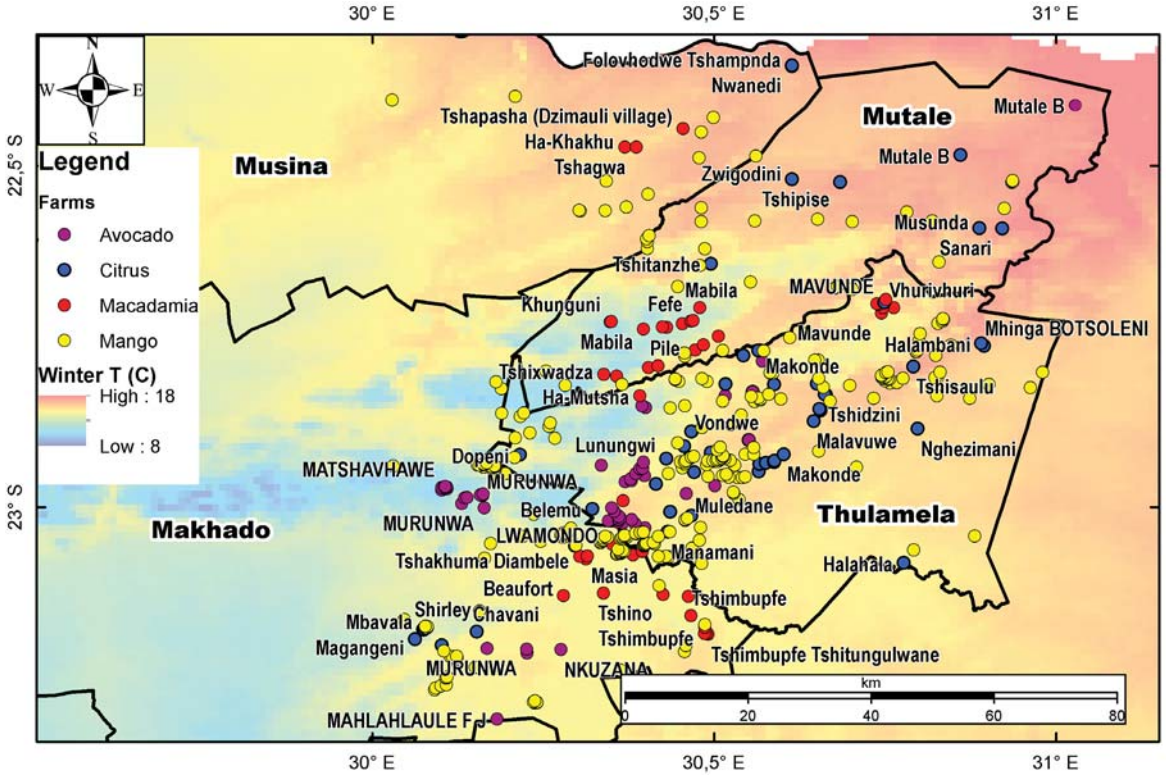

Figure 6.5. The mean annual temperatures for the various smallholder localities

6.4.4. Water resources

6.4.4.1. Surface water resources

The map in Figure 6.6 depicts the different proximities of the smallholder farmers to the streams. Rivers and streams are dependable water sources for agriculture (Bayramoğlu et al., 2018), especially in the subtropical regions where the rain is seasonal (Hernandez-Ochoa & Asseng, 2018), and confined to the summer (Mpandeli & Maponya, 2014). This is primarily because the water bodies retain water resources long after the rainy season. However, streams are only adopted in the irrigation of the smallholder farms that are within short proximity because of the restrictive expenses that are incurred in the conveyance of water from the streams to the farms (Chipfupa & Wale, 2019). In the subtropical regions, farmers are often clustered around the streams (Lowder et al., 2016). Precisely 20% of the farmers had their smallholder operations within the proximity of a kilometre from a stream. The highest amount 137 (30%) was within 1-2 km from the rivers. Meanwhile, 2-4 km and >4 km both had the constituency of 118 (25%) and 115 (25%) sequentially.

Although a logical constituent of the farmers (20%) is located within a km from the streams, the influence of the streams as an integral component governing the development and the spatiality of the smallholder farmers is impeded with the assertion of the following authors, Van Koppen et al. (2019) and Scoones (2019), who outlined that the smallholder operations are hardly irrigated in the Limpopo Province. Sikhipha (2019), also inferred that the smallholder performed manual irrigation, which is rather a challenging exercise as the majority of the farms are located far from the water sources (>2 km). The smallholder farmers are poverty-stricken (Manenzhe, 2015). Subsequently, they hardly install the irrigation system nor use fertilizers or pesticides (Sikhipha, 2019). Schittenhelm (2017), lamented that irrigation is a prime limiting factor for smallholder operations. Furthermore, the farming operations should be within a walking distance (ideally <km) to the streams to avoid expenses associated with water conveyance, they should also be a walking distance from home where kids will be able to join the rest of the family after school.

The poor development of the irrigation system implies that there is low adoption of the surface water resource. The spatiality conformity between the farms to the streams reflects that there is an opportunity to expand the potential and profitability of the farming sector through the installation of the irrigation system. According to Les et al. (2014), the adoption of cheap or gravity-driven irrigation and water conveyance technology holds the prospect to break the barriers for effective smallholder farming.

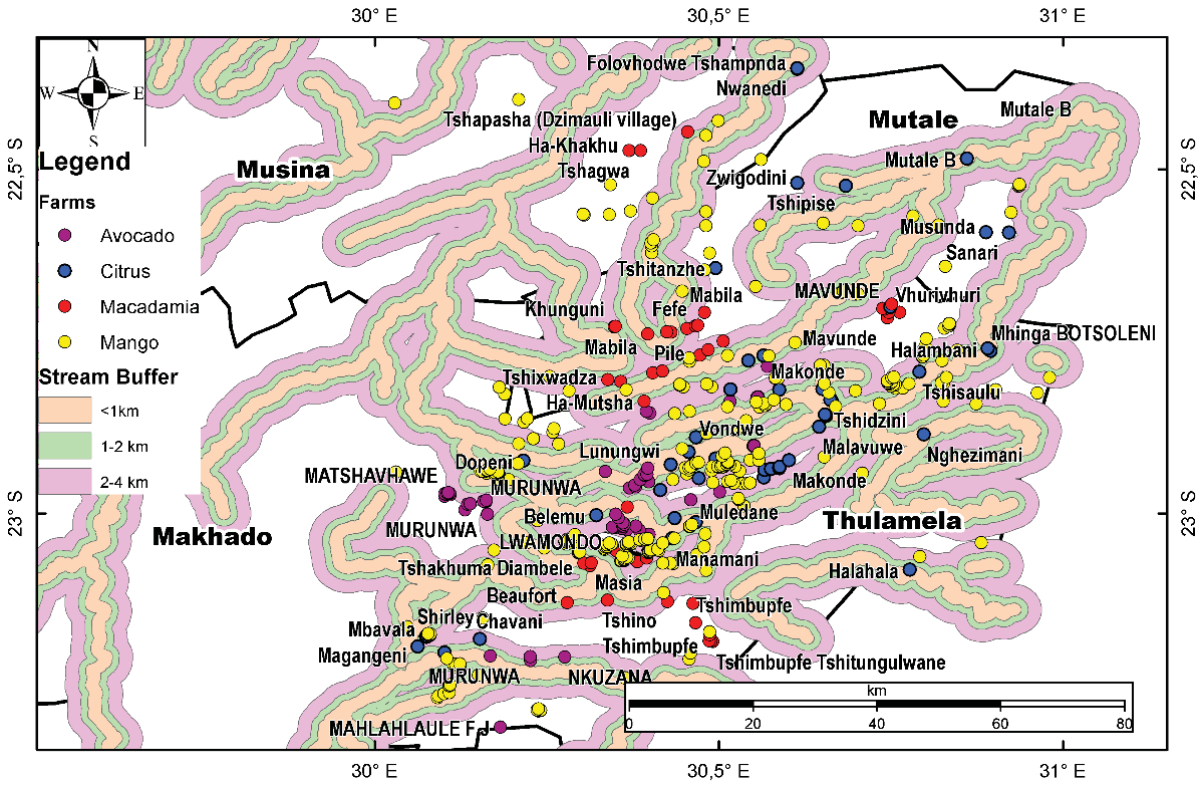

Figure 6.6. The proximity of the smallholder farmers to the streams

6.4.4.2. Groundwater resource for smallholder farming

The map in Figure 6.7 Shows the groundwater variability in different parts of the Vhembe According to Van Koppen (2017), there is low adoption of the groundwater resource within the smallholder community. In this regard, the conformity between the farmers and groundwater is rather a reflection of the adoption potential of the subsurface water by the agricultural sector in improving the potential and sustainability of the sector.

The blue (sky) depicts the poor groundwater potential that does not coincide with any farming. The total absence of the farmers in this area may reflect the strain state of the water resource in the area. The light green exhibits moderate groundwater potential that corresponds to the dispersed mango production. The exclusivity of the mango (Zwigodini, Tshixwadza, and Hamutsha) may be correlated to the deprivation of the water resource. Good groundwater potential reveals the areas where groundwater may easily be intercepted. It is the most extensive groundwater potential class. Interestingly, the majority of the farmers are located in this potential class. The middle part of the study area (Vondwe, Lunungwi, Vondwe, Makonde Lwamondo, and Ha-Lambani) constitute the most densely populated areas in the district. All crops are found in this area.

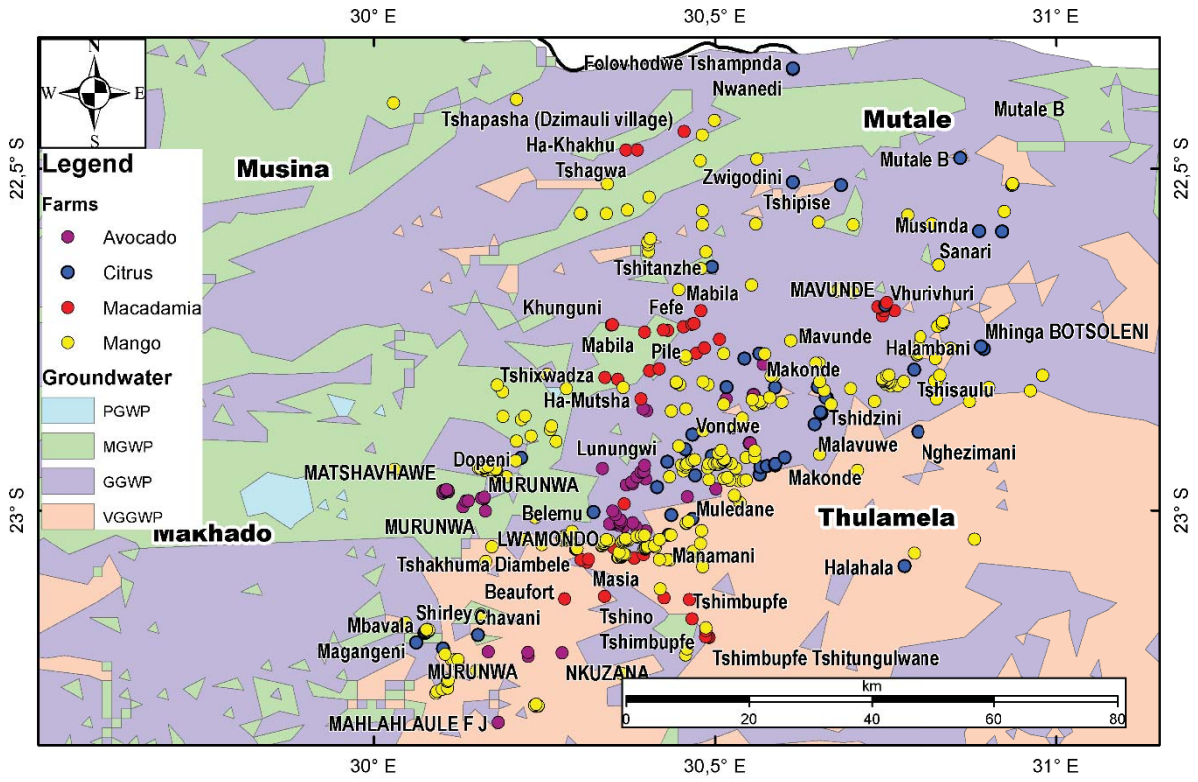

Figure 6.7. The groundwater variability in different parts of Vhembe

The optimal groundwater potential area is prominent on the southern part of the Thulamela (Muledane, Masia, Nkuzana, Tshakhuma, Halahala, and Tshimbupfe), with low farming activities. This implies that the adoption of the groundwater resource will contribute significantly to improve the sustainability of the farming sector and combat the impacts of climate change.

6.5. Aridity Index

Figure 6.8 indicates the aridity of the Vhembe District. The map depicts that the area is sub-categorized into four climatic zones; semi-arid, arid, dry sub-humid, and moist sub-humid zones. The map reflects that the arid area is the most spatial extent climatic unit as it constitutes a significant proportion of the Musina and Thulamela. According to (Griffins, 1985) this aridity category is attributed to excessive lack of water resource, to a point where rainfed crop farming is impossible. After these, the smallholder farmers are mainly scattered and isolated. The semi-arid regions (blue colour) are prominent in the north-eastern part of Musina. According to Gallard et al. (2002), the mean annual precipitation within this class ranges between 200 and 700 mm. The climatic unit is attributed to high rates of evapotranspiration that surpasses the rainfall. Intensive smallholder farming can be achieved through focusing on low water requirements crops (mango), or intensive irrigation of the crops.

The most ideal areas for the subtropical crops coincide with the dry sub-humid and moist sub-humid climatic zones. The dry sub-humid is the larger of the two as signified by the brown colour. The precipitation in this area is not able to support forest development but a high density of tall grass (Smerdon et al., 2008). The majority of the farmers are located in this climatic zone (Lwamondo, Ha-Mutsha, Tshimbupfe, and Vondwe). On the other hand, the moist sub-humid climate institute the most suitable area for subtropical crop farming, with little to no need for irrigation. Despite being the most prospective area for farming, the climatic zone coincides with a limited number of avocado smallholder farmers (Belemu, Lunungwi, and Murunwa). The agroecological climate shows that there is an uneven distribution of the farms in the district. There are few smallholder operators within the moist sub-humid zones, despite the climatic zone instituting the most prospective zone in the district. Therefore, optimization of the farming can be improved through intensifying the smallholder farmers in areas that conform to their agroecological requirements.

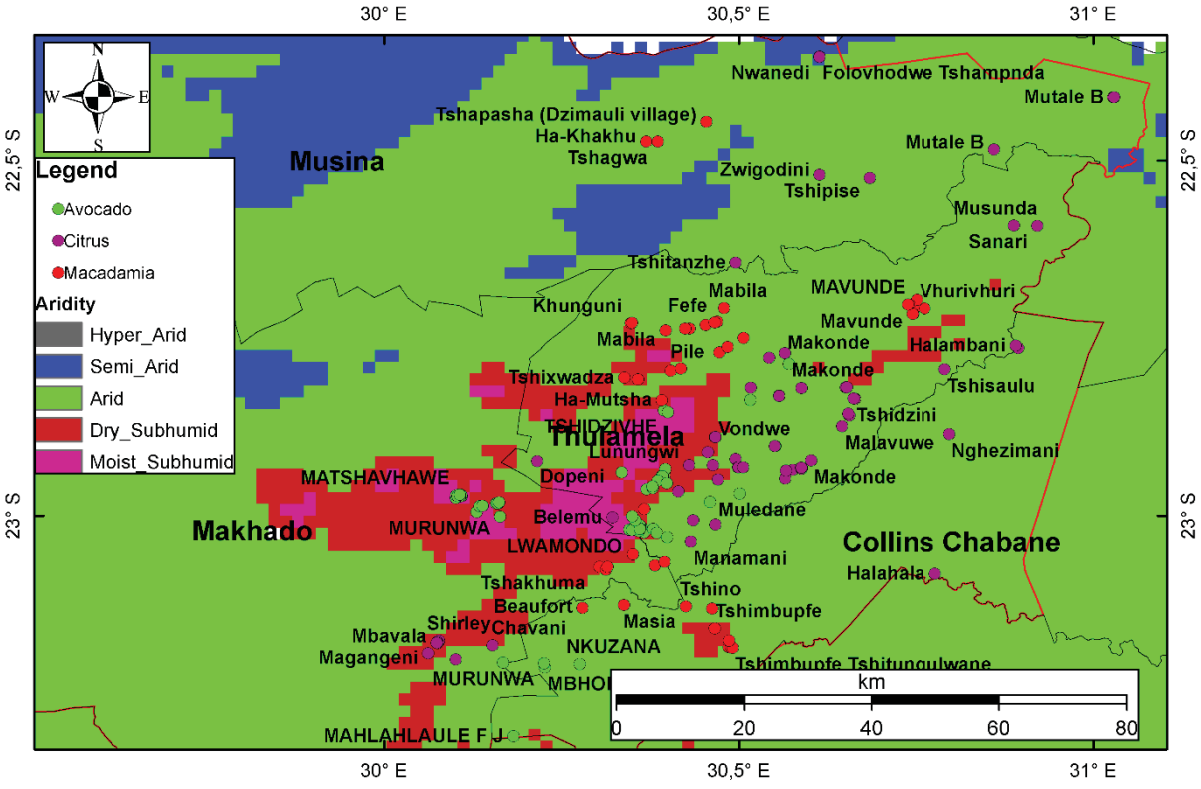

Figure 6.8. The conformity of the farmers to the aridity

6.5.1.Soil attributes

6.5.1.1. pH

The Map in Figure 6.9 shows the spatial variability of the soil pH in study. The definition of pH is simplified to the measure of the acidic or basic of the aqueous solution (Findenegg, 1987; Thomas, 1996). The pH of the soil, in agriculture, is important because it determines the mineral constituents and overall chemical composition of the soil (Reeves &. Liebig, 2016; Neina, 2019). Essential nutrients for the crops are easily accessible at a specific pH (Neina, 2019), some are absorbed in slightly acidic, while others at slightly basic and others at near neutral. In instances where the pH of water drops below 5.5 (Long et al., 2017), metal toxicity occurs (manganese & aluminium toxicity, Calcium, magnesium, phosphorus, and nitrates deficiency) (Long et al., 2017). However, most mineral nutrients are readily available to plants when soil pH is near neutral. On the other hand, if the pH exceeds 9, then sodium concentration increases (Reeves &. Liebig, 2016; Neina, 2019).

The soils of the Vhembe reflect a narrow spectrum of pH values that range from 4.2 to 6.6, which conforms to strong acidic to slightly neutral pH. The northern east part of Mutale and the southeastern part of the Makhado are both attributed to strong acidic soils (<5.5 pH) that can result in metal toxicity (manganese and aluminium) (Long et al. (2017). According to Jayaganesh (2011), such toxicity is associated with defoliation and subsequent crop death. The same areas are also attributed to low agricultural practices in Mutale B and moderate concentration in Mahlahlause and Masia areas. Except for the areas underlain with strong acidic soils, the rest of the province is suitable for subtropical fruit production. More than 95% of the farmers are situated in the ideal pH soils for their crops.

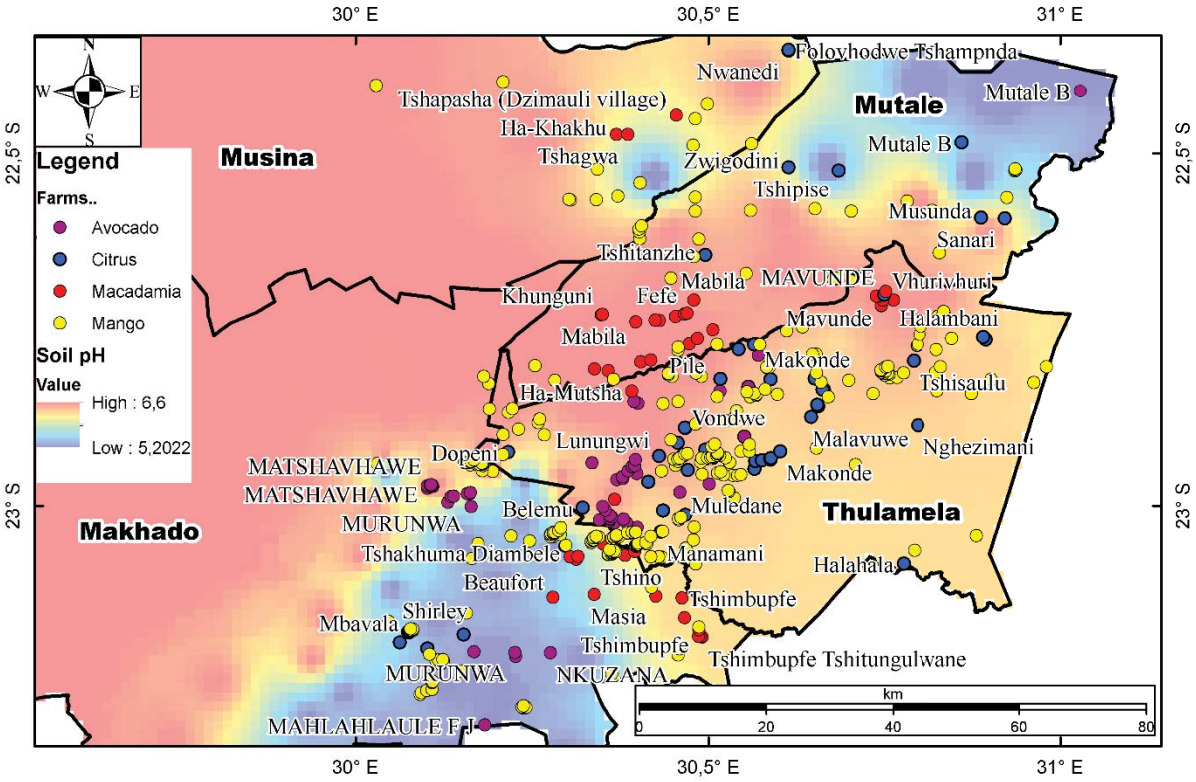

Figure 6.9. The soil pH throughout the smallholder operations

6.5.1.2. Soil Depth

The spatial variability of the soil depth is presented in Figure 6.10. According to Rajakaruna & Boyd (2019); Boyd et al. (2009), the physiological attributes of the crops determine the ideal soil depth. Each of the subtropical crops that are included in this study has a particular requirement of soil depth (avocado, mango, litchi; =1 m and citrus=1-2 m). Deeper soils are favourable for agriculture because they increase the absorption capacity of the roots to nutrients and water and provides support for the tree to remain upright (Yost & Hartemink, 2020; Nishanta & Boyd, 2019).

Mutale B, and the Southern part of Makhado (Murunwa, Beaufort, Diambele, Tshakhuma) exhibit excessive soil depth (>1 m). Meanwhile, the smallholder clusters (Halambani, Makonde, Vondwe, Muledane, and Manamani) are attributed with a shallow soil (depth of <0,7 m), according to the ARC-ISCW (2016), such soil depth is insufficient to suffice the selected crops. However, such clusters conform to micro-climatic zones that experience exceptional high rainfall (Mpandeli & Maponya, 2014). Meanwhile, the weathering of the basaltic rocks yields the development of the essential nutrients (Kantola, 2017), hence the agricultural production is amplified.

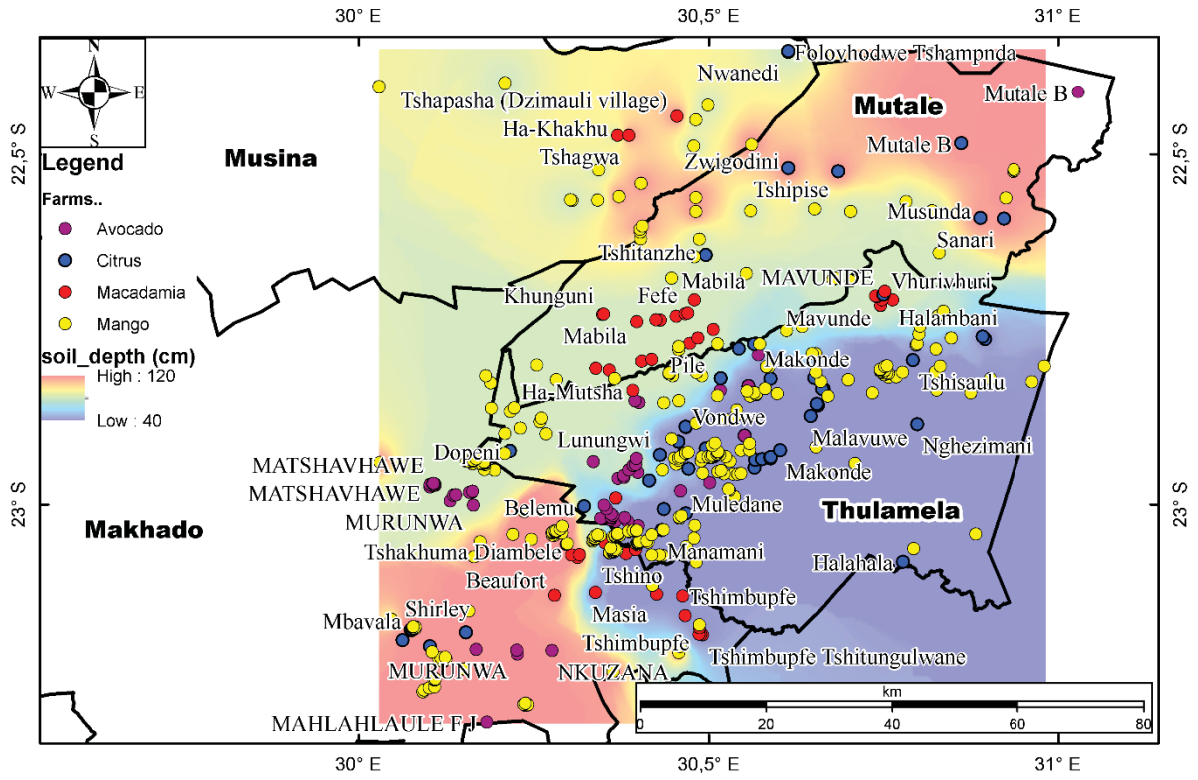

Figure 6.10. Soil depth within the vicinity of the smallholder farmers

6.5.2. Organic Carbon

According to FAO (2020), the measurable variable of the soil organic carbon is the carbon organic matter. Carbon is an essential component of the soil health condition, which also correlates to the production yields of the crops (Schjønning, 2018). It also plays an integral role in the physicochemical and biological behaviours of the soil (Haddaway, 2015). Moreover, this parameter constitutes roughly 2-10% of the total soil mass. Organic matter is the primal variable for the retention of nutrients and totality, soil structure, moisture retention, and pollutants degradation (FAO, 2020).

The map in Figure 6.11 depicts the concentration of organic carbon in the area of study. The colour variations insinuate the occurrence of the spatial variability of the organic carbon matter in the soil. The nervy blue colour corresponds to the lowest carbon concentration (<0.1%) that is prominent to the western side of the map (Mutale, Musina, and the western part of the Makhado). According to Haddaway (2015), and FAO (2020), such low values of organic carbon, infers that the water holding capacity, nutrients level soil structures are poor. This insinuates that the area is unideal for fain-fed crop farming.

Moreover, groundwater resources and other additives are necessary for high-yielding crop production.

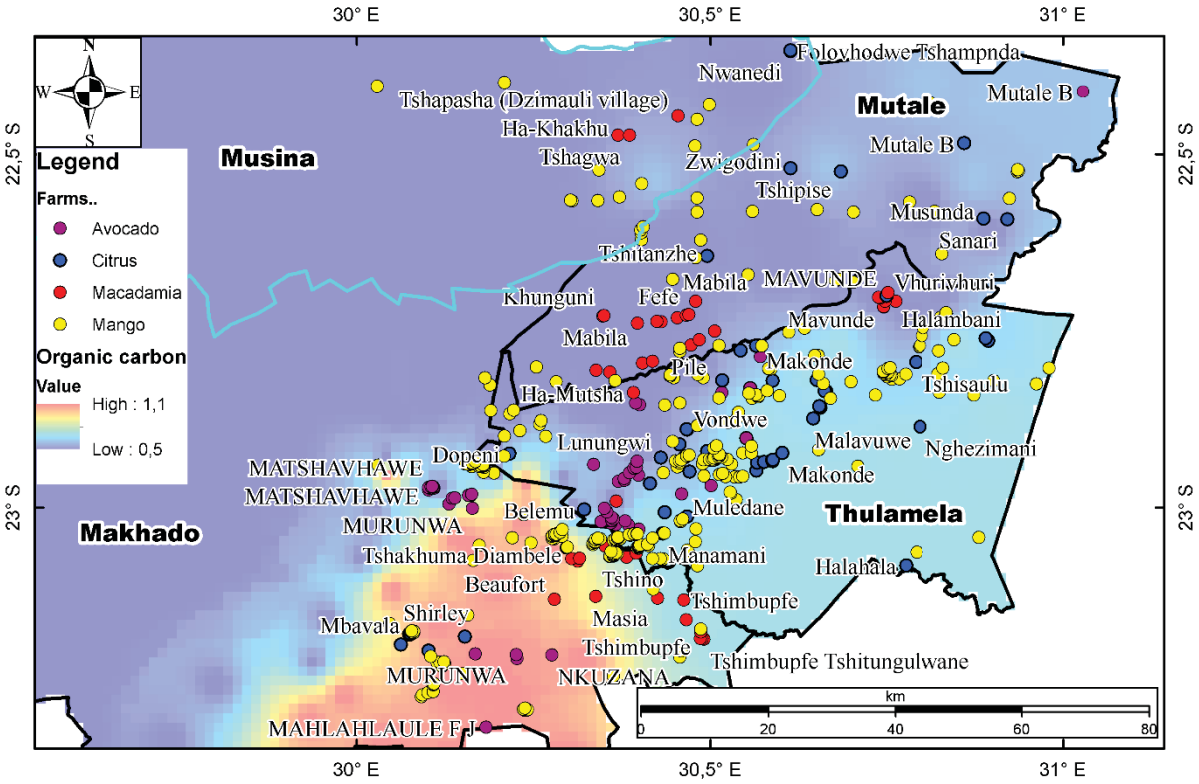

Figure 6.11. The concentration of the organic carbon with the soils

The highest level of the OCM (>1.1%) is found on the southeastern part of Makhado (Belemu, Nkuzana, Murunwa, Tshakhuma, and Mbavala) with a decline with westward progression. The high level of organic carbon matches the agricultural soil potential that was established by (Paterson, 2012), hence there are numerous smallholder operations in this area. With the view that the same area, coincides with the micro-climatic zone with a significant level of precipitation, the farming operations can be easily expanded. The OCM of 0,8-0,9% is prominent in Thulamela Municipality. A similar region is also significantly underlain with the hutton soil that is derived from the underlying basaltic rocks.

The weathering of such rocks results in iron-rich, high crop-yielding soils (Schjønning, 2018). The concurrence of the hutton soil, microclimatic settings, and organic carbon amplifies the agricultural potential of these areas.

6.6. Factor Analysis

Factor Analysis is a member of the multivariate statistical approaches that deals with the reduction of the dimensions of the large datasets into a few latent factors that are correlated (Wenning & Erickson. 1994; Mendiguchı et al., 2007). Data can only be subjected to Factor analysis, once it has satisfied the Kaiser-Meyer-Olkin (KMO) and Bartlett's test. KMO

measures the suitability of the data for the factor analysis by examining the common variance amongst the variables comprising the model, the suitability of the data is inversely proportional to the magnitude of the subsequent variance.

On the other hand, Bartlett's test of sphericity tests the suitability of the data based on the correlation matrix. The significance level of the hypothesis test holds the decision to either pursue the analysis or not, based on the significance level (small values <0.05 suggests that the data is ideal for factor analysis. Table 5.1 reflects the KMO and Bartlett's Test for the input parameters. The KMO value of 0.528, which is greater than the minimum required value of 0.5 implies the data is adequate for the factor model, meanwhile Bartlett's Test value of 0.00, which conforms to the <0.05 recommended, reveals the data can be used as input in the factor model.

Table 6.1. KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.546
Bartlett's Test of Sphericity	Approx. Chi-Square	928.151
	df	21
	Sig.	.000

Table 6.2 depicts the communalities values, which is the measure of the variance accounted for by the variables to the resulted factors. The small values signify that the parameters are not contributing to the factor solution and as such should be excluded in the analysis. The topographic relief and soil depth were not having meaningful contributions to the factor solution as they had the low extraction of <0.398 and <0.370 successively, they were subsequently excluded in the factor model.

Table 6.2. Communalities of the variables

Agroecological Variables	Initial	Extraction
Rainfall	1.000	.842
River proximity	1.000	.969
Groundwater resource	1.000	.758
Temperatures	1.000	.844
Soil-Fertility	1.000	.795
Soil pH	1.000	.832
Soil depth	1.000	.969

Table 6.3 shows that the factor model is comprised of the four latent factors (4 sets of combination of the agroecological variables) that can be used to interpret the spatial distribution of the farmers in the district. Factor 1 shows that the prime variable for the distribution of the farmers is the rainfall (0.801) and the soil-type (-0,826). The opposite signs of the prominent variables that dominate Factor 1 implies, that they are inversely correlated to each other. Contextually, the northern part of the Limpopo Province experiences high summer temperatures, which prohibit the development of the farms (Griffins, 1985), receives low rainfall. Hence, the low occurrence of the farming operations.

Factor 2 is attributed to significant loadings of Groundwater (0.860) and Soil fertility (0.854). Groundwater is an essential determinant of crop suitability especially in the subtropical regions that do not receive sufficient rainfall (Nikolaou, 2020). However, the smallholder operators are sceptical to adapt to the use of this resource because of the capital associated with the on-site development of the water resource and the subsequent running costs of the technology (Chikozho, 2020). However, the conformity of the smallholder farms to the groundwater indicates the expansive potential of the smallholder sector with the groundwater resource. Factor 3 is dominated by the high loading of the river (0.955). The significant loading of this variable implies that the farmers can easily turn to the surface water to amplify their potential and viability of their operations. According to Van Koppen (2017), there is marginal utilization of the irrigation system within the smallholder operations.

This implies that the majority of the farmers that are utilizing the stream water maybe applying manual irrigation utilizing the water containers. Therefore, the development of the gravity-oriented irrigation system holds the potential to amplify the opportunities within the smallholder sector.

Table 6.3. The loading of the different variables to the factors

Agroecological Variables	**Factors Loadings**			
	1	**2**	**3**	**4**
Rainfall	.801	-.196	.288	-.283
River proximity	-.238	-.030	.955	.007
Groundwater resource	.051	.860	-.035	-.122
Temperatures	-.828	.348	-.023	.190
Soil-Fertility	.103	.854	.169	-.161
Soil type	.830	.339	-.094	.141
Soil depth	.317	.079	.126	.920

The first three factors are attributes with the significant loadings of rainfall (0.801), groundwater resource (0.860), and streams (0.955). All these variables are the components of the water resource. However, according to Van Koppen (2017), smallholder farmers are primarily rainfed, with low adoption of surface irrigation and groundwater. This insinuates that the main controlling variable for the spatiality of the smallholder farmers is the rainfall trend. The existing potential and the sustainability of smallholder farming can be expanded through the adoption of surface and groundwater resources. Moreover, the district confines to the arid, semi-arid, dry sub-humid, and moist sub-humid climatic zones. These zones vary on their water remand but are all water strain at variable degrees. The low precipitation zones are attributed to dispersed smallholder farmers. Meanwhile, the higher rainfall areas are characterized by a high density of smallholder farmers.

The overlay of the smallholder farmers to the rainfall attested to this finding. On the other hand, significant loading (-0.828) that coincides with the temperatures for factor 1, suggests that the farming potentiality decreases with the increase in temperatures. In other words, there is an inverse relationship between rainfall and temperature. The areas with high rainfall are generally attributed to relatively low temperatures, whereas the dry areas are comparatively dry. There is an opportunity to intensify the smallholder subtropical entities within the moist sub-humid areas. This is because such an area institutes the most ideal areas for such crops but coincides with' the least concentration of the farmers.

6.7. Smallholder Clusters

The map in Figure 6.12 shows the hierarchical clustering of the smallholder farmers in the area of study. The map depicts that there are 7 subsequent clusters in the area (Zwigodini, Tshagwa, Sanari, Dopeni-Tshixwadza, Dzimauli-Vondwe, Lambani, Mukumbani-Tshififi, Thohoyandou, and Mbhokota). Each of the clusters is comprised of farmers that are located in proximity to each other irrespective of the variance of the commodity in production.

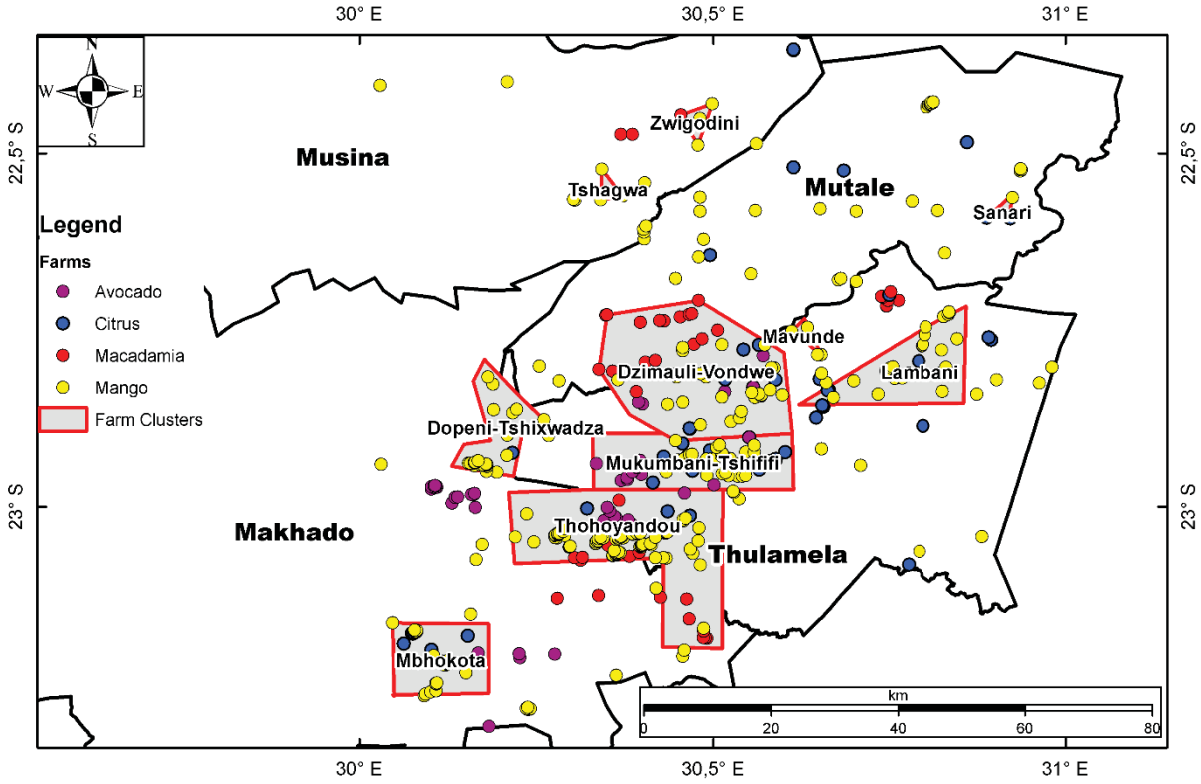

Figure 6.12. Shows the clusters of the smallholder farmers

The northern section of the study area that is comprised of Musina and Mutale Municipality conforms to the arid regions of the Limpopo Province. The area in this category is dry to an extent of prohibiting crop farming. Hence it is attributed to a low density of the smallholder farmers. Subsequently, there are three spatially insignificant clusters of the smallholder operators (Zwigodini, Tshagwa, and Sanari) that are predominated with the mango. The existence of the citrus farms in such restrictive climatic settings insinuates the existing smallholder farmers are likely founded on irrigation addition of the additives to condition the soil to crop requirement.

Unlike the aforementioned clusters, Lambani and Dopeni-Tshixwadza constitute a relatively larger volume of the farmers, although they are mainly mango producers with some dispersed citrus. The two conforms to the optimal rainfall area hence larger participation in agriculture. The most extensive clusters are Dzimauli-Vondwe, Mukumbani-Tshififi, and Thohoyandou. The three constitute a significant proportion (90%) of the smallholder farmers. Interestingly all the crops are available in these clusters but in the variable constituency. Litchi is prominent in the northern part of the Dzimauli-Vondwe cluster but with a limited constituency of avocado farmers. On the other hand, Mukumbani-Tshififi does not contain any macadamia farmer but numerous avocado farmers and some citrus.

Thohoyandou cluster exhibits an assemblage of the 4 crops that were part of the study. However, mango has a higher constituency of 40%. Despite the considerable difference in the constituency of the smallholder comprising the clusters, they are conforming to the interrelated agroecological attributes. These imply that, despite the variance in crop farming within the three clusters and the nearby farms, the area is rather confining to the same agroecological region. It is rather spatially restrictive to view the potentiality of these clusters in terms of their dominant crop.

6.7.1. Intercropping production system

The map in Figure 6.13 shows the superimposition of the smallholder farmers to the integrated subtropical fruit suitability map of the Vhembe District Municipality. Smallholders' subtropical farmers are renowned for intercropping farming system although, that is hindered by the limited land-size (2 ha mean) (Van Koppen, 2017). Some farmers are stuck on crop specialization, where a farmer focuses on a particular crop. The challenges with such a farming system include confining the income generation to the seasonality of the crop, sensitivity to the market price if it becomes saturated, and proneness to total production less through pests. On the other hand, a smart intercropping system ensures that the farmer incorporates crops with variable harvest seasons to ensure that the prospective income generation is spread almost throughout the year

There is underutilization of the agricultural potential areas throughout the district. Makhado exhibit a significant extent of the untapped avocado potential in Tshakhuma, Beaufort, Mutale B, Halahala, and Ha-Lambani. Citrus also reveals the substantial spatial potential that does not coincide with smallholder operations in Matshavhawe, Dopeni, Lambani, Beaufort, Mutale B, Halala, and Tshitungulwane. Interestingly, Halambani, Nkuzana, Matshavhawe, and Mutale B, show the potentiality for all the selected subtropical fruit, however, there is no farming in the area.

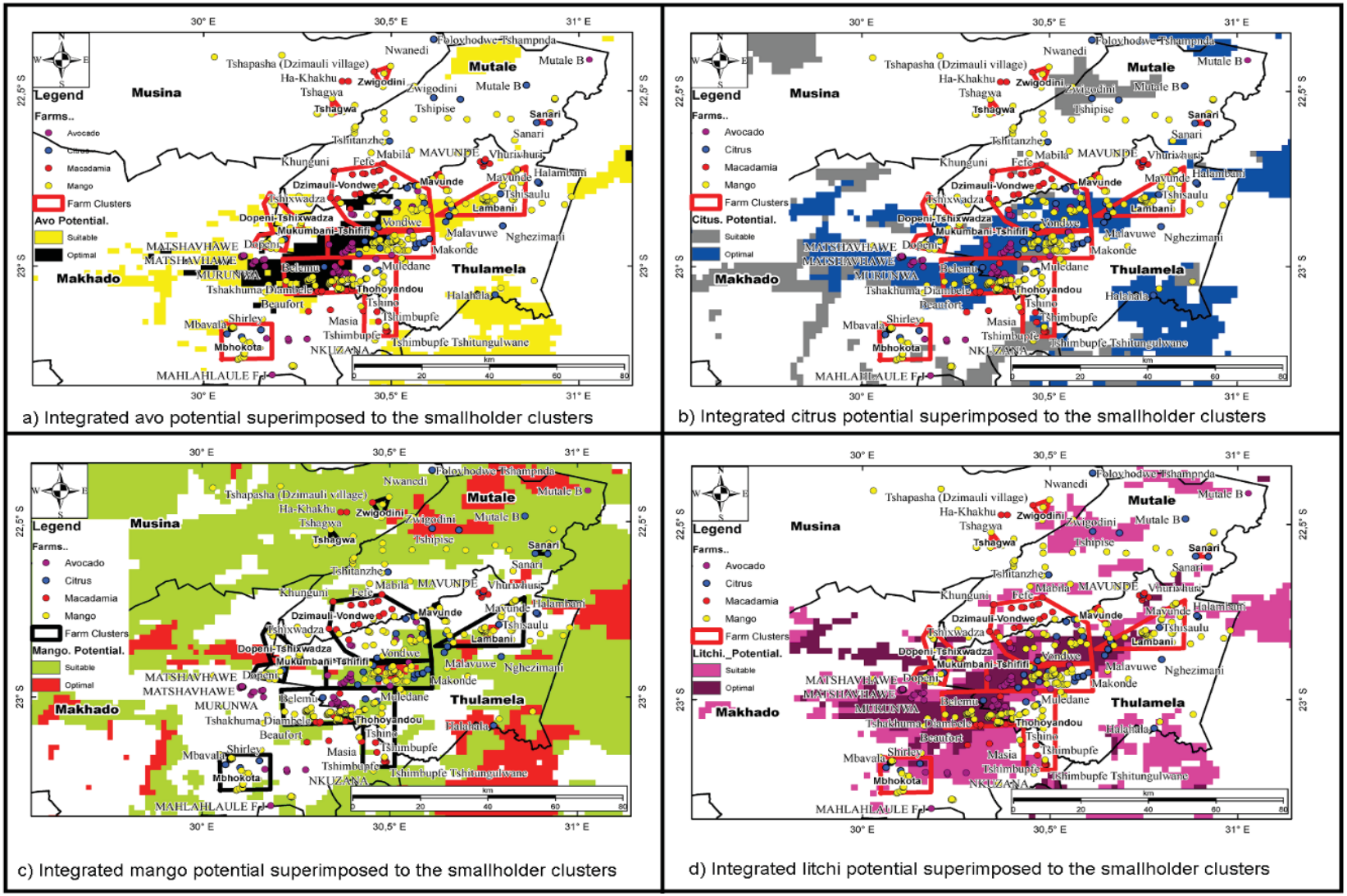

Figure 6.13. The superimposition of the smallholder farmers and their clusters to the integrated subtropical fruit potential

Ndwambi et al. (2020), reveal that there is an overlap in the subtropical fruit suitability throughout the Limpopo Province. In the quest to optimize the sustainability of smallholder operations, a smart intercropping system should be instilled. This system should be established with the mandate to spread the harvest period all year. Moreover, the intercropping system should also take into account the topologies of the agroecological parameters. The arid and the same arid region (Mutale, Musina, and the northern part of Makhado Municipality) are dominated by the mango and insignificant segments of the citrus. The smallholder in this region should primarily focus on mango because the crop is adaptive to extreme climatic conditions and poor water resources. This can be integrated with the citrus as it already portrays some potential. Ndwambi et al. (2020) established significant citrus potential based on groundwater resources. This combination will improve the sustainability of the smallholder farmers as citrus with adequate irrigation becomes an all-year crop (August to July) while mango (November to May) (ARC_ISCW, 2016). Subsequently, the income is spread throughout the year.

The dry sub-humid areas are adaptive to the diverse array of smallholder crops. However, the avocado production may not result in optimal yields, as it requires a mean annual rainfall of 1000 mmpa. This area will be founded on citrus, mango, and litchi. However, the smallholder clusters may not be based on the litchi and mango as the harvest period is confined to just two months (December to January) (ARC_ISCW, 2016) and 6 months (November to May) (ARC_ISCW, 2016) respectively, leaving a further half-year (June-November) without generating any income. Therefore, the underlying crop in this case should be citrus that will then spread the farm income throughout the year.

The moist sub-humid is suitable for all subtropical fruit. The area should be established based on the potentiality of the avocado. This is because the crop can only be well managed in this category. The production area should then be complemented with the combination of the citrus and minor constituencies of the litchi and mango. The avocado smallholders that are located within this cluster will result in a year-round harvest. The citrus has a strong export market. While the mango has a strong local market.

6.7.2. Access to Land and Business Support

One of the greatest challenges of the smallholder farmers is the access to land and the legal framework that prohibits their participation in agriculture. Chawiche (2015), indicated that the land size for smallholders ranged between 0,25 ha with a mean size of 2 ha. According to Sikhipha (2019), new applicants cannot be offered a land size above 3 ha.

The author went on to indicate that the majority of the farmers (70%) acquire their land through permission to occupy and the rest (30%) are renting. The PTO is issued by the Tribal Authorities. However, this institution hardly offers the smallholder farmers a land size that exceeds 3 ha, especially to new farmers. Meanwhile, this form of a certificate does not transfer the land ownership to the applicant, because the land may be redeemed due to incompliance to the bylaws, political reasons, and new development projects. This implies that no ownership security is guaranteed to the farmers.

An additional challenge that is posed to the PTO is that the smallholder farmers are deprived of access to the financial institutions because they cannot provide any form of collateral (Murado, 2019). According to Shimeless et al. (2018), apart from the agroecological parameters, the administrative settings prohibit the development of smallholder farmers. Despite the NDP prescription on the potentiality of the sector in job creation and wealth redistribution, there is still limited funding that has resulted in limited institutional support to the sector and a conducive operational environment (Shimeless et al., 2018). This has contributed to the sector's inability to penetrate the formal market.

The new partnership for Africa's Development (NEPAD) in the Comprehensive Africa Agriculture Development Programme (CAADP) compels the member states to commit 10% of their budget to support agriculture, with the special focus on establishing alternative water sources to minimize the dependency on rain-fed irrigation. Adams (2014) outlined that there is underutilization of the groundwater resources in South Africa. Consequently, Ndwambi et al. (2020), outlined the subtropical fruit potential with the incorporation of the groundwater resources. This could provide the base for the terms of investment to support the smallholder farms.

6.8. Conclusion and Recommendations

The smallholder farmers are allotted conforming to their agroecological requirements. However, the prime agroecological variable defines the spatial distribution of the smallholder subtropical farmers in the water resource. The potential of the smallholder farmers is restricted by the low adoption of surface water resources. The adoption of the gravity-driven irrigation system holds the potential to amplification of the smallholder sector. The sustainability of the sector can be improved through the adoption of the smart intercropping system. The presiding government should invest in agriculture to support the farms.

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CHAPTER 7

PERCEPTIONS ON IRRIGATION WATER SUPPLY AND UTILISATION BY SMALLHOLDER AGRICULTURAL ENTERPRISES IN VHEMBE DISTRICT OF LIMPOPO PROVINCE, SOUTH AFRICA

Abstract. The study investigated perceptions on irrigation water supply and utilisation by Smallholder Agricultural Enterprises (SHAEs) in Vhembe District of Limpopo Province. More (55.4%) SHAEs depended on surface water as main source for irrigation. Surface water supply was ranked moderate in majority of SHAEs, both for summer (58.6%) and winter (69.7%) irrigation and was regarded always available (51.3%). Groundwater was main source in 44.2% of SHAEs and was ranked very high for summer (55.7%) and winter (34.4%) irrigation. Groundwater was perceived to have advantage of being always available in 83.6% of SHAEs while 64.9% complained about higher pumping costs. One in three (33.9%) SHAEs revealed they irrigated two to four times a day while one in five (18.7%) irrigated once every eight to 14 days. The mean amount of water used to irrigate was estimated at 5 300,88*l* ± 20 762,91*l*. Almost two in three (62.6%) SHAEs experienced competition for water. Statistically signification association was observed between main source for irrigation and monthly income ($\chi 2$ (1) = 7.10, $p < 0.013$) after Bonferroni adjustment. It was determined that 51,3% of SHAEs with income ≤ R5000/month used surface water as main source for irrigation compared to 69.6% with income > R5000/month.

Keywords: Surface water, Groundwater, Irrigation

7.1. Introduction

While the global supply of available freshwater is more than adequate to meet all current and future water demands, its spatial and temporal distributions are not. As a result of skewed spatial and temporal distribution of the freshwater resources, there are many regions where water resources are inadequate to meet requirements (Cosgrove and Loucks, 2015) while other regions are oversupplied (Tshikolomo, Walker, and Nesamvuni, 2013). Adequacy of water supply remains critical for human life and livelihoods (Nnaji and Banigo, 2018; Ritchie, 2017).

Agriculture consumes the largest quantity of water in the world with some countries allocating around two-thirds of their water to this sector. Agriculture water requirements must be supplied in a context of declining availability due to environmental awareness, population growth and economic development (Iglesias and Garrote, 2015). The purpose of this study

was to investigate the irrigation water supply and utilisation in SHAEs with a focus on the Vhembe District of Limpopo Province.

7.2. Methodology

7.2.1. Description of study area

The study was carried out in Vhembe District Municipality of Limpopo Province, South Africa. The specific areas were Madimbo Corridor in Musina and Mutale Valley in Thulamela Local Municipality. The study was carried out in Vhembe District Municipality of Limpopo Province, South Africa. The specific areas were Madimbo Corridor in Musina and Mutale Valley in Thulamela Local Municipality. The two areas were categorized as independent smallholder agricultural enterprises (SHAE) each with a private water supply in the case of Madimbo and as irrigated smallholders which are served by communal water supply infrastructure in the case of Mutale. The two areas of Madimbo corridor and upper Mutale valley irrigation schemes constitute a total of more than 2270 ha of production area.

7.2.2. Sampling procedure

Stratified random sampling was used to obtain a representative sample of villages and households for interview (Leedy et al*.,* 2005) with target population being women and youth SHAEs. A two-stage random sampling process was conducted using *SURVEYSELECT* procedure of SAS. The *PROC SURVEYSELECT* allowed for probability-based random sampling where sampling in a category or class depended on the number of units within that class. The sampling was regarded appropriate for handling selection bias. The total number of SHAEs sampled were two hundred and ninety-four (N=294). The sample was comprised of 71 youths aged 18 to 35 (56 females and 15 males) and 223 women of whom 153 were adults (36-59 years) and 70 pensioners (≥ 60 years old).

7.2.3. *Data collection*

A semi structured household questionnaire was used to carry out a survey with an emphasis on women and youth SHAE. Total number of SHAE interviewed were two hundred and ninety-four (N=294) with a response rate of 75 percent. The sample was comprised of 71 youths aged 18 to 35 years old (56 females and 15 males) and 223 women of whom 153 were adults (36-59 years) and 70 pensioners (≥ 60 years old).

7.2.4. Data analysis

The Statistical Package for the Social Sciences (SPSS) version 22 was used to analyse quantitative data. Descriptive statistics included frequency tables and measures of central tendency. Inferential statistics were in the form of chi-square analyses, which assessed the

association between major demographic variables (gender, age, education, and income) and vegetable/field crop production, water resources and governance. (Fischer Exact tests were interpreted in cases where the assumptions for chi-square analysis had been violated.) A Bonferroni adjustment was made to prevent a type I error, therefore significance was considered when p <0.013. Qualitative data was analysed using MS Excel, themes for each question were created according to participant's responses and each response was coded accordingly. (In some cases, these themes were further broken down into one or more relevant sub-themes.)

7.3. Results and Discussions

7.3.1. *Irrigation water sources*

Knowledge of sources of irrigation water used in SHAEs was regarded important. Despite the utilisation of both surface and groundwater sources (Qureshi, 2018), the scarcity of the resource continued to adversely affect agricultural production, especially in arid and semi-arid areas (Abdelkhalik et al., 2020). As evident from the survey (Table 7.1), more SHAEs (55.4%) depended on surface water as their main source for irrigation compared to those who relied on groundwater (44.2%). For SHAE who used groundwater, the mean groundwater level was reportedly 42.03 m±18,10 m with a minimum of 10.00 m and a maximum of 90.00 m with 77.9% of them claiming to have conducted pumping tests for their boreholes. The cost of pumping irrigation water has been an important consideration when choosing a water source and tended to be higher for groundwater compared to that for surface water. For groundwater, pumping costs would be lesser for boreholes with water obtained at shallower levels compared to those where water was obtainable from deeper levels.

Although fewer responses were recorded, groundwater tended to be relatively more important in the study area as a complementary source of irrigation water compared to surface water. The 6.5 percent of SHAE who responded on the second complementary source of water gave an impression that there was hardly any significant complementary activities to source water by SHAE.

It was however noted that the activity to complement surface water with groundwater was done by five percent of the SHAE. As posited by Crouch et al. (2020), precedence is provided to human consumption when water gets scarcer in many countries. The 55.4 percent perceived usage of surface water in comparison to the 44.2 usage of groundwater gives an indication of the spatial geo-physical environment and water access in the study area.

Table 7.1. Sources of irrigation water for Smallholder Agricultural Enterprises in Vhembe District, Limpopo Province (Source: Own Survey)

Water source	Frequency	Percent
Source 1 (main source)		
Surface water	163	55.4
Groundwater	130	44.2
Missing (System)	1	.3
Total	**294**	**100.0**
Source 2 (complementary source)		
Surface water	4	1.4
Groundwater	15	5.1
Missing (System)	275	93.5
Total	**294**	**100.0**

Qureshi (2018) stated that surface water management can be improved by introducing small farm-level reservoirs to store rainfall during the high flow seasons for use in low or no flow periods. However, groundwater as a source of irrigation requires both conservation and recharge of the groundwater resources for purposes of sustainable farming (Dhawan, 1991). Conservation and recharge are necessary to prevent rapid declines on aquifer levels as that could have a negative implication for the sustainability of irrigated agriculture (Rouhi Rad, Araya, and Zambreski, 2020).

7.3.2. Quantity of water supplied by the sources

The SHAEs in the area under study tended to be severely constrained regarding access to water, hence knowledge of the quantity supplied has been critical. The quantity of irrigation water supplied reflected the importance of the source for the success of SHAEs (Table 7.2). Surface water was ranked moderate by majority of respondents, both for summer (58.6%) and winter (69.7%) irrigation. Although the study was conducted in a summer rainfall area, the ranking of irrigation water supply from surface water sources remained moderate during this season, a situation that probably reflected the low rainfall status of the area. The retention of moderate ranking in winter was probably due to availability of dams in which water was stored during summer rainfall season and reallocated to the dry winter season with no or very little rainfall (Keller, Sakthivadivel and Seckle, 2000).

The moderate ranking of surface water supply as moderate was corroborated by investigation done by Keller, Sakthivadivel, and Seckle (2000), who reported that water was stored in dams during rainfall seasons (summer in this study) when the economic value of the resource was low and was then reallocated to times (winter) and places when and where its

economic value was high.

As for groundwater, the respondents ranked it very high, both for summer (55.7%) and winter (34.4%) irrigation, with the same number (34.4%) of respondents having also ranked it moderate. Groundwater sources were perceived to be important and seemed to supply more irrigation water than surface water sources. The ranking of groundwater remained very high even by SHAEs (76.5%) who used it as their second (complimentary) source for both summer and winter. Based on the findings of this study, groundwater sources were perceived to be important sources that seemed to supply more irrigation water than surface water sources. This observation seemed in line with Nnaji and Banigo (2018) who, based on AHP method, ranked the water sources in order of preference as: Ground (borehole) better than Surface (water board better than water tankers which in turn is better than streams which was also better than rainwater harvesting). The ranking of groundwater remained very high even by SHAE (76.5%) who used it as their second (complimentary) source for both summer and winter.

Table 7.2. Ranking of quantity of irrigation water supply by sources in Vhembe District, Limpopo Province (Source: Own Survey)

Seasonal water supply ranking	Frequency	Percent
Source 1 (Surface) – Summer		
Very high	24	15.8
High	25	16.4
Moderate	89	58.6
Low	12	7.9
Very low	1	.7
Missing	1	.7
Total	**152**	**100.0**
Source 1 (Surface) – Winter		
Very high	10	6.6
High	10	6.6
Moderate	106	69.7
Low	17	11.2
Very low	8	5.3
Missing	1	.7
Total	**152**	**100.0**
Source 1 (Ground) – Summer		
Very high	68	55.7
High	11	9.0
Moderate	41	33.6
Low	1	.8
Missing	1	.8
Total	**122**	**100.0**
Source 1 (Ground) – Winter		
Very high	42	34.4
High	36	29.5
Moderate	42	34.4
Low	1	.8
Missing	1	.8
Total	**122**	**100.0**

In a study on multi-criteria evaluation of sources for self-help domestic water supply in Nigeria, it was observed that the most important criteria which were found to affect the ranking of water sources for domestic water supply are quality, risk of contamination, sustainability, maintainability, and public acceptance (Nnaji and Banigo, 2018), with most of the criteria also relevant for ranking of water sources for irrigation. Water quality aspects such as salinity and associated problems have been a major challenge for global food production (Minhas et al., 2020). As posited by Minhas et al. (2020), strategies to cope with salinity include a better understanding of the impacts of temporal and spatial dynamics of salinity on soil water balances vis-à-vis evapotranspiration (ET) and devising optimal irrigation schedules and efficient methods.

As stated by Kumarasamy et al. (2014), water quality indicators included physicochemical parameters where sodium absorption ratios (SAR – 0.14 to 9.23 meq L^{-1}), sodium percentage (Na% – 10.15 to 85.38 meq L^{-1}), residual sodium carbonate (RSC – 0.32 to 5.64 meq L^{-1}), potential salinity (PS – 0.5 to 7.1 meq L^{-1}), and permeability index (PI – 12.5 to 89.7 meq L^{-1}) attested to excellent water quality for irrigation. Other than quality issues, smallholder agricultural enterprises in the area under study tended to be severely constrained regarding access to water, hence for them the quantity supplied has been critical. Resultantly, the quantity of irrigation water supplied has reflected the importance of the source for the success of smallholder agricultural enterprises. The water sources in the study area were therefore ranked by the SHAE based on the volumes of irrigation water they supplied to the agricultural enterprises.

7.3.3. Advantages and disadvantages of irrigation water sources in the study area

Comprehensive discussion of the advantages and disadvantages of water sources should consider that the sources tend to be interlinked as opposed to being separate entities. Surface-water bodies often gained water from ground-water systems while also serving as sources of ground-water recharge (Winter et al., 1998). As development of land and water resources increased, it became apparent that development of one water resource affected the other. Nearly all surface-water features (streams, lakes, reservoirs, wetlands, and estuaries) interact with ground water. As part of the interactions, surface-water bodies often gained water and solutes from ground-water systems while surface-water bodies served as sources of ground-water recharge and caused changes in ground-water quality. As a result, withdrawal of water from streams tended to deplete ground water, and conversely, abstraction of groundwater tended to deplete water in streams, lakes, or wetlands (Winter et al., 1998).

In this study surface water as the main source (source 1) was perceived by half (51.3%) of SHAEs to be always available followed by those (36.8%) who considered the source to be located at proximity. The main disadvantages were that surface water as the main source had insufficient water (39.5%) with some respondents (20.4%) bothered by the water quality (Table 3). The finding that surface water was always available as the main source was rather consistent with the earlier ranking (Table 7.2) of supply from the source as moderate by majority of respondents for both summer (58.6%) and winter (69.7%) irrigation. Regarding groundwater (as water source 1), over four in five (83.6%) SHAEs perceived it to have the advantage of being always available. With the supply from groundwater having been ranked very high for both summer (55.7%) and winter (34.4%) irrigation, it would be expected for more SHAEs to have received sufficient water from this source (Table 7.2).

The SHAEs who pump water from a borehole or river can expect to experience relatively higher pumping costs than SHAEs receiving irrigation water from a canal delivery system (Stevens, 2007). Almost two in three (64.9%) respondents experienced higher pumping costs with 53.7% having reported electricity while 11.2% incurred fuel costs for their pumps. The SHAEs using groundwater sources would be among those incurring higher pumping costs as pumping depths in boreholes were reportedly greater (42.03 m±18.10 m). The cost of pumping would also likely be higher for groundwater compared to that for surface water. Sound discussion of the merits and demerits of surface and groundwater sources therefore requires understanding of the linkages between these sources. The perceptions of SHAE in the area under study regarding the advantages and disadvantages of these sources of water probably considered these linkages.

Table 7.3. Advantages and disadvantages of irrigation water sources as perceived in Smallholder Agricultural Enterprises in Vhembe District, Limpopo Province (Source: Own Survey)

Advantages and disadvantages of Source 1 water sources	Source 1 – Surface water		Source 1 – Groundwater	
	Frequency (n=152)	**Percent** *(of participants with surface water as source 1)*	**Frequency** (n=122)	**Percent** *(of participants with groundwater as source 1)*
Advantage				
Always available	78	51.3	102	83.6
Sufficient water	0	0.0	17	13.9
Close proximity	56	36.8	0	0.0
No extra costs involved	11	7.2	0	0.0
Good for irrigation	2	1.3	0	0.0
Missing	5	3.3	3	2.5
Total	**152**	**100.0**	**122**	**100.0**
Disadvantage				
Insufficient water	60	39.5	1	0.8
Not always clean	31	20.4	2	1.6
Expensive	21	13.8	33	27.0
Influenced by drought	12	7.9	0	0.0
Share with other SHAE	11	7.2		0.0
Alkalinity/Saline water	6	3.9	12	9.8
Water source is far away	1	0.7		0.0
Dependent on electricity	0	0.0	23	18.9
Requires maintenance	0	0.0	6	4.9
Missing	10	6.6	45	36.9
Total	**152**	**100.0**	**122**	**100.0**

7.3.4. Irrigation scheduling and competition for water

7.3.4.1. Irrigation scheduling

One in three (33.9%) SHAEs indicated that they irrigated between two and four times a day. Fewer SHAEs (13.6%) irrigated daily with the same number (0.7+1.7+11.2=13.6)

having irrigated once every second to fourth day. One in five (18.7%) SHAEs irrigated once every eight to 14 days (Table 7.4). The mean amount of water used to irrigate was reportedly 5 300.88/ ± 20 762.91/, with a minimum of 35/ and a maximum of 250 000/.

Table 7.4. Irrigation scheduling by Smallholder Agricultural Enterprises in Vhembe District, Limpopo Province (Source: Own Survey)

Irrigation schedule	Frequency	Percent
Two to four times a day	100	33.9
Daily	40	13.6
Every second day	2	.7
Every third day	5	1.7
Every fourth day	33	11.2
Between 8 and 14 days	55	18.7
After 2 weeks	15	5.1
When required	4	1.4
I do not record	1	.3
Not specified	39	13.3
Total	**294**	**100.0**

Efficient use of irrigation water requires proper scheduling informed by variables that include rainfall, temperature, and accompanying evapotranspiration (ET). Estimation of reference evapotranspiration (ET_o) is one of the most influential factors in proper irrigation scheduling (Rahimikhoob, Sohrabi, and Delshad, 2020). Proper irrigation scheduling prolongs irrigation capability (Levidow et al., 2014) and is an important initiative for improving crop production (Crouch et al., 2020). Effective scheduling of irrigation is associated with increased crop water productivity (CWP), a measure of crop yield per unit of water consumed (Anupoju and Kambhammettu, 2020). With the area under study described as water scarce, the essence of increased CWP cannot be over-emphasized (Abdelkhalik, Pascual, and Nájera, 2020).

With the SHAEs being generally resource poor, it would be expected for their irrigation scheduling to be based on intuition. The SHAEs would not afford equipment for soil/crop moisture measurement necessary to determine when to irrigate and how much water to apply in each cycle (Bennett, Harms, and Entz, 2014). Accordingly, some crops were probably over-irrigated (especially with the case of multiple irrigation per day) while others were under-irrigated (especially where irrigation was applied once in weeks). Over-irrigation would have resulted in reduced CWP (Greaves and Wang, 2017), mainly because of lack of increase in

crop yield with increased irrigation beyond a certain level of water supply, but also because of prospects of water logging and disease infections associated with wet conditions. Under-irrigation would have resulted in plant water stress associated with closing of stomata, reduced exchange of CO_2 and O_2, reduced photosynthesis, and declined crop yield.

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7.3.4.2. Competition for water use

Table 7.5 shows the competition for irrigation water experienced by SHAEs in Vhembe District. One in three (33.7%) SHAEs in the study area reported that they were the only users of water from their source. Approximately two in three (62.6%) SHAEs experienced some competition for water, and those were comprised of one in six (16.7%) who competed with other SHAEs and 45.9% who competed with other sectors. Despite the experience of competition for water by majority (62.6%) of SHAEs, about 43.8% of respondents reported that the situation did not result in conflicts in their case.

Table 7.5. Competition for irrigation water experienced by SHAEs in Vhembe District, Limpopo Province (Source: Own Survey)

Competition for water use	Frequency	Percent
I am the only user from the source	99	33.7
I, together with other SHAEs use water from this source	49	16.7
SHAEs and other sectors use water from this source	135	45.9
Missing	11	3.7
Total	**294**	**100.0**

Competition for water use, where it occurs, may at times be so severe that it may even result in conflicts among irrigation SHAE, especially in areas experiencing a decline in the supply of water. The relationship between climate change, water scarcity, and conflict is still debated. Much of the existing work relating resource scarcity to conflict has involved regional-scale analysis linking instances of violent outbreaks to environmental conditions.

A study conducted in Zambia on farmer perceptions of conflicts related to competition for resources such as water revealed that three in four (75%) respondents perceived conflict

as misunderstandings or disagreements between people, up to 91% of them had experienced past conflicts, 70% expected to experience future conflicts, while 58% expected to experience future physical violent conflicts (Marcantonio et al., 2018). As was observed on the study, a significant relationship occurred between perceptions of future rainfall decreasing and future physical violent conflict.

Competition for water and its associated conflicts was probably more severe during periods of drought when water supply was scarcer. Type of water source used highly influenced SHAE' perceptions of drought and the type of strategies implemented to mitigate it. For both surface and groundwater-based irrigation areas, local responses often required close cooperation among users, as the responses might involve redistributing the available resources, sharing extra costs, or combining water from different sources to achieve the desired water quality (Urquijo and De Stefano, 2016). Some farmer perceptions on drought were observed in a study conducted by Udmale et al. (2014) in the Maharashtra State of India. Environmental impacts such as increases in average atmospheric temperature, pasture-forest degradation, reduced supplies surface and depletion of groundwater were perceived to be devastating impacts of drought.

As revealed by the study, decreases in yield of cereals and horticultural crops, declines in livestock production and subsequent loss of employment were regarded among the major impacts of drought. Social impacts such as conflicts emanating from competition for water were also emphasised. With competition for irrigation water exacerbated by droughts probably being an issue in the study area (Table 7.5), effective strategies are necessary for managing irrigation water.

Table 7.6. Level of education and monthly income of head of household by main source of irrigation water used by smallholder SHAE in Mutale Local Municipality of Vhembe District. Limpopo Province

Demographic factor of association with main source of irrigation water	Chi-square value	df	Asymp. Sig. (2-sided)
Level of education of household head	2.867[a]	3	.413
Monthly income of household	7.099[a]	1	.008

7.3.5. Associations between demographic factors and main source of water for irrigation

Among the demographic factors regarded important were the level of education of household head (Dagada et al*.,* 2013; Tompson, 2008), and monthly income of the household (Maele et al., 2020) were regarded important and were hence selected for analysis. The role of education in farming decision making inclusive of irrigation water management cannot be

overemphasised. According to Dagada et al. (2013), human development is influenced by the level of education. Improvement of human resource capacity is essential to meet the challenges of agricultural production and food security. More years of schooling are associated with higher rates of adoption of new technologies (Tompson, 2008). With heads of household being major decision makers in their families, it was therefore deemed important to assess the association between their level of education and the main sources of irrigation water used by the smallholder irrigation SHAE in the study area. (Table 7.6). The results of the chi-square test revealed that there was no statistically significant association between the main source of irrigation water and the education level of household heads ($\chi 2(3) = 2.867$, $p = 0.413$). In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size ($\varphi = 0.10$, $p = 0.413$).

It was determined that 51.3% of the participants with less than R5000 a month indicated surface water as their main source for irrigation compared to 69.6% of participants with a monthly income of more than R5000. However, for monthly income the results of the chi-square test, showed that there was a statistically significant association between the main water source for irrigation and monthly income ($\chi 2\ (1) = 7.10$, $p < 0.013$) after a Bonferroni adjustment. Although there is a statistically significant association the effect size showed a weak association (Cohen, 1988) as measured by the Phi measure of effect size ($\varphi = 0.156$, $p = 0.008$).

7.4. Conclusion

Based on the results of the study, the following conclusions could be drawn: (a) although surface water was generally perceived as the most used (55.4%), groundwater (used by 44.2% of SHAEs) was also an important source of irrigation water; (b) groundwater was regarded to have better supply quantity compared to surface water while also being always available; (c) irrigation scheduling was generally based on intuition and practices of rotation without being backed by science based information; (d) competition for irrigation water seemed to be an issue although not yet at the level of causing major conflicts among the SHAEs; and (f) statistically significant association was only for the main source of irrigation water and household monthly income where households with more incomes tended to use more surface water sources compared to groundwater sources.

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CHAPTER 8

DEMOGRAPHY OF SMALLHOLDER AGRICULTURAL WOMEN AND YOUTH ENTRPRISES AND THEIR ASSOCIATION WITH THE CULTIVATION OF SELECTED VEGETABLE CROP

Personal characteristics of farmers such as gender, age, and health status have some influence on farming decision making and indeed the profitability of a farming enterprise. In a society, there is inequity among different groups (Malakar and Misha, 2017), populations belonging to different gender, age, education, and income levels groups. This also includes groups differentiated by castes, disability, economic, and employment status. Groups who belong to lower castes, the old aged, disabled, illiterates, poor health condition and unemployed are assumed to be the weaker sections of the society who either have less access to resources or restricted by their physical incapability. These populations differentiation impacts on agricultural productivity in a variety of ways.

Gender analysis done from most African countries, indicated that women were generally playing a major role in the agricultural sector (Asuamah, 1993). Same was reported on the profile of agricultural activities which were dominated by women across the commodity groups (Ugwumba & Lamidi, 2011; Ukwuaba & Inoni, 2012). However, the finding by Bembridge and Tshikolomo (1998) showed that the majority owners (90%) of agricultural projects in the Phaswana area of the Limpopo Province were males. They further stated that gender has influence on decision making with males responsible for major while females were responsible for relatively minor decisions. Females would reportedly dominate decisions on production activities and related technology adoption and efficient use of production resources (Echebiri, Igwe, & Okwun, 2006). Maele et al. (2015) in her study of youth agricultural projects indicated that of the 50 youth agricultural projects sampled for her study, about three in four (74%) were male owned, and hence men were majority at ownership level. From a policy perspective the South African democratic government promotes women empowerment and their equal participation in socio-economic activities and hence strategies should be sought for their increased participation agricultural projects.

A study done by Dagada, Nesamvuni, Van Rooyen, and Tshikolomo (2013) revealed that age plays an important role in the life of a person and determines how an individual behaves. The view of Dagada et al. (2013) affirmed Bembridge, Graven, Hough, and Van Rooyen (2008) who indicated that age has an influence on decision making and the physical ability of individuals. Maele et al. (2015) reported that a majority (45%) of youth owners of agricultural projects were 26-30 years of age, two in five (40%) were 18-25 while only 15% fell under the 31-35 age category. As was thought for gender, the age of smallholder farmers could have some influence on their decision making on farming issues in general and on

irrigation water resource management. According to Dagada et al. (2013), human development is influenced by the level of education.

Improvement of human resource capacity is essential to meet the challenges of agricultural production and food security. More years of schooling are associated with higher rates of adoption of new technologies (Olaiton, 1984; Tompson, 2008). In the work done by Maele et al. (2015), only 10% of the youth owners of agricultural projects had tertiary education.

The youths with only primary education together with those who did not even disclose their educational status were about three in five (60%) and were the majority. The youths with only primary education would at best possess very basic literacy skills and would not easily access print agricultural and other information, especially that in languages other than their mother tongue. The youths with low levels of education would also lack numeracy skills and would therefore not be able to determine whether their agricultural businesses are making profit or not. The prospects for access to information and for success in the agricultural business would likely be higher for the 10% of the youths who attained tertiary education. Approximately 67% of individuals with tertiary education qualifications complained that they were under-utilized by the youth agricultural projects. Some 15% of the youths with tertiary education reportedly took interim responsibilities in agricultural projects while they sought for preferred jobs aligned to their qualifications. The role of education in farming decision making inclusive of irrigation water management cannot be overemphasized.

Household income is a strong determinant of the access and use of agricultural resources (Tshikolomo et al., 2012) and subsequently of agricultural productivity. It was argued for instance, that people could be water poor not because there is no water in their area but because they are income poor. In other words, despite water being available within their area, people may fail to access it because they cannot afford the cost of doing so (Dungumaro, 2007). The success of any agribusiness enterprise is highly influenced by finance as this determines the enterprise's ability to access important resources such as water.

As affirmed by Steiner and Solem (1988), a successful farmer is someone likely to have access to adequate financial services and competitive advantage. From the above assertion, it may be inferred that the level of household income is a strong determinant of success in crop farming, and this may be a result of improved access to production inputs, including irrigation water. For households with low incomes, the costs of inputs may impede adoption of new technologies (Hassan and Karanja, 1997; Mazuze, 2004). This was affirmed by Diale (2011) who revealed that hybrid seed was more costly for low-income farmers to procure and transport compared to open pollinated varieties. According to the findings by Hassan and Karanja (1997) and by Mazuze (2004), farming households at Manthlane

Irrigation Scheme would better afford technologies and production inputs and would likely be more successful farmers.

SECTION 1: DEMOGRAPHY OF SMALLHOLDER AGRICULTURAL WOMEN AND YOUTH ENTERPRISES AND THEIR ASSOCIATION WITH THE CULTIVATION OF THE TOMATO (*SOLANUM LYCOPERSICUM*) VEGETABLE CROP

Abstract. The study was conducted at Madimbo corridor and upper Mutale valley smallholder irrigation schemes. The purpose of the study was to characterize smallholder agricultural women and youth entrepreneurs (SHAW-YE) with the objective to develop and facilitate policy instruments for sustainable agricultural businesses. A semi-structured household questionnaire together with facilitation was used to carry out the survey on a sample, purposively focusing on Smallholder Agriculture Women and Youth Enterprises (SHAW-YE). Sample was comprised of 294 respondents (N=294) with sub-samples of respondents selected through gender category, age category, and gender by age category. The Statistical Package for the Social Sciences (SPSS) version 22 was used to analyse quantitative data. Descriptive statistics included frequency tables and measures of central tendency. Inferential statistics were in the form of chi-square analyses, which assessed the association between major demographic variables (gender, age, education, and income) and vegetable/field crop production, water resources and governance. Fischer Exact tests were interpreted in cases where the assumptions for chi-square analysis had been violated. A Bonferroni adjustment was made to prevent a type I error; therefore, significance was considered when $p < 0.013$. The study revealed that the SHAW-YE are characterized by small land areas under cultivation. Policy efforts to promote women and youth are bearing fruits measured by participation of women with 48.4% compared to 20% of men in winter production of tomato. The numbers for summer revealed that women were participating at 9.7% compared with 13.3% for men. The participation of SHAW-YE round the ages of 36-59-year was at 52.9% while that for ages >60-year was at 51.5%. This indicated in the main the level of experience that the SHAW-YE may have in the production of tomatoes compared to 29.6% of 18-35-year participants. Farmer Field schools and other partnership models should be promoted by government for transfer of skills from experienced farmers to youth. In return youth farmers should help transfer technology and information to older farmers. Farmers should also be provided with content related education through extension agents and other appropriate means. About 61.7% SHAW-YE were at the level of Adult Basic Education & Training (ABET) indicating low level of education for most women farmers. Government should enhance skills training on-farm to SHAW-YE to complement the farmers experience with cultivation of tomatoes. About 45.8% of the SHAW-YE earned less than R5000.00 compared with 50.7% earning more than

R5000.00. Market channels and access should be promoted for SHAW-YE to enable throughput of tomatoes to not only informal but also fresh produce and retail markets.

8.1. Introduction

The tomato (Solanum lycopersicum) is the second most important and popular vegetable crop after potatoes in South Africa. South Africa is the dominant producer in the Southern African Development Community (SADC) region, growing 54% of tomatoes on 11% of the total cropped area. Despite ranking 35th in the world based on total tonnage in 2011, South Africa remains a major regional tomato producer in Sub-Saharan Africa. The crop is produced in all South African provinces, but Limpopo Province with its warm climate is best suited for production of tomatoes. Limpopo Province is the major production area with 3 590 ha (Northern Lowveld at 2 700 ha and far Northern areas of Limpopo at 890 ha). The province account for more than 75% of the total area planted with tomatoes in South Africa (DAFF, 2017). The other main producing areas are Onderberg area of Mpumalanga province at 770 ha and Border area of Eastern Cape province at 450 ha. Production is very limited in the winter months and tomatoes can only be produced in frost-free areas during winter or under protection by structures such as tunnels (DAFF, 2017).

Tomato contributed approximately 18.3% to the gross value of vegetable production in 2015. Tomato is consumed in a variety of ways including raw, as an ingredient in many dishes and sauces and in drinks. Tomatoes are a rich source of vitamins A and C and folic acid. In South Africa tomatoes are used in stews to complement the staple diet of maize meal. As a result, it is also one of the main vegetables used for hawking by small-scale entrepreneurs in the informal sector. Tomato as a commodity has a mature market system enabling SHAW-YE to produce for formal markets mainly fresh produce, processing, and retail shops. The demand for the crop and favourable price lends itself as an economically sustainable crop for SHAW-YE especially women and youth in the informal markets as well.

There are about 695 producers of tomatoes in both commercial and emerging sectors in Limpopo, South Africa. It is not only cultivated commercially, but also grown by back yard gardeners, subsistence, smallholder farmers in irrigation schemes inclusive of women and youth. Out of the eight most produced irrigated vegetable crops by SHAW-YE, tomato ranked first with 46.9% followed by okra (44.6%), butternut (14.3%), spinach (10.9%), green paper (7.1%), cabbage (6.8%) and onion (5.8%). The commercial sector contributes 95% of the total produce while the emerging sector contributes only five percent. Of the five percent production produced by the emerging group the majority are women who constitute 80% of the SHAW-YE in the rural areas who are part of the informal value chain from low-cost production to

informal markets at farm gate, hawkers, and street vendors (Statistics South Africa: 2002). A growing number of medium to commercial smallholder entrepreneurs produce to supply fresh produce and processing facilities. The SHAW-YE produce tomato on average plots of 3.71 ha per entrepreneur under irrigation which is the highest of all the vegetable crops. In the context that 89% of the population of Limpopo Province is classified as rural, the smallholder sector through tomato production plays a major role in the economic development of rural areas of the province (Nesamvuni et al., 2003). Job creation and employments are already a challenge for South Africa and all developing countries.

The World Bank reports (World Bank, 2015) indicated that approximately 75 million youth are unemployed worldwide and the International Labour Organization (ILO) (ILO, 2016) also projected a growth in unemployment of about 1 million people in the developing world by 2021. There is therefore a consensus to the fact that the neglect of the SHAW-YE, which constitute mostly women and youth in the rural areas would only render their social and economic conditions worse resulting in rural-urban mass migration. Socio-economic factors continue to play a critical role in determining the levels of production undertaken and the sort of crops planted. This was corroborated by von Braun and Mirzabaev (2015) who stated that the production levels are not the only areas affected but also the way business enterprises are managed which put the socio-economic characteristics of the smallholder farmers and entrepreneurs into focus. Previous studies (Mwaniki, 2006; Kyei et al., 2011; Abdul-kareem and Isgin, 2016; Abdulai et al., 2013; Asante et al., 2013; Onumah et al., 2013) have resolved that if assistance is to be extended to crop producers their demography is worth investigating to fully comprehend their needs.

The relationship between demography and socio-economic factors will be described in this study to produce appropriate policy information to agricultural stakeholders and government. In developing women and youth agricultural entrepreneurs producing tomatoes there is lack of knowledge on the contribution of the crop to women and youth livelihood and incomes in rural South Africa. The main objective of this study was therefore to assess the demography of SHAW-YE and the association with cultivation of tomatoes under irrigation.

8.2. Methodology

8.2.1. Study Area

The study was carried out in Vhembe District Municipality of Limpopo Province, South Africa. The specific areas were Madimbo Corridor in Musina and Mutale Valley in Thulamela Local Municipality. The SHAW-YE in the two areas were categorized as independent

enterprises each with a private water supply in the case of Madimbo and as irrigated smallholders which are served by communal water supply infrastructure in the case of Mutale. The two areas of Madimbo corridor and upper Mutale valley irrigation schemes constitute a total of more than 2270 ha of production area.

8.2.2. Sampling Procedure

Stratified random sampling was used to obtain a representative sample of villages and households for interview (Leedy et al., 2005) with target population being SHAW-YE's. A two-stage random sampling process was conducted using SURVEYSELECT procedure of SAS. The PROC SURVEYSELECT allowed for probability-based random sampling where sampling in a category or class depended on the number of units within that class. The sampling was regarded appropriate for handling selection bias.

8.2.3. Data Collection

A semi structured household questionnaire was used to carry out a survey with an emphasis on SHAW-YE. Total number of SHAW-YE interviewed were two hundred and ninety-four (N=294) with a response rate of 75 percent. The sample was comprised of 71 youths aged 18 to 35 years old (56 females and 15 males) and 223 women of whom 153 were adults (36-59 years) and 70 pensioners (≥ 60 years old).

8.2.4. Data analysis

The Statistical Package for the Social Sciences (SPSS) version 22 was used to analyse quantitative data. Descriptive statistics included frequency tables and measures of central tendency. Inferential statistics were in the form of chi-square analyses, which assessed the association between major demographic variables (gender, age, education, and income) and vegetable/field crop production, water resources and governance. (Fischer Exact tests were interpreted in cases where the assumptions for chi-square analysis had been violated). A Bonferroni adjustment was made to prevent a type I error; therefore, significance was considered when $p < 0.013$. Qualitative data was analysed using MS Excel, themes for each question were created according to participant's responses and each response was coded accordingly. (In some cases, these themes were further broken down into one or more relevant sub-themes.)

8.3. Results and Discussions

8.3.1. The production potential of tomato crop by smallholder agricultural women and youth enterprises

The average area of production under irrigation was 3.71 ha per farmer. The production area in summer was 0.59 ha bigger than in winter. The production potential, however, was higher in winter with up to 30 000 crates (750 000 kg) (from what area of land) whereas in winter/summer the production was just up to 1000 crates (25 000 kg/ha). The average price earned for the production was R150/crate (25 kg).

8.3.2. The association between cultivating tomato and gender

A chi-square test for association was conducted between cultivating tomatoes and gender in winter and summer (Table 8.1). It is necessary to establish the differences in the roles played by males and females in farm households since this gender differences are likely to influence their capacity to adapt to climate change as well as their choices of climate change adaptation strategies (IFPRI, 2009).

In determining the association between cultivating tomato and gender, it should be noted that a Bonferroni correction was made due to multiple comparisons with the same dependent variable, this correction decreases the possibility of making a type I error. Therefore, the significant value of 0.05 was adjusted to 0.013 (0.05/4). This level of significance was too steep for the effects of the demographic traits to be significance.

Focusing in the winter season all the expected cell frequencies were greater than five, therefore the assumption was not violated. After a Bonferroni adjustment there was not a statistically significant association between cultivating tomatoes and gender, $\chi 2 = 4{,}606$, $p = 0.032$. However, it was determined that 20.0% of males cultivated tomatoes compared to 48.4% females (Table 8.1). In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, $\varphi = 0.125$, $p = 0.032$. In summer not all the expected cell frequencies were greater than five, therefore the assumption was violated, and the Fischer Exact test conducted. The Fischer Exact test showed that there was not a statistically significant association between cultivating tomato and gender, $p = 0.649$. It was determined that 13.3% males cultivated tomatoes compared to 9,7% females. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, $\varphi = 0.27$, $p = 0.644$.

Table 8.1. Association between gender of Smallholder Agricultural Women and Youth Entrepreneur and seasonal cultivation of tomato crop in Vhembe District of Limpopo Province, South Africa

GENDER	VARIABLE	WINTER SEASON		SUMMER SEASON	
		NO	YES	NO	YES
MALE	Count	12	3	13	2
	Expected Count	8.0	7.0	13.5	1.5
	% within Gender of the respondent	80.0%	20.0%	86.7%	13.3%
	% within seasons crop: Tomatoes	7.7%	2.2%	4.9%	6.9%
	% of Total	4.1%	1.0%	4.4%	.7%
FEMALE	Count	144	135	252	27
	Expected Count	148.0	131.0	251.5	27.5
	% within Gender of the respondent	51.6%	48.4%	90.3%	9.7%
	% within seasons crop: Tomatoes	92.3%	97.8%	95.1%	93.1%
	% of Total	49.0%	45.9%	85.7%	9.2%
TOTAL	Count	156	138	265	29
	Expected Count	156.0	138.0	265.0	29.0
	% within Gender of the respondent	53.1%	46.9%	90.1%	9.9%
	% within seasons crop: Tomatoes	100.0%	100.0%	100.0%	100.0%
	% of Total	53.1%	46.9%	90.1%	9.9%
		$\chi2 = 4,606$, $p = 0.032$		Not Significant	

Though there were seasonal differences found in this study, males were still participating more in producing tomato. Similar observations were made in a study of youth agricultural projects in Limpopo Province, Maele et al. (2015) revealed that majority of farmers (74%) were male. The finding that men were majority owners of agricultural projects was also affirmed by Bembridge and Tshikolomo (1998) who revealed that 90% of fruit growers in the Phaswana area of the Limpopo Province were males. Despite the effort of the democratic government to promote women empowerment and their equal participation in socio-economic activities (Maele et al., 2015), men still constituted the majority in agricultural projects, further affirming the dominance of men in farming.

8.3.3. The association between cultivating tomato and age

A chi-square test for association was conducted between cultivating tomatoes and age as indicated in Table 8.2. In the current study, and for the winter season, the results indicated that all expected cell frequencies were greater than five, which met the requirement for chi-square test. After a Bonferroni adjustment there was a statistically significant association between cultivating tomato and age, $\chi2 = 11.367$, $p = 0.003$. It was determined that 29.6% of

18-35-year participants cultivate tomato compared to 52.9% and 51.5% of 36-59-year participants and >60 years participants respectively. Although there is a statistical association the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, φ = 0.197, p = 0,003. When we compare with results for the summer season all the expected cell frequencies were greater than five, therefore the assumption was also not violated. There was not a statistically significant association between cultivating tomato and age, $\chi 2 = 1.886$, p = 0.390.

Table 8.2. Association between age of Smallholder Agricultural Women and Youth Entrepreneur and seasonal cultivation of tomato crop in Vhembe District of Limpopo Province, South Africa

AGE (YEARS)	VARIABLE	WINTER SEASON		SUMMER SEASON	
		NO	YES	NO	YES
18-35	Count	50	21	61	10
	Expected Count	37.7	33.3	64.0	7.0
	% within Gender of the respondent	70.4%	29.6%	85.9%	14.1%
	% within seasons crop: Tomatoes	32.1%	15.2%	23.0%	34.5%
	% of Total	17.0%	7.1%	20.7%	3.4%
36-59	Count	73	82	142	13
	Expected Count	82.2	72.8	139.7	15.3
	% within Gender of the respondent	47.1%	52.9%	91.6%	8.4%
	% within seasons crop: Tomatoes	46.8%	59.4%	53.6%	44.8%
	% of Total	24.8%	27.9%	48.3%	4.4%
>60	Count	33	35	62	6
	Expected Count	36.1	31.9	61.3	6.7
	% within Gender of the respondent	48.5%	51.5%	91.2%	8.8%
	% within seasons crop: Tomatoes	21.2%	25.4%	23.4%	20.7%
	% of Total	11.2%	11.9%	21.1%	2.0%
TOTAL	Count	156	138	265	29
	Expected Count	156.0	138.0	265.0	29.0
	% within Gender of the respondent	53.1%	46.9%	90.1%	9.9%
	% within seasons crop: Tomatoes	100.0%	100.0%	100.0%	100.0%
	% of Total	53.1%	46.9%	90.1%	9.9%
		$\chi 2 = 11.367$, p = 0.003		$\chi 2 = 1.886$, p = 0.390	

It was determined that 14.1% of 18-35-year participants cultivated tomatoes compared to 8.4% of 36-59-year participants and 8.8% of >60-year participants. Similar, there was not a statistically significant result, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, φ = 0.080, p = 0.390. The results confirmed the findings by Mulinya (2017) who reported that farmers within the ages of 30-34 years are likely

to understand well the issues involved in farming and therefore are armed with necessary information regarding climate change adaptation strategies that can be well achieved and adhered to. In the main the results showing 52.9% and 51.5% of 36-59-year participants and >60 years participants agreed with the observation by Simotwo et al. (2018) who revealed that farmers were aging. However, Fussel and Klein (2006), in the contrary also reported that older farmers could be resistant to change and thus may not see the need of employing new technologies and would prefer the traditional models of farming that they are familiar with other than adopting new methods.

Farm productivity has been shown to deteriorate with the farmers' age, especially among the smallholders who largely rely on their own physical labour to execute many farming responsibilities (Uddin et al., 2014). Hassan & Nhemachena (2008) in determining farmers‟ strategies for adapting to climate change reveals that for farmer's age, in particular older farmers were more experienced and expect older farmers to adapt to climate change better than farmers whose age are lesser. However, they also assumed younger farmers to have a longer planning horizon and to take up long term measures that will influence their decision to increase production levels.

8.3.4. The association between cultivating tomato and education

A chi-square test for association was conducted between cultivating tomato and household head education as shown in Table 8.3. The importance of education in successful developmental activities such as farming cannot be overemphasized. The level of education has a strong influence on the extent to which a farmer can access new information and technology, not only through improved literacy that enables the farmers to access written information, but also through the increased ability to search for information using modern information technologies. Citing Appleton and Balihuta (1996), Oduro-Ofori et al. (2014) described the effect of education on agricultural productivity as cognitive and non-cognitive. Cognitive effects reportedly emphasize basic literacy and numeracy that farmers achieve from education while non-cognitive effects emphasize the change in the attitude of farmers who attended school due to improved discipline introduced by formal schooling. Better education may therefore be associated with the improved adaptive capacity to adverse effects of climate change and variability. In this after compliance with the Chi-square test and Bonferroni adjustment for the winter season; there was a statistically significant association between cultivating tomato and household head education, $\chi 2 = 12.399$, $p = 0.006$. It was determined that 34.4% of participants whose household head had no, or only primary school education cultivated tomato, while 47.4% and 36.4% of participants with household head education levels of secondary and tertiary level education cultivated tomato respectively compared to the 61.7% of participants with household head education of ABET.

Table 8.3. Association between education of Smallholder Agricultural Women and Youth Entrepreneur and seasonal cultivation of tomato crop in Vhembe District of Limpopo Province, South Africa.

EDUCATION	VARIABLE	WINTER SEASON		SUMMER SEASON	
		NO	YES	NO	YES
PRIMARY	Count	40	21	54	7
	Expected Count	32,1	28.9	54.9	6.1
	% within Gender of the respondent	65.6%	34.4%	88.5%	11.5%
	% within season crop: Tomatoes	26.1%	15.2%	20.6%	24.1%
	% of Total	13.7%	7.2%	18.6%	2.4%
SECONDARY	Count	61	55	107	9
	Expected Count	61.0	55.0	104.4	11.6
	% within Gender of the respondent	52.6%	47.4%	92.2%	7.8%
	% within seasons crop: Tomatoes	39.9%	39.9%	40.8%	31.0%
	% of Total	21.0%	18.9%	36.8%	3.1%
TERTIARY	Count	21	12	29	4
	Expected Count	17.4	15.6	29.7	3.3
	% within Gender of the respondent	63.6%	36.4%	87.9%	12.1%
	% within season crop: Tomatoes	13.7%	8.7%	11.1%	13.8%
	% of Total	7.2%	4.1%	10.0%	1.4%
ABET	Count	31	50	72	9
	Expected Count	42.6	38.4	72.9	8.1
	% within Gender of the respondent	38.3%	61.7%	88.9%	11.1%
	% within season crop: Tomatoes	20.3%	36.2%	27.5%	31.0%
	% of Total	10.7%	17.2%	24.7%	3.1%
TOTAL	Count	153	138	262	29
	Expected Count	153.0	138.0	262.0	29.0
	% within Gender of the respondent	52.6%	47.4%	90.0%	10.0%
	% within season crop: Tomatoes	100.0%	100.0%	100.0%	100.0%
	% of Total	52.6%	47.4%	90.0%	10.0%

Although there is a statistical association the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, $\varphi = 0.206$, $p = 0.006$. For the Chi-square test in summer the results showed at least 80% of the expected cell frequencies that were greater than five, therefore the assumption was not violated. There was not a statistically significant association between cultivating tomato and household head education, $\chi 2 = 1,074$, $p = 0.783$. It was determined that 11,5% of participants whose head of household only had no/primary school education cultivated tomato while 7,8% of participants with household head with secondary education cultivated tomato and 12,1% and 11,1% of participants with household heads with tertiary education and ABET respectively cultivated tomato. Also, the effect size showed a weak association (Cohen, 1988), as measured by the

Phi measure of effect size, φ = 0.061, p = 0.783. From this study it can be resolved that reading and writing are basic conditions for farmers to have the ability to access information available in written and electronic media and to use that information for the exercise of their citizenship, thus creating conditions for adaptation to climate change (O'Brien et al., 2004a).

8.3.5. The association between cultivating tomatoes and income

A chi-square test for association was conducted between cultivating tomato and monthly income (Table 8.4). Literature is explicit about the five pillars of livelihood which includes financial capital (stocks of money or assets in liquid form), natural capital (land, water, and biological resources), social capital rights or claim derived from group membership, physical capital (infrastructure, resources created through economic production), and human capital (Ijatuyi et al., 2017). High income households can afford their needs much more than low-income households.

According to Nouman et al. (2013), household income is also one of the determinants of the amount of credit that can be borrowed by the farmers. High income of farming households can therefore not only better afford needs such as production inputs and other production factors but would also easily qualify for credit to procure the assets that would otherwise not be affordable. In this study the results for the winter season showed that all the expected cell frequencies were greater than five, therefore the assumption was not violated (Table 8.4). There was not a statistically significant association between cultivating tomato and monthly income, $\chi 2 = 0.519$, $p = 0.471$. It was determined that 45.8% of participants earning < R5000 a month cultivated tomatoes, compared to 50.7% of those earning > R5000 a month. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, $\varphi = 0.042$, $p = 0.471$.

For the summer season comparison, the chi-square test for association was conducted between cultivating tomato and monthly income. All the expected cell frequencies were greater than five, therefore the assumption was not violated. There was a statistically significant association between cultivating tomatoes and monthly income, $\chi 2 = 8{,}171$, $p = 0.004$.

Table 8.4. Association between monthly income of Smallholder Agricultural Women and Youth Entrepreneur and seasonal cultivation of tomato crop in Vhembe District

INCOME	VARIABLE	WINTER		SUMMER	
		NO	YES	NO	YES
< 5000	Count	122	103	209	16
	Expected Count	119.4	105.6	202.8	22.2
	% within Gender of the respondent	54.2%	45.8%	92.9%	7.1%
	% within season crop: Tomatoes	78.2%	74.6%	78.9%	55.2%
	% of Total	41.5%	35.0%	71.1%	5.4%
>5000	Count	34	35	56	13
	Expected Count	36.6	32.4	62.2	6.8
	% within Gender of the respondent	49.3%	50.7%	81.2%	18.8%
	% within seasons crop: Tomatoes	21.8%	25.4%	21.1%	44.8%
	% of Total	11.6%	11.9%	19.0%	4.4%
TOTAL	Count	156	138	265	29
	Expected Count	156.0	138.0	265.0	29.0
	% within Gender of the respondent	53.1%	46.9%	90.1%	9.9%
	% within season crop: Tomatoes	100.0%	100.0%	100.0%	100.0%
	% of Total	53.1%	46.9%	90.1%	9.9%
		$\chi 2 = 0.519$, $p = 0.471$		$\chi 2 = 8{,}171$, $p = 0.004$	

It was determined that 7,1% of participants earning < R5000 a month cultivated tomato, compared to 18,8% of those earning > R5000 a month. Although the association was significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, $\varphi = 0.167$, $p = 0.004$. Based on the results it can be concluded that high income farming households **will be better adapted to adverse effects of climate change and seasonal variability** when compared to their low-income counterparts. Farmers with higher incomes are likely to embrace and will be interested in adapting by changing practice and modern methods such as irrigation to cope with the changing climate (Gbetibou, 2009).

8.4. Conclusion

The results of the study indicate some imperative conclusions about the demographic profile of the Smallholder Agricultural Women and Youth Enterprises and their association with the production of tomato. The study revealed that gender, age, education, and income seem to have an influence on the production of tomato in the Madimbo Corridor in Musina and Mutale Valley in Thulamela Local Municipality. The study revealed that the SHAW-YE are

characterized by small land areas under cultivation. Policy efforts to promote women and youth are bearing fruits measured by participation of women with 48.4% compared to 20% of men in winter production of tomato was not statistically significant. Though the numbers for summer indicated that fewer (9.7%) women were participating compared with 13.3% of men. The participation of SHAW-YE round the ages of 36-59-year at 52.9% and >60-year at 51.5% indicates in the main the level of experience that the SHAW-YE may have in the production of tomato compared to 29.6% of 18-35-year participants. Farmer Field schools and other partnership models should be promoted by government for transfer of skills from experienced farmers to youth. In return youth farmers should help transfer technology and information to older farmers.

Farmers should also be provided with content related education through extension agents and other appropriate means. About 61.7% SHAW-YE were at the level of Adult Basic Education & Training (ABET) indicating low level of education for most women farmers. Government should enhance skills training on-farm to SHAW-YE to complement the farmers experience with cultivation of tomatoes. About 45.8% of the SHAW-YE earned less than R5000.00 compared with 50.7% earning more than R5000.00. Markets channels and access should be promoted for SHAW-YE to enable throughput of tomato to not only informal but also fresh produce and retail markets.

SECTION 2: DEMOGRAPHY OF SHAW-YE AND THEIR ASSOCIATION WITH THE CULTIVATION OF THE OKRA ((ABELMOSCHUS ESCULENTUS L. MOENCH) VEGETABLE CROP

Abstract. The study was conducted at Madimbo corridor and upper Mutale valley smallholder irrigation schemes. The purpose of the study was to characterize women and youth smallholder irrigation scheme entrepreneurs (SHAW-YE) with the objective to develop and facilitate policy instruments for sustainable agricultural businesses. A structured household questionnaire together with facilitation was used to carry out survey on a sample, purposively focusing on Smallholder Agricultural Women and Youth Enterprises (SHAW-YE). Total sample was comprised of 294 respondents (N=294) selected through general category, gender category and gender by age category. The Statistical Package for the Social Sciences (SPSS) version 22 was used to analyse quantitative data. Descriptive statistics included frequency tables and measures of central tendency. Inferential statistics were in the form of chi-square analyses, which assessed the association between major demographic variables (gender, age, education, and income) and vegetable/field crop production, water resources and governance. Fischer Exact tests were interpreted in cases where the assumptions for chi-

square analysis had been violated. A Bonferroni adjustment was made to prevent a type I error; therefore, significance was considered when p <0.013.

The results of the study indicate some imperative conclusions about the demographic profile of the Smallholder Agricultural Enterprises and their association with the production of Okra. The study revealed that gender, age, education, and income seem to have an influence on the production of Okra in the Madimbo Corridor in Musina and Mutale Valley in Thulamela Local Municipality. However, there was no statistical significance and there was weak association between the demography and production of Okra. The study revealed that the SHAW-YE producing Okra are characterized by small land areas under cultivation. The increased participation of SHAW-YE around the ages of 18-35-year gave a trend suggesting that youth were the dominant participants in the production of this crop.

However, the poor level of education at 90.8% re-emphasizes the need for Government to enhance skills training on-farm to SHAW-YE to complement the farmers experience with cultivation of Okra. About 44.0% of the SHAW-YE earned less than R5000.00 compared with 46.4% earning more than R5000.00. Market channels and access should be promoted for SHAW-YE to enable throughput of Okra to not only informal but also fresh produce and retail markets.

8.5. Introduction

Okra (Abelmoschus esculentus (L.) Moench) is a yearly fruit vegetable crop propagated through seed and normally grown commercially in tropical and sub-tropical regions of the world (Abe, 2018). It is also grown in warmer temperate regions of the Mediterranean region (Dhankhar, 2009). According to the writings of Kochhar (1986) and Thakur (1986) Okra is currently found in most countries of the African continent and Asia. Sathish (2013) did a review on the work done on the crop and reported that it originated in Ethiopia and was cultivated by the ancient Egyptians. Several authors (Kochhar, 1986; Thakur, 1986; Gemede et al., 2015 and Gemede et al., 2016) reported that okra is a multi-use crop due to its numerous usages of the pods, fresh leaves, buds, flowers, stems, and seeds. The young fruits can be consumed as vegetables, in the form of salads, soups and stews, fresh or dried, fried or boiled. Woolfe (1977), in his studies done on mucilages extracted from Okra found that the plant contains gum like substances in various plant parts, which is associated with other important substances including tannins.

The main purposes of mucilage within the plant includes helping in water storage, decreasing diffusion in plants, assistance in seed dispersal and germination, and acting as a membrane thickener and food reserve. Okra mucilage is used for manufacturing in glace

paper production and medicinal applications as a plasma replacement or blood volume expander (Anyikele et al., 2007) in different parts of the world. Nutritionally, Okra contains proteins, carbohydrates, and vitamins that plays a vital role in food security, human health, and nutritional security (Lamont, 1999; Saifullar et al., 2009).

The young and green fruits are consumed as fresh fruits, in boiled, fried, or cooked variety of forms. Tindall (1983) indicated that the seeds of Okra contain about 20% protein and 20% oil. Moekchantuk (2004) in his work to export Okra reported that the seeds of the crop can be dried, and the dried seeds are a nutritious material that can be used to prepare vegetable curds or roasted and ground to be used as coffee additive or substitute. Doijode (2001), also reported that okra leaves can also be used as animal feed, whilst the green leaf buds and flowers are also edible (Akinyele et al., 2007). A study by Kumar et al. (2009) in China suggested that an alcohol extract of okra leaves can eliminate oxygen free radicals, alleviate renal tubular-interstitial diseases, reduce proteinuria, and improve renal function.

Okra as a vegetable crop has become traditional with comparatively low agricultural input needed. Historically, the intercropping of crops by smallholder farmers has been a common exercise throughout the years. The advantage of the practice may allow balancing interactions in crops that have greater system resilience, in some instances reduce insect pest incidence and deliver environmental benefits such as greater soil and water conservation potential. Over 75% of maize and 60% of okra grown in Nigeria are produced under intercropping system. On average SHAW-YE produce okra on an average plots of 2.13 ha per entrepreneur under irrigation which is the second out of all the vegetable crops. In the context that 89% of the population of Limpopo Province is classified as rural, the smallholder sector producing Okra has a potential to play a major role in the economic development of rural areas of the Province (Nesamvuni et al., 2003).

However, socio-economic factors continue to play a critical role in determining the levels of production undertaken and the sort of crops planted. This was corroborated by von Braun and Mirzabaev (2015) who stated that the production levels are not the only areas affected but also the way business enterprises are managed which put the socio-economic characteristics of the smallholder farmers and entrepreneurs into focus. Previous studies (Mwaniki, 2006; Abdulai et al., 2013; Asante et al., 2013; Onumah et al., 2013) have resolved that if assistance is to be extended to crop producers their demography is worth investigating to fully comprehend their needs.

The relationship between demography and socio-economic factors will be described in this study to produce appropriate policy information to agricultural stakeholders and government. In developing women and youth agricultural entrepreneurs producing Okra there is lack of knowledge on its contribution to women and youth livelihood and incomes in SHAW-YE in rural South Africa. The main objective of this study was therefore to assess the demography of SHAW-YE and the associated cultivation of Okra under irrigation.

8.6. Methodology

8.6.1. Study Area

The study was carried out in Vhembe District Municipality of Limpopo Province, South Africa. The specific areas were Madimbo Corridor in Musina and Mutale Valley in Thulamela Local Municipality. The two areas were categorized as independent SHAW-YE each with a private water supply in the case of Madimbo and as irrigated enterprises which are served by communal water supply infrastructure in the case of Mutale. The two areas of Madimbo Corridor and upper Mutale Valley irrigation schemes constitute a total of more than 2270 ha of production area.

8.6.2. Sampling Procedure

Stratified random sampling was used to obtain a representative sample of villages and households for interview (Leedy et al., 2005) with target population being SHAW-YE's. A two-stage random sampling process was conducted using SURVEYSELECT procedure of SAS. The PROC SURVEYSELECT allowed for probability-based random sampling where sampling in a category or class depended on the number of units within that class. The sampling was regarded appropriate for handling selection bias.

8.6.3. Data Collection

A semi structured household questionnaire was used to carry out a survey with an emphasis on SHAW-YE. Total number of SHAW-YE interviewed were two hundred and ninety-four (N=294) with a response rate of 75 percent. The sample was comprised of 71 youths aged 18 to 35 years old (56 females and 15 males) and 223 women of whom 153 were adults (36-59 years) and 70 pensioners (≥ 60 years old).

8.6.4. Data analysis

Statistical Package for the Social Sciences (SPSS) version 22 was used to analyse quantitative data. Descriptive statistics included frequency tables and measures of central tendency. Inferential statistics were in the form of chi-square analyses, which assessed the association between major demographic variables (gender, age, education, and income) and vegetable/field crop production, water resources and governance. Fischer Exact tests were interpreted in cases where the assumptions for chi-square analysis had been violated. A Bonferroni adjustment was made to prevent a type I error; therefore, significance was considered when $p < 0.013$. Qualitative data was analysed using MS Excel, themes for each question were created according to participant's responses and each response was coded accordingly. (In some cases, these themes were further broken down into one or more relevant sub-themes.)

8.7. Results and Discussions

8.7.1. The production potential

The average production area under irrigated for Okra was 1.64 ha per farmer. The production area was 0.49 ha more in winter than in summer. It was reported that winter had production potential of up to 5000 bags in summer as compared to 200 bags at the most in winter. The price for Okra was on average the same at R50/bag.

8.7.2. The association between cultivating Okra and gender

A chi-square test for association was conducted between cultivating Okra and gender (Table 8. 5). It is necessary to establish the differences in the roles played by males and females in farm households since this gender differences are likely to influence their capacity to adapt to climate change as well as their choices of climate change adaptation strategies (IFPRI, 2009).

The test of association in the winter season showed that all the expected cell frequencies were greater than five, which means that the assumption for the test was not violated. However, there was not a statistically significant association between cultivating okra and gender, $\chi 2 = 0{,}028$, $p = 0.866$. It was determined that 46.7% of males cultivated okra compared to 44.4% females. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, $\varphi = 0.010$, $p = 0.866$. The test for association in the summer season indicated that all the expected cell frequencies were greater than five, the test's assumption was not violated. The results also showed that there was not a statistically significant association between cultivating okra and gender, $\chi 2 = 0{,}524$, $p = 0.56$. It was determined that 26.7% males cultivated okra

compared to 35.8% females. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, φ = 0.042, p = 0.469.

Table 8.5. Association between gender of Smallholder Agricultural Women and Youth Entrepreneur and seasonal cultivation of Okra crop in Vhembe District of Limpopo Province, South Africa

GENDER	VARIABLE	WINTER		SUMMER	
		NO	YES	NO	YES
MALE	Count	8	7	11	4
	Expected Count	8.3	6.7	9.7	5.3
	% within Gender of the respondent	53.3%	46.7%	73.3%	26.7%
	% within season crop: Okra	4.9%	5.3%	5.8%	3.8%
	% of Total	2.7%	2.4%	3.7%	1.4%
FEMALE	Count	155	124	179	100
	Expected Count	154.7	124.3	180.3	98.7
	% within Gender of the respondent	55.6%	44.4%	64.2%	35.8%
	% within season crop: Okra	95.1%	94.7%	94.2%	96.2%
	% of Total	52.7%	42.2%	60.9%	34.0%
TOTAL	Count	163	131	190	104
	Expected Count	163.0	131.0	190.0	104.0
	% within Gender of the respondent	55.4%	44.6%	64.6%	35.4%
	% within season crop: Okra	100.0%	100.0%	100.0%	100.0%
	% of Total	55.4%	44.6%	64.6%	35.4%
		$\chi2 = 0,028$, p = 0.866		$\chi2 = 0,524$, p = 0.56.	

Though there were seasonal differences found in this study, males were still participating more in producing Okra. Similar observations were made in a study of youth agricultural projects in Limpopo Province, Maele et al. (2015) revealed that majority of farmers (74%) were male. The finding that men were majority owners of agricultural projects was also affirmed by Bembridge and Tshikolomo (1998) who revealed that 90% of fruit growers in the Phaswana area of the Limpopo Province were males.

8.7.3. The association between cultivating Okra and age

The Chi-square test of association between age of the respondent and the cultivation of Okra crop in winter and summer is reflected in Table 8.6.

Table 8.6. Association between age of Smallholder Agricultural Women and Youth Entrepreneur and seasonal cultivation of Okra crop in Vhembe District of Limpopo Province, South Africa

AGE (YEARS)	VARIABLE	WINTER		SUMMER	
		NO	YES	NO	YES
18-35	Count	38	33	41	30
	Expected Count	39.4	31.6	45.9	25.1
	% within Gender of the respondent	53.5%	46.5%	57.7%	42.3%
	% within Winter crop: Okra	23.3%	25.2%	21.6%	28.8%
	% of Total	12.9%	11.2%	13.9%	10.2%
36-59	Count	83	72	100	55
	Expected Count	85.9	69.1	100.2	54.8
	% within Gender of the respondent	53.5%	46.5%	64.5%	35.5%
	% within season crop: Okra	50.9%	55.0%	52.6%	52.9%
	% of Total	28.2%	24.5%	34.0%	18.7%
>60	Count	42	26	49	19
	Expected Count	37.7	30.3	43.9	24.1
	% within Gender of the respondent	61.8%	38.2%	72.1%	27.9%
	% within season crop: Okra	25.8%	19.8%	25.8%	18.3%
	% of Total	14.3%	8.8%	16.7%	6.5%
TOTAL	Count	163	131	190	104
	Expected Count	163.0	131.0	190.0	104.0
	% within Gender of the respondent	55.4%	44.6%	64.6%	35.4%
	% within season crop: Okra	100.0%	100.0%	100.0%	100.0%
	% of Total	55.4 %	44.6%	64.6%	35.4%
		$\chi2 = 1,431$, $p = 0.489$		$\chi2 = 3,114$, $p = 0.211$	

For winter season the results showed that all the expected cell frequencies were greater than five, for the Chi-square test assumption not to be violated. There was not a statistically significant association between cultivating okra and age, $\chi2 = 1,431$, $p = 0.489$. It was determined that 46,5% of 18-35-year participants cultivate okra compared to 46,5% and 38,2% of 36-59 year and those >60 years respectively. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, $\varphi = 0.070$, $p = 0.489$.

A chi-square test for association was conducted between cultivating okra and age in summer (Table 8.8). All the expected cell frequencies of the table were greater than five, therefore the test assumption was not violated.

There was not a statistically significant association between cultivating okra and age, $\chi2 = 3,114$, $p = 0.211$. It was determined that 42.3% of 18-35-year participants cultivated okra

compared to 35.5% of 36-59 year participants and 27.9% of those >60-years. In line with the result not being statistically significant, the effect of size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, φ = 0.103, p = 0.211. Okra seems to be a youth-oriented crop judged by the trends showing higher participation of youth between the ages of 18-35-yer both in winter and summer. More participation seems to be in winter (44.6%) than in summer (35%). The results showed how youth tend to take new challenges in the name of a new crop for the area and adopt it for the market. This was corroborated by Fussel and Klein (2006) who reported that older farmers could be resistant to change and thus may not see the need of employing new technologies and would prefer the traditional models of farming that they are familiar with other than adopting new methods. Farm productivity has been shown to deteriorate with the farmers' age, especially among the smallholders who largely rely on their own physical labour to execute many farming responsibilities (Uddin et al., 2014). The advantage with youth farmers was they may have a longer planning horizon and to take up long term measures that will influence their decision to increase production levels.

8.7.4. The association between cultivating Okra and education

A chi-square test for association was conducted between cultivating okra and household head education (Table 8.7). The importance of education in successful developmental activities such as farming cannot be overemphasized. The level of education has a strong influence on the extent to which a farmer can access new information and technology, not only through improved literacy that enables the farmers to access written information, but also through the increased ability to search for information using modern information technologies. Citing Appleton and Balihuta (1996), Oduro-Ofori et al. (2014) described the effect of education on agricultural productivity as cognitive and non-cognitive.

Table 8.7. Association between education of Smallholder Agricultural Women and Youth Entrepreneur and seasonal cultivation of Okra crop in Vhembe District of Limpopo Province, South Africa

EDUCATION	VARIABLE	WINTER		SUMMER	
		NO	YES	NO	*YES*
PRIMARY	Count	29	32	46	15
	Expected Count	33.5	27.5	39.2	21.8
	% within Gender of the respondent	47.5%	52.5%	75.4%	24.6%
	% within season crop: Okra	18.1%	24.4%	24.6%	14.4%
	% of Total	10.0%	11.0%	15.8%	5.2%
SECONDARY	Count	61	55	66	50
	Expected Count	63.8	52.2	74.5	41.5
	% within Gender of the respondent	52.6%	47.4%	56.9%	43.1%
	% within season crop: Okra	38.1%	42.0%	35.3%	48.1%
	% of Total	21.0%	18.9%	22.7%	17.2%
TERTIARY	Count	20	13	21	12
	Expected Count	18.1	14.9	21.2	11.8
	% within Gender of the respondent	60.6%	39.4%	63.6%	36.4%
	% within season crop: Okra	12.5%	9.9%	11.2%	11.5%
	% of Total	6.9%	4.5%	7.2%	4.1%
ABET	Count	50	31	54	27
	Expected Count	44.5	36.5	52.1	28.9
	% within Gender of the respondent	61.7%	38.3%	66.7%	33.3%
	% within season, crop: Okra	31.3%	23.7%	28.9%	26.0%
	% of Total	17.2%	10.7%	18.6%	9.3%
TOTAL	Count	160	131	187	104
	Expected Count	160.0	131.0	187.0	104.0
	% within Gender of the respondent	55.0%	45.0%	64.3%	35.7%
	% within season crop: Okra	100.0%	100.0%	100.0%	100.0%
	% of Total	55.0%	45.0%	64.3%	35.7%
		$\chi2 = 3,545$, $p = 0.315$		$\chi2 = 6,250$, $p = 0.100$	

Cognitive effects reportedly emphasize basic literacy and numeracy that farmers achieve from education while non-cognitive effects emphasize the change in the attitude of farmers who attended school due to improved discipline introduced by formal schooling. Better education may therefore be associated with the improved adaptive capacity to adverse effects of climate change and variability. The results showed no statistically significant association between cultivating okra and household head education in winter, $\chi2 = 3.545$, $p = 0.315$. It was determined that 52.5% of participants whose household head's had no/primary school cultivated okra, while 47.4% and 39.4% of participants with household head education levels of secondary and tertiary level cultivated okra respectively. Also, 38.3% of participants with

household head education of ABET planted the crop. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, φ = 0.110, p = 0.315. The level of education for SHAW-YE producing Okra seems to be poor as 90.8% of respondents either had no primary schooling or had Adult Basic Education & Training (ABET).

A chi-square test for association was conducted between cultivating okra and household head education for the summer season. There was not a statistically significant association between cultivating okra and household head education, $\chi 2 = 6,250$, p = 0.100. It was determined that 24,6% of participants with no/primary household head education cultivated okra while 43,1% of participants with household head with secondary education cultivated okra and 36,4% and 33,3% of participants with household heads with tertiary education and ABET respectively cultivated okra. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, φ = 0.147, p = 0.100.

8.7.5. The association between cultivating Okra and income

A chi-square test for association was conducted between cultivating okra and monthly income (Table 8.8). According to Nouman et al. (2013), household income is also one of the determinants of the amount of credit that can be borrowed by the farmers. High income farming households can therefore not only better afford needs such as production inputs and other production factors but would also easily qualify for credit to procure the assets that would otherwise not be affordable. The results revealed that there was not a statistically significant association between cultivating okra and monthly income, $\chi 2 = 0.121$, p = 0.728. It was determined that 44.0% of participants earning < R5000 a month cultivated okra, compared to 46.4% of those earning > R5000 a month. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, φ = 0.020, p = 0.728. Similarly, for the summer season there was not a statistically significant association between cultivating okra and monthly income, $\chi 2 = 0.210$, p = 0.647.

It was determined that 34.7% of participants earning < R5000 a month cultivated okra, compared to 37.7% of those earning > R5000 a month. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, φ = 0.027, p = 0.647.

Table 8.8. Association between monthly income of Smallholder Agricultural Women and Youth Entrepreneur and seasonal cultivation of Okra crop

INCOME	VARIABLE	WINTER		SUMMER	
		NO	YES	NO	YES
< 5000	Count	126	99	147	78
	Expected Count	124.7	100.3	145.4	79.6
	% within Gender of the respondent	56.0%	44.0%	65.3%	34.7%
	% within season crop: Okra	77.3%	75.6%	77.4%	75.0%
	% of Total	42.9%	33.7%	50.0%	26.5%
>5000	Count	37	32	43	26
	Expected Count	38.3	30.7	44.6	24.4
	% within Gender of the respondent	53.6%	46.4%	62.3%	37.7%
	% within season crop: Okra	22.7%	24.4%	22.6%	25.0%
	% of Total	12.6%	10.9%	14.6%	8.8%
TOTAL	Count	163	131	190	104
	Expected Count	163.0	131.0	190.0	104.0
	% within Gender of the respondent	55.4%	44.6%	64.6%	35.4%
	% within season crop: Okra	100.0%	100.0%	100.0%	100.0%
	% of Total	55.4%	44.6%	64.6%	35.4%
		$\chi 2 = 0.121$, $p = 0.728$		$\chi 2 = 0{,}210$, $p = 0.647$	

8.8. Conclusion

The results of the study indicate some imperative conclusions about the demographic profile of the Smallholder Agricultural Enterprises and their association with the production of Okra. The study revealed that gender, age, education, and income seem to have an influence, but we had statistically not significant results on the production of Okra in the Madimbo Corridor in Musina and Mutale Valley in Thulamela Local Municipality. However, there was no statistical significance and weak association between the demography and production of Okra. The study revealed that the SHAW-YE producing Okra are characterized by small land areas under cultivation. The increased participation of SHAW-YE around the ages of 18-35 year gave a trend suggesting that youth were the dominant participants in the production of this crop.

However, the poor level of education for 90.8% of participants re-emphasizes the need for Government to enhance skills training on-farm to SHAW-YE to complement the farmers experience with cultivation of Okra. About 44.0% of the SHAW-YE earned less than R5000.00 compared with 46.4% earning more than R5000.00. Markets channels and access should be

promoted for SHAW-YE to enable throughput of Okra to not only informal but also fresh produce and retail markets.

SECTION 3: DEMOGRAPHY OF SHAW-YE AND THEIR ASSOCIATION WITH THE CULTIVATION OF THE BUTTERNUT VEGETABLE CROP

Abstract. The study was conducted at Madimbo corridor and upper Mutale valley smallholder irrigation schemes. The purpose of the study was to characterize smallholder agricultural women and youth entrepreneurs (SHAW-YE) with the objective to develop and facilitate policy instruments for sustainable agricultural businesses. A semi-structured household questionnaire together with facilitation was used to carry out survey on a sample, purposively focusing on SHAW-YE. Total sample was 294 respondents (N=294) selected through general category, gender category and gender by age category. The Statistical Package for the Social Sciences (SPSS) version 22 was used to analyse quantitative data. Descriptive statistics included frequency tables and measures of central tendency. Inferential statistics were in the form of chi-square analyses, which assessed the association between major demographic variables (gender, age, education, and income) and vegetable/field crop production, water resources and governance. Fischer Exact tests were interpreted in cases where the assumptions for chi-square analysis had been violated. A Bonferroni adjustment was made to prevent a type I error; therefore, significance was considered when $p < 0.013$. The results of the study indicate some imperative conclusions about the demographic profile of the SHAW-YE and their association with the production of Butternut. The study revealed that gender, age, education, and income seem to have an influence on the production of butternut in the Madimbo Corridor in Musina and Mutale Valley in Thulamela Local Municipality.

However, there was no statistical significance and weak association between the demography and production of Butternut. The study revealed that the SHAW-YE producing Butternut are characterized by small land areas under cultivation and poor participation. The increased participation of SHAW-YE around the ages of 18-35 year gave a trend suggesting that youth were the dominant participants in the production of this crop. However, the poor level of education at (19.7%) re-emphasizes the need for Government to enhance skills training on-farm to SHAW-YE to complement the farmers experience with cultivation of butternut. About 13.8% of the SHAW-YE earned less than R5000.00 compared with 15.9% earning more than R5000.00. Market channels and access should be promoted for SHAW-YE to enable throughput of butternut to not only informal but also fresh produce and retail markets.

8.9. Introduction

Butternut (Cucurbit moschata) is an important summer crop grown by Smallholder Agricultural Women and Youth Entrepreneurs (SHAW-YE) under irrigation in South Africa (DAFF, 2011). It is one of three most grown vegetable crops by SHAW-YE in Limpopo Province of South Africa together with Tomato and Okra (LDARD, 2021). Butternut squash is a vigorous growing plant that takes 85 to 90 days to maturity and it produces good uniform fruits weighing about 650 to 1000g.

Among other cucurbits like courgettes, pumpkin and cucumbers, butternut squash is gaining preference because of its early maturity, colour that is appealing to the eyes of the consumers, its long shelf life, and small size that makes it attractive to producers, traders, and consumers. It is also a hardy crop, which can tolerate moderately harsh environmental conditions and is resistant to many pests of the cucurbits (Bonjour et al., 1990). Butternut squashes are increasing in popularity among SHAW-YE in rural setup because the crop can be grown well in small plots of land and yield relatively good returns with minimal fertilizer inputs. Also, the crop's keeping quality is good with high level of sunburn tolerance. The harvested fruit is hardy and can be left on the land for a month or two. It has a sweet, nutty taste like that of a pumpkin. It has yellow skin and orange fleshy pulp. When ripe, it turns increasingly deep orange, and becomes sweeter and richer in nutrients. Findings of research done by Li (2020) affirmed those of earlier researchers (Fu, Shi, & Li, 2006; Fu, Tian, Cai, Liu, & Li, 2007) who indicated growing attention to butternut due to the nutritional value of the seeds and skin that are rich in useful health compounds such as vitamins, polysaccharides, carotene, and mineral salts.

It has been estimated that there is approximately 303,000 SHAW-YE in Limpopo Province (Statistics South Africa: 2002) with women constituting about 80% of these SHAW-YE. The development of women and youth then become a policy priority for improved household livelihood and job creation. Also, in the context that 89% of the population of Limpopo Province is classified as rural, agriculture plays a major role in the economic development of rural areas of the province. On average SHAW-YE produce butternut on plots of 1.99 ha per entrepreneur under irrigation. The crop is marketed at the farm gate to individual households and hawkers with some produced under contract arrangement for sale to fresh produce and exported markets. Socio-economic factors continue to play a critical role in determining the levels of production undertaken and the sort of crops planted. This was corroborated by von Braun and Mirzabaev (2015) who stated that the production levels are not the only areas affected but also the way business enterprises are managed which put the socio-economic characteristics of the smallholder farmers and entrepreneurs into focus. Previous studies (Mwaniki, 2006; Kyei et al., 2011; Abdul-kareem and Isgin, 2016; Abdulai et

al., 2013; Asante et al., 2013; Onumah et al., 2013) have resolved that if assistance is to be extended to crop producers their demography is worth investigating to fully comprehend their needs. Butternut as an emerging economic crop lends itself well to be part of the SHAW-YE menu of sustainable crops. Despite its ease of selling through ready market and high nutritional value, there is lack of knowledge on its contribution to women and youth livelihood and incomes.

The relationship between demography and socio-economic factors will be described in this study to produce appropriate policy information to agricultural stakeholders and government. The main objective of this study was therefore to assess the demography of SHAW-YE and the association with cultivation of butternut as a vegetable crop.

8.10. Methodology

8.10.1. Study Area

The study was carried out in Vhembe District Municipality of Limpopo Province, South Africa. The specific areas were Madimbo Corridor in Musina and Mutale Valley in Thulamela Local Municipality. The two areas were categorized as independent smallholder agricultural enterprises each with a private water supply in the case of Madimbo and as irrigated smallholders which are served by communal water supply infrastructure in the case of Mutale. The two areas of Madimbo corridor and upper Mutale valley irrigation schemes constitute a total of more than 2270 ha of production area.

8.10.2. Sampling Procedure

Stratified random sampling was used to obtain a representative sample of villages and households for interview (Leedy et al., 2005) with target population being SHAW-YE. A two-stage random sampling process was conducted using SURVEYSELECT procedure of SAS. The PROC SURVEYSELECT allowed for probability-based random sampling where sampling in a category or class depended on the number of units within that class. The sampling was regarded appropriate for handling selection bias.

8.10.3. Data Collection

A semi structured household questionnaire was used to carry out a survey with an emphasis on SHAW-YE. Total number of SHAW-YE interviewed were two hundred and ninety-four (N=294) with a response rate of 75 percent.

The sample was comprised of 71 youths aged 18 to 35 years old (56 females and 15 males) and 223 women of whom 153 were adults (36-59 years) and 70 pensioners (≥ 60 years old).

8.10.4. Data analysis

The Statistical Package for the Social Sciences (SPSS) version 22 was used to analyse quantitative data. Descriptive statistics included frequency tables and measures of central tendency. Inferential statistics were in the form of chi-square analyses, which assessed the association between major demographic variables (gender, age, education, and income) and butternut production, water resources and governance. Fischer Exact tests were interpreted in cases where the assumptions for chi-square analysis had been violated. A Bonferroni adjustment was made to prevent a type I error; therefore, significance was considered when $p < 0.013$.

8.11. Results and Discussions

8.11.1. The production potential

The average production area under irrigation was 1.99 ha. The production area was 0.05 ha higher in winter than summer which was negligible. The production was higher by a 2 500 kg difference with a summer butternut crop better than winter. On average the price of butternut did not seem to change between seasons and is stable at R50/bag.

8.11.2. The association between cultivating Butternut and Gender

A chi-square test for association was conducted between cultivating butternut and gender (Table 8.9). It is essential to determine the differences in the roles played by gender in farm households since this gender differences are likely to influence their capacity to adapt to climate change as well as their choices of climate change adaptation strategies (IFPRI, 2009). For the winter season, the results of this study conducted using the Fischer Exact test showed that there was not a statistically significant association between cultivating butternut and gender, $p = 0.913$. It was determined that 13,3% males cultivated butternut compared to 14,3% females.

In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, $\varphi = 0.006$, $p = 0.914$. Similarly, for the summer season the Fischer Exact test conducted showed that there was not a statistically significant association between cultivating butternut and gender, $p = 0.358$. It was determined that no males cultivated butternut compared to 11.5% females. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, $\varphi = 0.81$, $p = 0.165$. With the

results not being statistically significant the trend showed that butternut had less participation by SHAW-YE and tended to be produced by women. This was in direct contradiction to findings of a study on youth agricultural projects in Limpopo Province by Maele et al. (2015) that revealed that majority of farmers (74%) were male.

Table 8.9. Association between gender of Smallholder Agricultural Women and Youth Entrepreneur and seasonal cultivation of butternut crop in Vhembe District of Limpopo Province, South Africa

GENDER	VARIABLE	WINTER		SUMMER	
		NO	YES	NO	YES
MALE	Count	13	2	15	0
	Expected Count	12.9	2.1	13.4	1.6
	% within Gender of the respondent	86.7%	13.3%	100.0%	0.0%
	% within season crop: Butternut	5.2%	4.8%	5.7%	0.0%
	% of Total	4.4%	.7%	5.1%	0.0%
FEMALE	Count	239	40	247	32
	Expected Count	239.1	39.9	248.6	30.4
	% within Gender of the respondent	85.7%	14.3%	88.5%	11.5%
	% within season crop: Butternut	94.8%	95.2%	94.3%	100.0%
	% of Total	81.3%	13.6%	84.0%	10.9%
TOTAL	Count	252	42	262	32
	Expected Count	252.0	42.0	262.0	32.0
	% within Gender of the respondent	85.7%	14.3%	89.1%	10.9%
	% within season crop: Butternut	100.0%	100.0%	100.0%	100.0%
	% of Total	85.7%	14.3%	89.1%	10.9%
		Not Significant		Not Significant	

The finding that men were majority owners of agricultural projects was also affirmed by Bembridge and Tshikolomo (1998) who revealed that 90% of fruit growers in the Phaswana area of the Limpopo Province were males. The production practices coupled with its hardiness to climate and prices of informal markets may lend the crop to be more user-friendly to women farmers.

8.11.3. The association between cultivating Butternut and Age

A chi-square test for association was conducted between cultivating butternut and age (Table 8.10). In the winter growing season it was determined that 12,7% of 18-35 year participants cultivated butternut compared to 18,1% and 7,4% of 36-59 participants and >60-year participants respectively. The test results for winter season indicated that there was not a statistically significant association between cultivating butternut and age, $\chi 2 = 4,627$, $p = 0.099$. In line with the result not being statistically significant, the effect size showed a weak

association (Cohen, 1988), as measured by the Phi measure of effect size, φ = 0.125, p = 0.099.

For the summer months after a Bonferroni adjustment there was not a statistically significant association between cultivating butternut and age, χ2 = 7,153, p = 0.028. It was determined that 5,6% of 18-35 year participants cultivated butternut compared to 15,5% of 36-59 year participants and 5,9% of >60-year participants. Like the not statistically significant result, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, φ = 0.156, p = 0.028. Generally, the participation of SHAW-YE in producing Butternut was poor. The trend showed more youth participating compared to the older age groups. The participation of the age group pf 36-59-year was also relatively competitive. The results were supported by Mulinya, (2017) who reported that farmers within the ages of 30-34 years are likely to comprehend issues involved in agriculture and therefore are equipped with essential information regarding climate change adaptation strategies within the sector.

Table 8.10. Association between age of Smallholder Agricultural Women and Youth Entrepreneur and seasonal cultivation of Butternut crop in Vhembe District of Limpopo Province, South Africa

AGE (YEARS)	VARIABLE	WINTER		SUMMER	
		NO	YES	NO	YES
18-35	Count	62	9	67	4
	Expected Count	60.9	10.1	63.3	7.7
	% within Gender of the respondent	87.3%	12.7%	94.4%	5.6%
	% within season crop: Butternut	24.6%	21.4%	25.6%	12.5%
	% of Total	21.1%	3.1%	22.8%	1.4%
36-59	Count	127	28	131	24
	Expected Count	132.9	22.1	138.1	16.9
	% within Gender of the respondent	81.9%	18.1%	84.5%	15.5%
	% within season crop: Butternut	50.4%	66.7%	50.0%	75.0%
	% of Total	43.2%	9.5%	44.6%	8.2%
>60	Count	63	5	64	4
	Expected Count	58.3	9.7	60.6	7.4
	% within Gender of the respondent	92.6%	7.4%	94.1%	5.9%
	% within season crop: Butternut	25.0%	11.9%	24.4%	12.5%
	% of Total	21.4%	1.7%	21.8%	1.4%
TOTAL	Count	252	42	262	32
	Expected Count	252.0	42.0	262.0	32.0
	% within Gender of the respondent	85.7%	14.3%	89.1%	10.9%
	% within season crop: Butternut	100.0%	100.0%	100.0%	100.0%
	% of Total	85.7%	14.3%	89.1%	10.9%
		$\chi 2 = 4,627$, p = 0.099		$\chi 2 = 7,153$, p = 0.028	

8.11.4. The association between cultivating Butternut and Education

A chi-square test for association was conducted between cultivating butternut and household head education (Table 8.11). As stated by Ndegwe et al. (1985), education is a basic need, a way of meeting other basic needs, and an activity that sustains and accelerates overall development. This statement was affirmed by Olaiton (1984) and Tompson (1981) who indicated that more years of schooling are associated with higher rates of adoption of innovations than are fewer years of schooling. According to Lundahl (1979) as cited by Steyn (1988), education is one of the important agencies of acculturation and renewal for the members of the society. It is generally accepted that education is the cornerstone of the comprehensive human resources approach to development. Human behaviour sometimes needs to be altered and education plays a vital role for such change to be successful.

In testing Chi-square for the association between cultivating butternut and level of education the results indicated that at least 80% of the expected cell frequencies were greater than five, therefore the assumption was not violated. For the winter season there was not a statistically significant association between cultivating butternut and education of head of household, $\chi 2 = 3.625$, $p = 0.305$. It was determined that 19.7% of participants with heads of household having no/primary education cultivated butternut, 15.5% of those with secondary education cultivated butternut while 6.1% and 12.3% of those with tertiary education and ABET respectively cultivated butternut. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, $\varphi = 0.112$, $p = 0.305$. Similarly, for the summer season the analysis showed that at least 80% of the expected cell frequencies were greater than five, therefore the assumption was not violated. There was a statistically significant association between cultivating butternut and level of education of household head, $\chi 2 = 13.132$, $p = 0.004$.

It was determined that 6.6% of participants with heads of household possessing no/primary education cultivated butternut, 14.7% of those with secondary education cultivated butternut, while 24.2% and 3.7% of those with tertiary education and ABET respectively cultivated butternut. Although there was a significant association, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, $\varphi = 0.212$, $p = 0.004$.

Table 8.11. Association between education of Smallholder Agricultural Women and Youth Entrepreneur and seasonal cultivation of Butternut crop in Vhembe District of Limpopo Province, South Africa

EDUCATION	VARIABLE	WINTER		SUMMER	
		NO	YES	NO	YES
PRIMARY	Count	49	12	57	4
	Expected Count	52.2	8.8	54.3	6.7
	% within Gender of the respondent	80.3%	19.7%	93.4%	6.6%
	% within seasons crop: Butternut	19.7%	28.6%	22.0%	12.5%
	% of Total	16.8%	4.1%	19.6%	1.4%
SECONDARY	Count	98	18	99	17
	Expected Count	99.3	16.7	103.2	12.8
	% within Gender of the respondent	84.5%	15.5%	85.3%	14.7%
	% within season crop: Butternut	39.4%	42.9%	38.2%	53.1%
	% of Total	33.7%	6.2%	34.0%	5.8%
TERTIARY	Count	31	2	25	8
	Expected Count	28.2	4.8	29.4	3.6
	% within Gender of the respondent	93.9%	6.1%	75.8%	24.2%
	% within season crop: Butternut	12.4%	4.8%	9.7%	25.0%
	% of Total	10.7%	.7%	8.6%	2.7%
ABET	Count	71	10	78	3
	Expected Count	69.3	11.7	72.1	8.9
	% within Gender of the respondent	87.7%	12.3%	96.3%	3.7%
	% within season crop: Butternut	28.5%	23.8%	30.1%	9.4%
	% of Total	24.4%	3.4%	26.8%	1.0%
TOTAL	Count	249	42	259	32
	Expected Count	249.0	42.0	259.0	32.0
	% within Gender of the respondent	85.6%	14.4%	89.0%	11.0%
	% within season crop: Butternut	100.0%	100.0%	100.0%	100.0%
	% of Total	85.6%	14.4%	89.0%	11.0%
		$\chi 2 = 9.608$, $p = 0.022$		$\chi 2 = 13.132$, $p = 0.004$.	

8.11.5. The association between cultivating Butternut and income

A chi-square test for association was conducted between cultivating butternut and monthly income (Table 8.12). According to Nouman et al. (2013), household income is also one of the determinants of the amount of credit that can be borrowed by the farmers. High income of farming households can therefore not only better afford needs such as production inputs and other production factors but would also easily qualify for credit to procure the assets that would otherwise not be affordable.

Table 8.12. Association between monthly income and seasonal cultivation of butternut by Smallholder Agriculture Women and Youth Entrepreneurs in Vhembe District of Limpopo Province, South Africa

INCOME	VARIABLE	WINTER		SUMMER	
		NO	*YES*	NO	YES
< 5000	Count	*194*	*31*	200	25
	Expected Count	192.9	32.1	200.5	24.5
	% within Gender of the respondent	86.2%	13.8%	88.9%	11.1%
	% within season crop: Butternut	77.0%	73.8%	76.3%	78.1%
	% of Total	66.0%	10.5%	68.0%	8.5%
>5000	Count	58	11	62	7
	Expected Count	59.1	9.9	61.5	7.5
	% within Gender of the respondent	84.1%	15.9%	89.9%	10.1%
	% within season crop: Butternut	23.0%	26.2%	23.7%	21.9%
	% of Total	19.7%	3.7%	21.1%	2.4%
	Count	252	42	262	32
	Expected Count	252.0	42.0	262.0	32.0
	% within Gender of the respondent	85.7%	14.3%	89.1%	10.9%
	% within season crop: Butternut	100.0%	100.0%	100.0%	100.0%
	% of Total	85.7%	14.3%	89.1%	10.9%
		$\chi2 = 0,202$, $p = 0.653$.		$\chi2 = 0.051$, $p = 0.822$	

To test for Chi-square in the winter season data the results showed that all the expected cell frequencies were greater than five, therefore the assumption was not violated. There was not a statistically significant association between cultivating butternut and monthly income, $\chi2 = 0,202$, $p = 0.653$. It was determined that 13,8% of participants earning < R5000 a month cultivated butternut, compared to 15,9% of those earning > R5000 a month. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, $\varphi = 0.026$, $p = 0.653$.

Similarly, for the summer season, there was not a statistically significant association between cultivating butternut and monthly income, $\chi2 = 0.051$, $p = 0.822$. It was determined that 11.1% of participants earning < R5000 a month cultivated butternut, compared to 10.1% of those earning > R5000 a month. In line with the association not being significant, the effect size showed a weak association (Cohen, 1988), as measured by the Phi measure of effect size, $\varphi = 0.013$, $p = 0.822$.

8.12. Conclusion

The results of the study indicate some imperative conclusions about the demographic profile of the Smallholder Agricultural Enterprises and their association with the production of Butternut. The study revealed that gender, age, education, and income seem to have an influence on the production of butternut in the Madimbo Corridor in Musina and Mutale Valley in Thulamela Local Municipality. However, the there was no statistical significance and weak association between the demography and production of Butternut. The study revealed that the SHAW-YE producing Butter are characterized by small land areas under cultivation and poor participation. The increased participation of SHAW-YE around the ages of 18-35 year gave a trend suggesting that youth were the dominant participants in the production of this crop. However, the poor level of education at (19.7%) re-emphasizes the need for Government to enhance skills training on-farm to SHAW-YE to complement the farmers experience with cultivation of butternut. About 13.8% of the SHAW-YE earned less than R5000.00 compared with 15.9% earning more than R5000.00. Markets channels and access should be promoted for SHAW-YE to enable throughput of butternut to not only informal but also fresh produce and retail markets.

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CHAPTER 9

SOCIO-ECONOMIC CONTRIBUTION OF SMALLHOLDER WOMEN AND YOUTH AGRICULTURAL ENTREPRENEURS PRODUCING SELECTED VEGETABLE CROPS IN THE VHEMBE DISTRICT, LIMPOPO PROVINCE OF SOUTH AFRICA

Abstract. The study was conducted at Madimbo corridor and upper Mutale valley smallholder irrigation schemes. The purpose of the study was to characterize women and youth smallholder irrigation scheme entrepreneurs (SHAW-YE) with the objective to develop and facilitate policy instruments for sustainable agricultural businesses. A structured household questionnaire together with facilitation was used to carry out survey on a sample, purposively focusing on women and youth SHAW-YE. Total sample was (N=294) and respondents selected through general category, gender category and gender by age category. The Statistical Package for the Social Sciences (SPSS) version 22 was used to analyse quantitative data. Descriptive statistics included frequency tables and measures of central tendency. Inferential statistics were in the form of chi-square analyses, which assessed the association between major demographic variables (gender, age, education, and income) and vegetable/field crop production, water resources and governance. (Fischer Exact tests were interpreted in cases where the assumptions for chi-square analysis had been violated.) A Bonferroni adjustment was made to prevent a type I error; therefore, significance was considered when $p < 0.013$. The participation of SHAW-YE in Agriculture through vegetable production was significant measured by the irrigated land under Tomatoes, Okra and Butternut. The levels of income broadly indicate a contribution to the informal economy which is mostly rural. From a policy perspective there should be an ongoing support especially the commercialization of SHAW-YE and continued support to link produce to the market channels such as retail shops, fresh produce market and processing facilities. The objective of cultivating the selected vegetables was mainly for selling – re-emphasizing the fact that SHAW-YE are indeed market oriented but with loose value chains. There seems to be an optimum utilization of natural resources such as compost and manure combined with inorganic fertilizers. From a policy perspective there should be continued support to SHAW-YE with Input Support Policy ILIMA-LETSEMA. SHAW-YE uses pesticides for their crops with risks that needs to be mitigated. Considerable evidence links pesticide uses to chronic health problems in farmers, and pesticides are known to bio-accumulate in soil and water and also be very harmful to ecosystems and wildlife. Fresh produce vendors, meanwhile (a group that includes many farmers), are often unaware of the potential health risks to consumers or themselves. The results of the study indicated that in both winter and summer mainly women participation was higher at (38.4%) and (50.0%), respectively. The second category of participation was exclusively women in winter (45.2%) and summer (38.1).

These results re-affirms that women make essential contributions to agriculture and rural agricultural enterprises. However, it should be noted that there is much diversity in women's roles and over-generalization undermines policy relevance and planning.

9.1. Introduction

The Limpopo province is extremely diverse in terms of agriculture. There is a vast number of crops grown in the province and horticulture crops also contribute significantly to the total number of hectares under crops (LDARD, 2012). A vast number of types of vegetables are also grown in the province with Limpopo being largest producer of tomatoes in the country. During the winter season a great deal of crops are grown under irrigation. With the policy of commercialization of smallholder agricultural farmers from 2004 government managed to increase the participation of same farmers to available markets from farm gate to retails and fresh produce markets (Nesamvuni et al., 2003). This was coupled with other policy instruments such as input support policy, revitalization of the smallholder irrigations schemes and the comprehensive agricultural support program that enabled agricultural entrepreneurs to access funding for infrastructural development and markets (LDARD, 2012). According to statistics South Africa report (2002) on the survey of large- and small-scale agriculture, there were an estimated 245,000 fruit farming and 349,000 vegetables crop operations in RSA of these 138,000 fruit farms operations (56.3%) and 87,000 vegetables crop operations (24%) were found in the Limpopo Province. From the composition of horticultural products in the province, the production of vegetables is the most important (49.1%) followed by citrus fruits (25.9%) and subtropical fruits (15.5%). Within the Province the production of vegetables contributes an average of about 22% to the gross income from agriculture and 18% to the total gross income of vegetables in South Africa. Tomato is the only one vegetable crop that has been reported extensively both from the smallholder and commercial perspectives.

A study done by Ramigo (2017) indicated that tomatoes are mainly produced in Mopani (193 592 tons), while Capricorn district is the main producer of potatoes (157 195 tons), onions (18 478 tons) and pumpkins (16 646 tons). Other districts such as Vhembe mainly produce potatoes followed by tomatoes, onions and pumpkins being the least. In terms of physical output (metric tons) the Waterberg district mainly produced potatoes followed pumpkins, onions and tomatoes. The study further showed that tomatoes generated the largest gross farming income of R479.4 million in Mopani district, followed by potatoes (R33.5 million), onions (R15.3 million) and pumpkins (R7.4 million). R270.8 million worth of potatoes was generated in Capricorn district, followed by tomatoes (R43.5 million), onions (R25.4 million) and pumpkin (R19.4 million). Other regions such as Vhembe mainly generated income from potatoes (R105.2 million), followed by tomatoes (R69.9 million).

There is a dearth of information on the economic contribution of other vegetable crops such as Okra and Butternut, especially from the context of smallholder agriculture. Out of the eight most produced vegetable crops by SHAW-YE, Tomato ranked first with (46.9%), Okra (44.6%), Butternut (14.3%), Spinach (10.9%), Green paper (7.1%), Cabbage (6.8%) and Onion (5.8%) under irrigation. In the context that 89% of the population of Limpopo Province is classified as rural, the smallholder vegetable production plays a major role in the economic development of rural areas of the province (Nesamvuni et al., 2003).

With job creation and employments already a challenge for South Africa and all developing countries, it is therefore critical that the economic contribution of major vegetables by smallholder agricultural entrepreneurs be studied. Central to the potential contribution by the said vegetable crops is the socio-economic factors and production constraints that continue to play a critical role in determining the levels of production undertaken and the sort of crops planted. This was corroborated by von Braun and Mirzabaev (2015) who stated that the production levels are not the only areas affected but also the way business enterprises are managed which put the socio-economic characteristics of the smallholder farmers and entrepreneurs into focus. In researching the socio-economic contribution of three selected vegetable crops the objective of production, key production practices, market access and labour were considered. The main objective of this study was therefore to assess the socio-economic contributions of selected vegetable crops (Tomatoes, Okra, and Butternut) produced by SHAW-YE the Vhembe District, Limpopo Province of South Africa.

9.2. Methodology

9.2.1. Study Area

The study was carried out in Vhembe District Municipality of Limpopo Province, South Africa. The specific areas were Madimbo Corridor in Musina and Mutale Valley in Thulamela Local Municipality. The two areas were categorized as independent smallholder agricultural enterprises (SHAW-YE) each with a private water supply in the case of Madimbo and as irrigated smallholders which are served by communal water supply infrastructure in the case of Mutale. The two areas of Madimbo corridor and upper Mutale valley irrigation schemes constitute a total of more than 2270 ha of production area.

9.2.2. Sampling Procedure

Stratified random sampling was used to obtain a representative sample of villages and households for interview (Leedy et al., 2005) with target population being women and youth SHAW-YE's. A two-stage random sampling process was conducted using SURVEYSELECT procedure of SAS.

The PROC SURVEYSELECT allowed for probability-based random sampling where sampling in a category or class depended on the number of units within that class. The sampling was regarded appropriate for handling selection bias.

9.2.3. Data Collection

A semi structured household questionnaire was used to carry out a survey with an emphasis on women and youth SHAW-YE. Total number of SHAW-YE interviewed were two hundred and ninety-four (N=294) with a response rate of 75 percent. The sample was comprised of 71 youths aged 18 to 35 years old (56 females and 15 males) and 223 women of whom 153 were adults (36-59 years) and 70 pensioners (≥ 60 years old).

9.2.4. Data analysis

The Statistical Package for the Social Sciences (SPSS) version 22 was used to analyse quantitative data. Descriptive statistics included frequency tables and measures of central tendency. Inferential statistics were in the form of chi-square analyses, which assessed the association between major demographic variables (gender, age, education, and income) and vegetable/field crop production, water resources and governance. (Fischer Exact tests were interpreted in cases where the assumptions for chi-square analysis had been violated). Bonferroni adjustment was made to prevent a type I error; therefore, significance was considered when $p < 0.013$.

9.3. Results and Discussions

9.3.1. The Objective of Cultivating Selected Vegetable Crops.

The Frequencies and Associated percentages of SHAW-YE on the objectives of cultivating the selected vegetable crops is shown in Table 9.1. A study done by Dqibityala (2017) on farmers' perception on factors influencing small-scale vegetable production at Tsengiwe village, South Africa showed a matrix developed by Manderson (2015) that categorised the objectives of vegetable production.

Table 9.1. Frequencies and Associated percentages of SHAW-YE on the objectives of cultivating the Selected Vegetable crops.

WINTER						
CROP NAME	Tomatoes		Okra		Butternut	
CROP USE	Frequency	%	Frequency	%	Frequency	%
Mainly own consumption	2	1.4	3	2.3	1	2.4
Exclusively own consumption	4	2.9	6	4.6	0	0
Exclusively sale	38	27.5	42	32.1	4	9.5
Mainly sale	92	66.7	72	55.0	36	85.7
None Response	2	1.4	8	6.1	1	2.4
TOTAL	138	100	131	100	42	100
SUMMER						
CROP NAME	Tomatoes		Okra		Butternut	
CROP USE	Frequency	%	Frequency	%	Frequency	%
Mainly own consumption	0		8	7.7	0	0
Exclusively own consumption	0	0	2	1.9	0	0
Exclusively sale	4	13.8	24	23.1	10	31.2
Mainly sale	25	86.2	67	64.4	20	62.5
None Response	0	0	3	2.9	2	6.3
TOTAL	29	100	104	100	32	100

Subsistence smallholder producers were identified as producers for mainly home consumption. Those who were smallholder farmers in loose value chains produce vegetables for home consumption with added income. Smallholder farmers who were market oriented and are in tight value chains produced vegetables mainly for income and leftovers for home consumption. Lastly Manderson (2015) listed smallholder farmers that were capitalistic oriented who produced the vegetables for profit only. Based on the results of this study we can easily categorize the SHAW-YE as those that are market oriented and are in loose value chains produced vegetables mainly for income and leftovers for home consumption.

9.3.2. Seasonal Variation in Fertilizer Use to Cultivate Selected Vegetable Crops

The Frequencies and associated percentages of SHAW-YE use of fertilizer within selected vegetable crops is indicated in Table 9.2. One of the most important threats to the sustainability of small-scale crop production systems is the decline in soil fertility associated with falling levels of organic matter and soil nutrients (Snapp, 1998; Smaling & Braun, 1996). Although mineral fertilizers have played a major role in maintaining and increasing soil fertility in most areas of the world (FAO, 1992; Smaling, 1993), a range of factors mitigate against the widespread use of mineral fertilizers by small-scale farmers (Gerner & Harris, 1993; Smaling & Braun, 1996). The high cost of these inorganic fertilizers is a major factor against their use by small-scale farmers given their limited financial resources.

Fertilizer has also been shown to produce variable crop yield responses under small-scale conditions, which makes the technology risky and difficult to use by farmers in this sector (Smaling, 1993; Van Noordwijk et al., 1994). Consequently, the amount of inorganic fertilizer used by the small-scale farming sector in South Africa, for example, is generally small and significantly below the levels recommended for the agro-ecological regions of the country (FSSA, 1997). As a result, manure will continue to play a vital role in the maintenance of soil fertility in South Africa and elsewhere in the tropics (Bationo & Mokwunye, 1991; Yoganathan & van Averbeke, 1996; Materechera et al., 1998). The results of this study indicated that the majority of the SHAW-YE combined the application of manure and chemical fertilizers in winter which was in the order of 61.4 percent for Okra, 57.7 percent for Tomatoes, and 34.2 percent for Butternut respectively. The magnitude if the difference was even in summer.

Table 9.2. Frequencies and associated percentages of SHAW-YE use of fertilizer within selected vegetable crops

WINTER						
CROP NAME	Tomatoes		*Okra*		Butternut	
FERTILIZER	Frequency	%	Frequency	%	Frequency	%
Manure	39	28.5	26	20.5	19	46.3
Chemical 1	19	13.8	23	18.1	8	19.5
Combined 2	79	57.7	78	61.4	14	34.2
None Response	1	0.7	4	3.1	1	2.4
TOTAL	138	100	131	100.0	42	100.0
SUMMER						
CROP NAME	Tomatoes		Okra		Butternut	
FERTILIZER	Frequency	%	Frequency	%	Frequency	%
Manure	5	15,6	32	30,8	5	15,6
Chemical 1	2	6,3	9	8,7	2	6,3
Combined 2	19	59,4	59	56,7	19	59,4
None Response	6	18.8	4	3.8	6	18.8
TOTAL	32	100	104	100	32	100

[1]Chemical fertilizers = Inorganic Fertilizers; [2]Combined = combined use of manure and inorganic Fertilizers

9.3.3. Seasonal Variation in Pesticides Use to Cultivate Selected Vegetable Crops

The Frequencies and associated percentages of SHAW-YE use of pesticides within selected vegetable crops are shown in Table 9.3. Smallholder farms which are located tropical areas with high pest pressure, leads to heavy use and reliance on pesticides over traditional methods of pest control. This presents several challenges. Considerable evidence links pesticide uses to chronic health problems in farmers, and pesticides are known to bio-accumulate in soil and water and also be very harmful to ecosystems and wildlife. Fresh produce vendors, meanwhile (a group that includes many farmers), are often unaware of the potential health risks to consumers or themselves. Finally, smallholder farmers operate within a lax regulatory environment, and many do not possess adequate knowledge of optimal spray

regimens or safety behaviour. Thus, most do not take adequate safety precautions (Ngowi, 2007; Smart et al., 2018).

Table 9.3. Frequencies and associated percentages of SHAW-YE use of pesticides within selected vegetable crops

WINTER						
CROP NAME	Tomatoes		Okra		Butternut	
USE OF PESTICIDES	Frequency	%	Frequency	%	Frequency	%
Yes	134	97.1	124	94.7	42	100
No	1	0.7	2	1.5	0	0
None Response	3	2.2	5	3.8	0	0
TOTAL	138	100	131	100.0	42	100.0
SUMMER						
CROP NAME	Tomatoes		Okra		Butternut	
USE OF PESTICIDES	Frequency	%	Frequency	%	Frequency	%
Yes	23	79.3	99	95.2	25	86.2
No	0	0	0	0	0	0
None Response	6	15.4	5	4.8	7	21.9
TOTAL	29	100	104	100	32	100

Most of the SHAW-YE uses pesticides (97.1%) for Tomatoes, (94.7%) for Okra and (100) for Butternut, respectively. The selected crops again seem to be influenced by season with heavy participation in pesticides use more in winter than in summer.

9.3.4. Seasonal Variation in the Market Share of Selected Vegetable Crops

The Frequencies and associated percentages of SHAW-YE market share of Selected Vegetables are indicated in Table 9.4. Altshul (1998) and Lyster (1990) stated that marketing plays a serious part in meeting the overall goal of food security, poverty alleviation and sustainable agriculture mainly among small-scale farmers in emerging countries. The pressure that the small-scale farmers get from market liberalization makes it difficult for the farmers to partake in markets. 32 Marketing by small-scale producers is inhibited by deprived

infrastructure, distance from market, deficiency of assets and transport and insufficient market material (Makhura, 2001). The challenge that affects the vegetable production is incapability for small-scale farmers to enhance the ability to reach markets and vigorously involve in the market.

Table 9.4. Frequencies and associated percentages of SHAW-YE market share of Selected Vegetables

WINTER						
CROP NAME	Tomatoes		Okra		Butternut	
MARKET	Frequency	%	Frequency	%	Frequency	%
Farm gate	30	21.7	34	26.0	16	38.1
Fresh produce	4	2.9	9	6.9	2	4.8
Contracts	6	4.3	1	.8	12	28.6
Hawkers	23	16.7	29	22.1	4	9.5
Export	23	16.7	24	26	16	38.1
None Response	52	37.7	34	26	8	19
TOTAL	138	100	131	100	42	100
SUMMER						
CROP NAME	Tomatoes		Okra		Butternut	
MARKET	Frequency	%	Frequency	%	Frequency	%
Farm gate	14	48.3	30	28.8	2	6.3
Fresh produce	2	6.9	6	5.8	0	0
Contracts	2	6.9	0	0	2	6.3
Hawkers	2	6.9	31	29.8	4	12.5
Export	1	3.4	10	9.6	7	21.9
None Response	8	27.6	27	26.0	17	53.1
TOTAL	29	100	104	100	32	100

9.3.5. Seasonal Variation in the Management & Division of Labour of SHAW-YE in the Production of Selected Vegetable Crops

The Frequencies and associated percentages of SHAW-YE Division of Labour in the Production of Selected Vegetables in Table 9.5. Doss (2011) gave an account of the participation of women in Agriculture in the FAO report that was written with SOFA team. In her report the contribution of women to agricultural and food production was significant but impossible to verify empirically the share produced by women. Women's participation in rural labour markets was found to vary considerably across regions, but invariably women were overrepresented in unpaid, seasonal, and part-time work.

The report further indicated that women were often paid less than men, for the same work. Available data on rural and agricultural feminization shows that this was not a general trend but mainly a sub-Saharan Africa phenomenon, as well as observed in some sectors such as unskilled labour in the fruit, vegetable, and cut-flower export sector.

Table 9.5. Frequencies and associated percentages of SHAW-YE Division of Labour in the Production of Selected Vegetables

CROP NAME	**Winter**		**Summer**	
LABOUR	Frequency	%	Frequency	%
Exclusively men	2	.7	0	0
Mainly men	6	2.0	2	.7
Mainly women	113	38.4	147	50.0
Exclusively women	133	45.2	112	38.1
Men and women equally	8	2.7	9	3.1
None Response	8	2.7	24	8.2
TOTAL	294	100	294	100

The results of the study indicated that in both winter and summer mainly women participation was higher at (38.4%) and (50.0%), respectively. The second category of participation was exclusively women in winter (45.2%) and summer (38.1). These results re-affirms that women make essential contributions to agriculture and rural agricultural enterprises. However, it should be noted that there is much diversity in women's roles and over-generalization undermines policy relevance and planning (SOFA Team and Cheryl Doss, 2011).

9.4. Seasonal Economic Contribution of the three selected vegetable crops to the SHAW-YE and informal economy of the region

9.4.1. Production Indicators for Selected Vegetables in Winter

The estimates of output and income levels for selected vegetable crops produced by SHAW-YE in the Madimbo Corridor and Mutale Valley are shown in Table 9.6. For the three selected vegetable crops under investigation, it was shown that their average cultivated areas in hectors were 3.71 for tomatoes, 2.13 for Okra and 1.99 for butternut, respectively. These results were like related studies on SHAW-YE for tomatoes (Nesamvuni et al., 2003; Gwebu et al., 2018; and Mango et al., 2015), for Okra (Ekunwe et al., 2017; Kumar et al., 2010 and Okunade et al., 2009) and butternut (LDARD, 2012 and DAFF, 2011).

Table 9.6. Estimates of output and income levels for selected vegetable crops produced in Winter by SHAW-YE in the Madimbo Corridor and Mutale Valley

PRODUCTION INDICATORS	SELECTED WINTER VEGETABLE CROPS		
	Tomatoes	Okra	Butternut
[1]Estimated Mean Cultivated Area (ha)	3.71	2.13	1.99
[2]Estimated Mean Output (kg)	(1000 Crates X 25) 25 000	(100BagsX 3 kg) 300	(100X20 kg) 2000
[3]Estimated Mean Income from Vegetable Crops (Rands)	150 Rands per 25 kg 6 Rands/kg	50 per 3 kg 16 Rands/kg	40 per 20 kg 2 Rands/kg
[4]Estimated adjusted Income based on Mean output	150 000	4999.99	4000
[5]Estimated proportion of SHAW-YE cultivating the stated Vegetable Crop	0.14	0.04	0.03
[6]Estimated Total Area (ha) cultivated in the Vhembe District by SHAW-YE	65547.00	89338.00	65547.00
[7]Adjusted Total Area (ha) cultivated with selected crops	9176.58	3573.52	1966.47
[8]Estimated Total Output (kg) adjusted cultivated area in Vhembe	73 530 288.46	503 312.68	1 976 351.76
[9]Informal Market Price	R6/kg	R16/kg	R2.00/kg
[10]Estimated Total Value earned by SHAW-YE in Vhembe District (Millions Rands)	441 181 730.77	8 053 002.82	3 952 703.52
[11]Market Price	R13.98	R5.00	R10.41
[12]Estimated Total Value earned by SHAW-YE in Vhembe using Market price (Millions Rands)	1 027 953 432.67	2 516 563.40	20 573 821.82

[1]Estimated Mean Cultivated Area (ha) = estimated from data analysis mean cultivated area

[2]Estimated Mean Output (kg) = Number of crates multiplied by the weight of crate (25 kg)

[3]Estimated Mean Income from Vegetable Crops = informal market price

[4]Estimated Adjusted Income based on Mean Output = (2) X (3)

[5]Estimated proportion of SHAW-YE (Smallholder Agricultural Entrepreneur) cultivating the crop out of total in Vhembe (SHAW-YE = 230 000)

[6]Estimated Total Area (ha) cultivated in the Vhembe District = estimated from crop suitability model

[7]Adjusted Total Area (ha) cultivated in the Vhembe District = Estimated to be the proportion (5) X Estimated area (ha) in Vhembe (6)

[8]Estimated Total Output (Kg) adjusted to cultivated are in Vhembe District = [(2) X (7)]/(1)
[9]Informal Market Price
[10]Estimated Total Value earned by SHAW-YE in Vhembe District (Millions Rands) = (8) X (9) (Informal Market Price)
[11]Market Price
[12]Estimated Total Value earned by SHAW-YE in Vhembe District (Millions Rands) = (8) X (11) (Market Price)

Similarly, the same authors reported variations in production outputs per hectors that were comparable for SHAW-YE. With estimates of price used from informal markets the income based on mean output was higher for tomatoes than Okra and butternut. The SHAW-YE on average made more money R150 000.00 with Tomatoes, followed by Okra with R4999.99 and last Butternut with R4000.00 on an average unit of production with an adjusted total area in hectors cultivated used to estimate the total output in Vhembe District Tomatoes was found to be the most cultivated crop followed by Okra and Butternut. Using the informal market price Tomatoes, Okra and Butternuts are estimated to contribute about 441 Million Rands, 8 Million and 4 Million of Rands to the informal economy of Vhembe, respectively. Using the formal markets prices the values change to about one billion for Tomatoes, 2.5 Million for Okra and 20 million for Butternut, respectively.

9.4.2. Production Indicators for Selected Vegetables in Summer

The estimates of output and income levels for selected vegetable crops produced by SHAW-YE in the Madimbo Corridor and Mutale Valley are shown in Table 9.7. For the three selected vegetable crops under investigation, it was shown that their average cultivated areas in hectors were 3.71 for tomatoes, 1.64 for Okra and 1.94 for butternut, respectively. These results were like related studies on SHAW-YE for tomatoes (Nesamvuni et al., 2003; Gwebu et al., 2018; and Mango et al., 2015), for Okra (Ekunwe et al., 2017; Kumar et al., 2010 and Okunade et al., 2009) and butternut (LDARD, 2012 and DAFF, 2011). With estimates of price used from informal markets the income based on mean output was higher for tomatoes than Okra and butternut. The SHAW-YE on average made more money R50 100 with Tomatoes, followed by Okra with R49 849 and last Butternut with R2500 on an average unit of production.

With an adjusted total area in hectors cultivated used to estimate the total output in Vhembe District Okra was found to be the most cultivated crop followed by Tomato and Butternut. Using the informal market price Tomatoes, Okra and Butternuts are estimated to contribute about 124 Million Rands, 105 Million and 5 Million of Rands to the informal economy

of Vhembe, respectively. Using the formal markets prices the values change to about 433 Million for Tomatoes, 33 Million for Okra and 21 million for Butternut, respectively.

Table 9.7. Estimates of output and income levels for selected vegetable crops produced in Summer by SHAW-YE in the Madimbo Corridor and Mutale Valley.

PRODUCTION INDICATORS	SELECTED WINTER VEGETABLE CROPS		
	Tomatoes	Okra	Butternut
[1]Estimated Mean Cultivated Area (ha)	3.71	1.64	1.94
[2]Estimated Mean Output (kg)	(501 Crates X 25) 12 525	(1001 Bags X 3 kg) 3003	(50X20 kg) 1000
[3]Estimated Mean Income from Vegetable Crops (Rand)	100 Rand per 25 kg 4 Rand/kg	50 per 3 kg 16 Rand/kg	50 per 20 kg 2.5 Rand/kg
[4]Estimated adjusted Incom based on Mean output	50 100	49 849.8	2500
[5]Estimated proportion of SHAW-YE cultivating the stated Vegetable Crop	0.14	0.04	0.03
[6]Estimated Total Area (ha) cultivated in the Vhembe District by SHAW-YE	65547.00	89338.00	65547.00
[7]Adjusted Total Area (ha) cultivated with selected crops	9176.58	3573.52	1966.47
[8]Estimated Total Output (kg) adjusted cultivated area in Vhembe	30 980 233.02	6 543 463.76	1 976 351.76
[9]Informal Market Price	R4/kg	R16/kg	R2.50/kg
[10]Estimated Total Value earned by SHAW-YE in Vhembe District (Millions Rand)	123 920 932.10	104 695 420.2	4 940 879.40
[11]Market Price	R13.98	R5.00	R10.41
[12]Estimated Total Value earned by SHAW-YE in Vhembe using Market price (Millions Rand)	433 103 657.60	32 717 318.80	20 573 821.82

[1]Estimated Mean Cultivated Area (ha) = estimated from data analysis mean cultivated area

[2]Estimated Mean Output (kg) = Number of crates multiplied by the weight of crate (25 kg)

[3]Estimated Mean Income from Vegetable Crops = informal market price

[4]Estimated Adjusted Income based on Mean Output = (2) X (3)

[5]Estimated proportion of SHAW-YE (Smallholder Agricultural Entrepreneur) cultivating the crop out of total in Vhembe (SHAW-YE = 230 000)

[6]Estimated Total Area (ha) cultivated in the Vhembe District = estimated from crop suitability model

[7]Adjusted Total Area (ha) cultivated in the Vhembe District = Estimated to be the proportion (5) X Estimated area (ha) in Vhembe (6)

[8]Estimated Total Output (Kg) adjusted to cultivated are in Vhembe District = [(2) X (7)]/(1)

[9]Informal Market Price

[10]Estimated Total Value earned by SHAW-YE in Vhembe District (Millions Rands) = (8) X (9) (Informal Market Price)

[11]Market Price

[12]Estimated Total Value earned by SHAW-YE in Vhembe District (Millions Rands) = (8) X (11) (Market Price)

9.4.3. Seasonal Economic Indicators Comparisons for the contribution of the selected Vegetables in Summer

There was no seasonal variation in the estimated mean cultivated area in (ha) for Tomatoes, but a decrease in Okra from an average of 2.13 ha per farmer in winter to 1.64 ha in summer. The decrease in the mean cultivated area in hectors for butter was negligible. The mean output in (kg) decreased on average to half the production in Tomatoes, and Butternut, whereas the mean output for Okra increased 10-fold from 300 kg to 3000 kg. There was no seasonal variation in the Informal Market Price (IMP) of Okra, but the IMP of Tomato decreased in summer from an average of six South African Rands (R) to four South African Rands. The IMP of Butternut increased in summer by small margin of 50 cents. Seasonal comparison of the vegetable crops in terms of SHAW-YE income using the Estimated Adjusted Income with (IMP) based on output indicates that entrepreneurs are making more money in winter with Tomatoes than with other two crops. However, in summer Okra earns the SHAW-YE as much income as Tomatoes compared with half earned from Butternut.

Similarly, the regional contribution made by SHAW-YE producing Okra increased in summer from 8 Million to an estimated 105 Million. Tomato contribution decreased its contribution from 441 Million to 124 Million, with Butternut increasing its contribution in Summer by almost a million Rands. Using the estimated Formal Market Price of the selected vegetable crops, Tomatoes contribution to the regional economy form SHAW-YE was estimated to over One Billion in winter which decrease to R433 Million in summer. However,

Okra's contribution increases from just over Two Million Rands in winter to over 33 Million Rands in summer. There was no seasonal variation in the contribution of Butternut to the regional economy with a static value of just over R20 Million.

9.5. Conclusions

The participation of SHAW-YE in Agriculture through vegetable production was significant measured by the irrigated land under Tomatoes, Okra and Butternut. The levels of income broadly indicate a contribution to the informal economy which is mostly rural. From a policy perspective there should be an ongoing support especially the commercialization of SHAW-YE and continued support to link produce to the market channels such as retail shops, fresh produce market and processing facilities.

The objective of cultivating the selected vegetables was mainly for selling – re-emphasizing the fact that SHAW-YE are indeed market oriented but with loose value chains. There seems to be an optimum utilization of natural resources such as compost and manure combined with inorganic fertilizers. This creates an environment of low cost with an effort to maximize production with less. From a policy perspective there should be continued support to SHAW-YE with Input Support Policy ILIMA-LETSEMA. Tomato seems to be an appropriate winter crop based on the agro-ecological and economic indicators of the study. Similarly, Okra seems to make a better contribution as a summer crop than tomatoes. These results re-affirms that women make essential contributions to agriculture and rural agricultural enterprises.

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CHAPTER 10
CONCLUSIONS AND RECOMMENDATIONS

10.1. The Background Narrative to Long-term Sustainability

This section presents aspects and key issues that are critical to enhance long term sustainability of Women and Youth Agricultural Entrepreneurs. Central to this report should therefore be the definition, and components of Sustainable Agriculture. There is no one commonly accepted definition of sustainable agriculture. Several definitions deserve some consideration for purposes of giving directions to the context of Smallholder Women – Youth Agricultural Entrepreneurs (SHW-YAE) sustainability.

The Director of the LISA Program for USDA notes that, " 'Sustainable' means the capability to continue producing food and fibre indefinitely and *profitably* without damaging the natural resources and *environmental* quality on which all of us depend" (Schaller, 1989). Conway and Barbier (1990) defined sustainable agriculture as the ability to maintain productivity, whether of a field, farm, or nation, in the face of stress or shock such as increasing salinity, or erosion, or debt, or a new pest, or a rare drought or a sudden massive increase in input prices.

The definition of the United Kingdom governmental Department of Environment Food and Rural Affairs (DEFRA) signifies several important attributes of sustainable agriculture: availability to the consumers of adequate supplies of wholesome varied and reasonably priced food, produced within accordance with generally accepted environmental and social standards, flexible and competitive industry which contributes to an economically viable rural society, effective protection of the environment and prudent use of natural resources, conserved and enhanced landscape, wildlife, cultural and archeologically value of agricultural land and respecting of high level of animal welfare, contribute to the long-term sustainability of rural communities(DEFRA, 2006).

The OECD definition of sustainable agriculture says that this is agricultural production that is economically viable and does not degrade the environment over the long run (OECD, 2000). The Committee for Agriculture of the Food and Agriculture Organization of the United Nations (FAO) has reported of changes in the perception in relation to the interpretation of Sustainable Agriculture and Rural Development (SARD) which are emerging:

(a) **The first** is that the concept must extend to social, institutional, and economic sustainability and not exclusively environmental sustainability. Those now working on SARD understand that sustainability means that management practices must be

profitable and socially and culturally suitable and must satisfy local requirements such as property rights over natural resources.

(b) **The second** is a new focus on development as a process which must allow for calculated trade-offs between reductions in the stock of natural capital (forests, unexploited freshwater, etc.) and the generation of resources for investment in human and social capital (healthier and better educated people, technical knowledge, and infrastructure). These shifts in perception increase the challenge of implementing SARD, but also open opportunities for doing so (The Place 2001).

(c) In the United States the term sustainable agriculture was defined in 1977 year as an integrated system of plant and animal production practices having a site-specific application that will, over the long-term satisfy human food and fibre needs, enhance environmental quality and the natural resource base upon which the agriculture economy depends, make the most efficient use of non-renewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls, sustain the economic viability of farm operations and enhance the quality of life for farmers and society as a whole (National 1977).

(d) The United States Network of Sustainable Agriculture Research and Education (SARE) defines thus sustainable agriculture refers to an agricultural production and distribution system that achieves the integration of natural biological cycles and controls, protects and renews soil fertility and the natural resource base, optimizes the management and use of on-farm resources, reduces the use of non-renewable resources and purchased production inputs, provides an adequate and dependable farm income, promotes opportunity in family farming and farm communities, minimizes adverse impacts on health, safety, wildlife, water quality and the environment (Food, 1990).

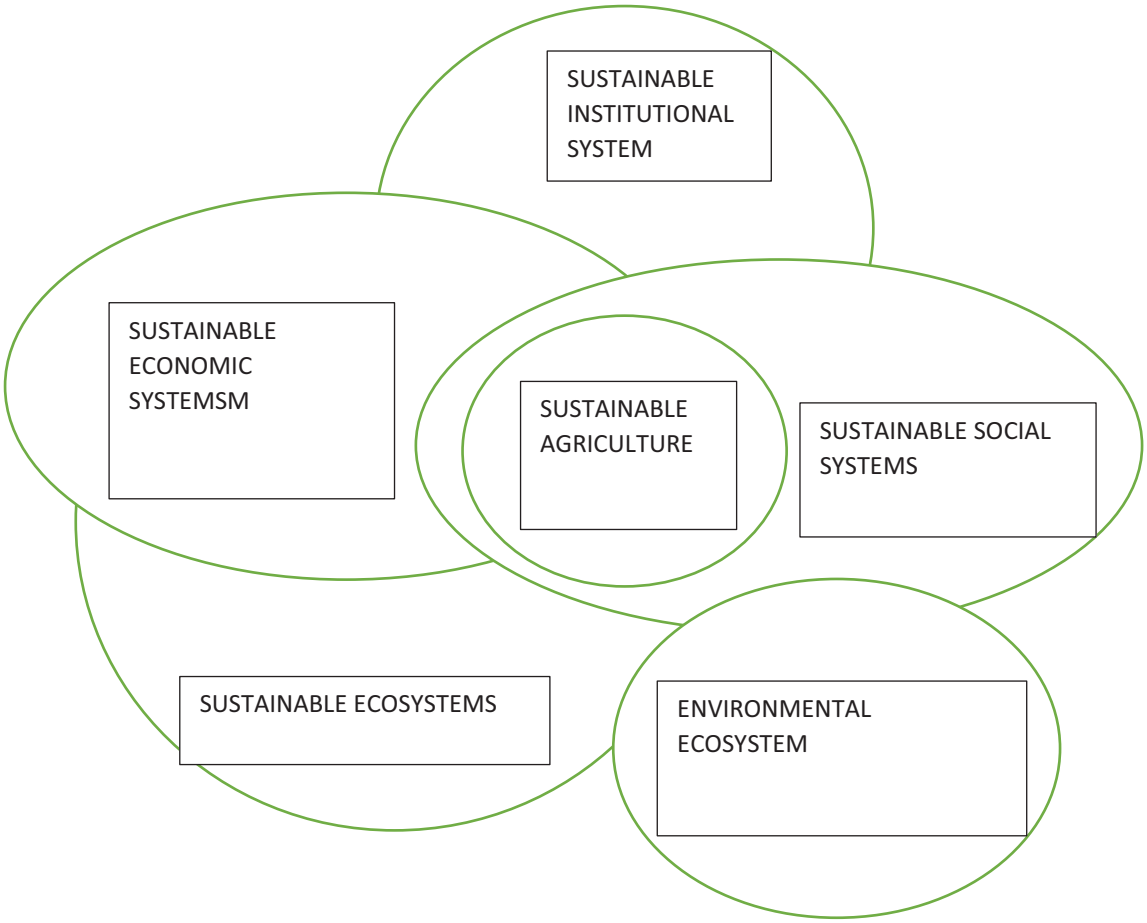

Figure 10.1. Coherent Subsystems for Sustainable Agriculture (Economic, Social, Environmental & Institutional

To sum up all the contributions on the definition and components of Sustainability of Agriculture the report will focus on the state of four coherent subsystems within which agriculture is operating. They are economic, social, environmental, and institutional (Figure 10.1).

The following sections will focus on the Agricultural Sustainability Model and components to project that contributes to the long-term sustainability of the enterprises led by women and youth entrepreneurs. For purposes of this report four coherent subsystems within which smallholder agriculture operate were considered for conclusions and recommendations. These were the environmental, economic, social, and institutional subsystems.

10.2. The Agricultural Sustainable Model – Conclusions & Recommendations

10.2.1. Enhancing the Long-Term Social Sustainability of W-Y SHAE

In this study only 24.15 percent of the SHAEs were within the ages of 30-34 years the category likely to understand issues involved in farming and with necessary information regarding climate and business risks. The majority (52.72%) of the SHAE were Adults of the

ages between 36 to 59 years and therefor aging. In the same logic over two-third (65.70%) of SHAEs had secondary education which is the level of education with a strong influence on the extent to which a farmer can access. Focussing on women the study showed that W-Y SHAE were mostly female (94.9%), and adults of 36-59 years (52.72%) with rather little education where 27.84% possessed primary while 39.86% had secondary education. Most participants (88.65%) were not formally employed (54.61% were self-employed and 34.04% were full-time farmers. W-Y SHAE probably experienced some level of poverty with 68.03% receiving low household incomes (R1 001 to R5 000/month) and 77% dependent on social grants. It was interesting to note that 65.31% of participants stayed in houses with multiple rooms mostly with cement brick walls and corrugated iron roofs (54.42%). They all had access to electricity and possessed a stove and fridge. Majority owned radio (96.67%), digital satellite television (87.45%), and vehicle (65.56%). They all had cell phones except for 6.19% of males. Also, worth noting is the fact that 91.84% of W-Y SHAE participants reported having had an adequate food supply with 79.38 having provided three meals per day.

However, the situation was different during hard times where most (49.56%) provided two meals with only 40.27% maintaining three meals. As revealed by participants, the reason for the provision of fewer meals was mostly delayed maturity of farm produce. However, their monthly returns received though above the international minimum poverty lines of R900.00 had to be supplemented by social grants that consist of child grant and old age grant.

10.2.2. Recommendations

The need for addressing challenges related to transformation in line with new policies of government and sourcing of financial resources (budget) cannot be overemphasized. It is recommended that:

(a) Extension Program Coordinating Units be established to mainstream the contribution that External Stakeholders and Government make to smallholder farmers.

(b) Farmer Field schools and other partnership models should be promoted by government for transfer of skills from experienced farmers to youth. In return youth farmers should help transfer technology and information to older farmers.

(c) Farmers should also be provided with content related education through extension agents and other appropriate means. About 61.7% SHAW-YE were at the level of Adult Basic Education & Training (ABET) indicating low level of education for most women farmers.

(d) Government should enhance skills training on-farm to SHAW-YE to complement the farmers experience with cultivation of vegetables.

(e) About 45.8% of the SHAW-YE earned less than R5000.00 compared with 50.7% earning more than R5000.00. Markets channels and access should be promoted for SHAW-YE to enable throughput of vegetables to not only informal but also fresh produce and retail markets.

All the demographic indicators suggest that government support for W-Y SHAE should be continued for the following social reasons:

(f) The sector offset the challenge of food security for the rural poor (92% having adequate food supply and 79.4% able to provide three meals per day), the returns on investment to this sector should not just be measured in economic returns but the social stability that indirectly create opportunities for economic growth through agricultural value addition.

(g) Food security also create a base for broader human capital development, at school youth with adequate meals perform better at school compared to hunger-stricken youth.

(h) The sector is a major creator of employment for rural communities the study showed that (88.65%) of W-Y SHAE were not formally employed (54.61%) were self-employed and 34.04% were full-time farmers. This is a major contribution that stabilises provinces such as Limpopo and the informal economic boom in Vhembe District.

(i) The level of income also manifested not only in profits or returns from farming but the total livelihood of the W-Y SHAEs households. They were reported to stay in well-built multiple roomed houses (65.3%), majority owned radio (96.67%), digital satellite television (87.45%), and vehicle (65.56%). They all had cell phones except for 6.19% of males. These facts indicate that the W-Y SHAE are all set for a digital platform of the future.

(j) Lastly, the indicators are very favourable for government in terms of political stability in an environment of Covid-19 and the need for the economy to recover.

10.2.3. Enhancing the Long-Term Environmental Sustainability of W-Y SHAE

The geo-physical attributes showed that Madimbo Corridor varied from Arid and Semi-arid whereas the Mutale Valley varied from Semi-Arid to Sub-humid. An Arid area was characterized by a severe lack of water resources to the extent of hindering the development of plants and vegetation. The study area had variable precipitation with low rainfall (at most 460 mmpa) received by villages along the Madimbo Corridor and medium to high rainfall (701 to 1 380 mmpa) received by those along the Mutale Valley. The annual maximum temperatures ranged from 38.1℃ to 44.0℃ (Madimbo Corridor) and 30.0℃ to 40.0℃ (Mutale

Valley). The study area relied on surface water supplemented by groundwater which was utilized more at Madimbo Corridor compared to Mutale Valley. The area was characterized as semi-arid to sub-humid, hence technologies for efficient use of irrigation water should be promoted for long term sustainability. Similarly, investment needs to be made for groundwater exploration and exploitation where necessary. Evidence of the study showed that W-Y SHAE based in the Madimbo Corridor (Ha-Gumbu, Malale, Masea, Ngwele, Tshipise, Masea and the Musina-Nwanedi) villages use more of underground water to supplement the surface water – river systems more than the Mutale Valley (Tshiombo, Matangari, Maraxwe). The Madimbo Corridor varies from Arid and Semi-arid whereas the Mutale Valley varied from Semi-Arid to Sub-humid. The smallholder farmers are allotted conforming to their agroecological requirements. However, the prime agroecological variable defines the spatial distribution of the smallholder subtropical farmers in the water resource. The potential of the smallholder farmers is restricted by the low adoption of surface water resources. The adoption of the gravity-driven irrigation system holds the potential to amplification of the smallholder sector.

The geo-physical character meaning the predominance of arid to semi-arid of the area of study meant that there was a lack brought forth by the prevalence of the evapotranspiration to the rate of the precipitation. Agricultural production in this category is impossible with the exception where there is irrigation.

10.2.4. Recommendations

Cristal issues identified as components of Agricultural Sustainability towards the long-term sustainability of W-Y SHAE were the following:

(a) Most of the W-Y SHAE therefore cultivate the crops in winter when the micro-climate permits and gives the W-Y SHAE a competitive advantage of high temperatures in winter to grow major horticultural and field crops ahead of the rest of the country. The sustainability of the sector can be improved through the adoption of the smart intercropping system even for Sub-tropical Fruit Trees.

(b) W-Y SHAE uses pesticides for their crops with risks that needs to be mitigated. Considerable evidence links pesticide uses to chronic health problems in farmers, and pesticides are known to bio-accumulate in soil and water and also be very harmful to ecosystems and wildlife. Fresh produce vendors, meanwhile (a group that includes many farmers), are often unaware of the potential health risks to consumers or themselves.

(c) The results of the study indicated that in both winter and summer mainly women participation was higher at (38.4%) and (50.0%), respectively. The second category of

participation was exclusively women in winter (45.2%) and summer (38.1). These results re-affirms that women make essential contributions to agriculture and rural agricultural enterprises. However, it should be noted that there is much diversity in women's roles and over-generalization undermines policy relevance and planning.

(d) Although surface water was generally perceived as the most used (55.4%), groundwater (used by 44.2% of SHAEs) was also an important source of irrigation water; groundwater was regarded to have better supply quantity compared to surface water while also being always available

(e) Irrigation scheduling was generally based on intuition and practices of rotation without being backed by science-based information for long terms sustainability, there will be a need for Research-Extension-Farmer linkages to develop irrigation scheduling depending on crops.

(f) Competition for irrigation water seemed to be an issue although not yet at the level of causing major conflicts among the SHAEs the model that supplement surface water resources with groundwater is recommended.

10.2.5. Enhancing the Long-Term Economic Sustainability of W-Y SHAE

The participation of SHAW-YE in Agriculture through vegetable production was significant measured by the irrigated land under Tomatoes, Okra and Butternut. The levels of income broadly indicate a contribution to the informal economy which is mostly rural. From a policy perspective there should be an ongoing support especially the commercialization of W-Y SHAE and continued support to link produce to the market channels such as retail shops, fresh produce market and processing facilities.

The objective of cultivating the selected vegetables was mainly for selling – re-emphasizing the fact that SHAW-YE are indeed market oriented but with loose value chains. There seems to be an optimum utilization of natural resources such as compost and manure combined with inorganic fertilizers. This creates an environment of low cost with an effort to maximize production with less. From a policy perspective there should be continued support to W-Y SHAE with Input Support Policy ILIMA-LETSEMA. Tomato seems to be an appropriate winter crop based on the agro-ecological and economic indicators of the study.

Similarly, Okra seems to make a better contribution as a summer crop than tomatoes. These results re-affirms that women make essential contributions to agriculture and rural agricultural enterprises. For long term sustainability the Agricultural Model is recommended for adoption. Limpopo and Gauteng Department of Agriculture through ENVIRO-GIS have already developed basic frameworks for use in land and commodity suitability models for smallholder farmers.

An Agricultural Model reflected in Figure 10.2 shows the components of the model with natural resource base constituted of soil, terrain, climate, water, and pasture. From the natural resource base, we have commodities that are affected by the economics (cost, value chain, markets, local and international parameters). The SHA-SE are the agents of change through the management of the natural resources and the economics associated with the commodities to create jobs, in turn influenced by capabilities, policies, strategies, research and development. These model plays itself out in the implementation in the country, province, District, Local Municipality, Ward, Villages, and household.

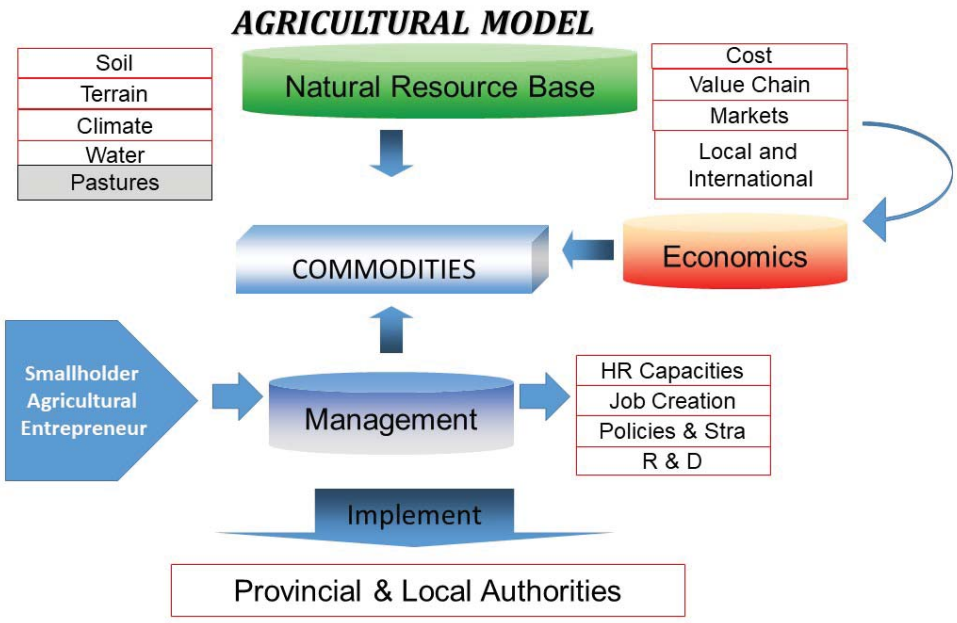

Figure 10.2. The Agricultural Model

10.2.6. Enhancing the Long-Term Institutional Sustainability of W-Y SHAE

The stakeholders regarded as key for success of smallholder production of subtropical fruits and indirectly by W-Y SHAE in the study area were Limpopo Department of Agriculture and Rural Development (LDARD), South African Mango Growers Association (SAMGA), Agriculture Research Council (ARC) and National Agriculture Marketing Council (NAMC). The roles of these four stakeholders were also to provide information perceived by 100% of the respondents. As for challenges, the main issue reported for stakeholders were: SAMGA – (probably lack of) transformation (95% of respondents), ARC – (lack of) budget (82%), NAMC – (lack of) budget (47%), and LDARD – standard of extension officers (10%) and budget (9%).

10.2.7. Recommendations

For long-term sustainability the following needs to be considered:

(a) Increased production of subtropical fruits by W-Y SHAE in the study area requires clarification of the roles of each of the stakeholders to the farmers. Strategies should be developed to strengthen the knowledge base of each stakeholder in accordance with confirmed roles as this will enable the stakeholders to improve their contribution to increased production and transformation of the subtropical fruits industry.

(b) Stakeholders should be assigned leadership of tasks based on their roles and knowledge base to avoid unnecessary duplication and conflicts. The need for addressing challenges related to transformation in line with new policies of government and sourcing of financial resources (budget) cannot be overemphasized.

(c) Stakeholders as individuals seem not to provide solutions for the multiplicity of agricultural challenges. Respondents regarded certain combinations of these stakeholders to be important, namely: SAMGA, ARC, and NAMC (28%), SAMGA, LDARD, and ARC (27%), SAMGA and ARC (18%), SAMGA, LDARD, NAMC, and ARC (11%). The four stakeholders were regarded as key by 100% of the respondents because they all provide information to W-Y SHAE. For instant, SAMGA and LDARD provide information on farming, ARC provide information on research and NAMC provide information on marketing. Information plays an important role, and it is a valuable resource because it guides W-Y SHAE for effective decision making in their farms.

(d) Extension Program Coordinating Units be established to mainstream the contribution that External Stakeholders and Government make to smallholder farmers.

10.3. Emerging Issues from the Study

(a) The analysis forms this study conforms with the theoretical advances that states that the sustainability concept must extend to social, institutional, and economic sustainability and not exclusively environmental sustainability. The W-Y SHAE practices must be profitable and socially and culturally suitable and must satisfy local requirements such as property rights over natural resources. It was clear from our study and our experience as part of the community that W-Y SHAE had several constraints in terms of ownership mainly (1) weak relationships with other stakeholders resulting in limited access to information, (2) lack of access to funding, and (3) poor land tenure.

(b) What also emerged from this study was that the sustainability model components are not in themselves sufficient to explain the complete complexity of the situation of W-Y SHAE. It was more the association of variables and the interaction of the independent component with each other that forms the model of sustainability.

(c) The terminology adopted in this report associated Agriculture and the independent components for example Social elements thus become Agro-Social component. Similarly, for Economic element became Agro-Economic, for Environmental – Agro-Environmental, for Institutional – became Agro-Institutional. Arising form, the same associations are established terminologies that were developed through individual elements with each other for example Social and Economic elements were closely linked. Same could be argued for Social and Institutional, Social and Environmental.

(d) W-Y SHAE depend on natural available water bodies. This study investigated the water issues in detail inclusive of developing a model for crop suitability based on the use of both surface and groundwater. Legally the matter of Water Rights which also correlate to Energy – Electricity access is a great impediment for W-Y SHAE. Policy on this matter especially relating to SHAE needs to be reviewed.

(e) W-Y SHAE are renowned for intercropping farming system although, that is hindered by the limited land-size (2 ha mean). Some farmers are stuck on crop specialization, where a farmer focuses on a particular crop. The challenges with such a farming system include confining the income generation to the seasonality of the crop, sensitivity to the market price if it becomes saturated, and proneness to total production less through pests. On the other hand, a smart intercropping system ensures that the farmer incorporates crops with variable harvest seasons to ensure that the prospective income generation is spread almost throughout the year.

(f) There is underutilization of the agricultural potential areas throughout the district. Makhado exhibit a significant extent of the untapped avocado potential in Tshakhuma, Beaufort, Mutale B, Halahala, and Ha-Lambani. Citrus also reveals the substantial spatial potential that does not coincide with smallholder operations in Matshavhawe, Dopeni, Lambani, Beaufort, Mutale B, Halala, and Tshitungulwane. Interestingly, Halambani, Nkuzana, Matshavhawe, and Mutale B, show the potentiality for all the selected horticultural and field crops however, there is no farming in the area.

(g) One of the greatest challenges of the smallholder farmers is the access to land and the legal framework that prohibits their participation in agriculture. From the survey done as part of this study it was revealed that new applicants cannot be offered a land size above 3 ha. Most of the farmers (70%) acquire their land through permission to occupy and the rest (30%) are renting. The PTO is issued by the Tribal Authorities. However, this institution hardly offers the smallholder farmers a land size that exceeds

3 ha, especially to new farmers. Meanwhile, this form of a certificate does not transfer the land ownership to the applicant, because the land may be redeemed due to incompliance to the bylaws, political reasons, and new development projects. This implies that no ownership security is guaranteed to the farmers. The emerging discussions on Land through Traditional Leadership Forums, House of Traditional Leaders and The National Department of Cooperative Government and Traditional Affairs policy must be considered.

(h) An additional challenge that is posed by PTO is that the smallholder farmers are deprived of access to the financial institutions because they cannot provide any form of collateral. Apart from the agroecological parameters, the administrative settings prohibit the development of smallholder farmers. Despite the NDP prescription on the potentiality of the sector in job creation and wealth redistribution, there is still limited funding that has resulted in limited institutional support to the sector and a conducive operational environment.

10.4. References

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ANNEXURE 1
PUBLICATIONS & CAPACITY BUILDING REPORT

11.1. Introductions

The project was designed to build capacity throughout the value chain to completion. Postgraduates' students were involved in planning, data collection, workshops to draft papers and publications. The four doctoral students (Webb Bernadette, Mahopo Tjale Clopus, Mavhungu Tsumbedzo Jutas, and Ndwambi Khuthadzo) are due to submit their dissertations 2022. The list of congress Abstracts, and Short papers shows the level of participation of Postgraduate students with six (6) out of 17 short papers having them as first authors and the rest as co-authored. Similarly, three (3) of eight papers (8) with Postgraduate students as first authors. This exercise on its own build the capacity for Scientific Writing among the postgraduate students. Mention needs to be made that there are a potential 10 papers that are still being processed as part of this project and student's doctoral thesis that will accrue as publications after the submission deadline. WRC's investment has gone far enough to generate new knowledge and build capacity in the existing crop of students.

The project in many respects involved farmers in the study area who participated in focus group discussions which were reported in the project's reports. The farmers continue to operate in the same commodity groupings for market access and extension support. The projects also capacitated Extension Officers who engaged the researchers on data collection, facilitation of meetings with farmers and stakeholders and also discussions on policy implementations, gaps and potential reviews.

11.2. Publications

11.2.1. Congress Abstracts & Short Papers

11.2.1.1. Project Based

1) Sikhipha, N.M., Tshikolomo, K.A., Nesamvuni, A.E., Van Niekerk, J., Mpandeli, N.S. 2020. Analysis of Multiple Stakeholders Influencing Smallholder Producers of Subtropical Fruits in the Limpopo Province of South Africa. South African Society of Agricultural Extension Congress 2020/2021

2) Tsumbedzo J. M., Nesamvuni, A.E., Tshikolomo, K. A., Raphulu, T., van Niekerk, J., and Mpandeli, N. S., 2020. Characterization of Irrigated Smallholder Agricultural Entrepreneurs Households Led by Women and Youth in Vhembe District. South African Society of Agricultural Extension Congress 2020/2021

3) Tjale Cloupas Mahopo, Cebisa Nesamvuni, Johan Van Niekerk & Edward Nesamvuni. 2021. Perceptions of Women Street Food Vendors on the determinants of competitiveness of the street food enterprise in the rural towns of Vhembe District, Limpopo Province Presenter/s: Virtual Humanities Conference, Critical Food Studies – South Africa & Beyond. South Africa

11.2.1.2. *Other Projects*

1) Maponya P., Du Plooy CP., Backeberg GR., Mpandeli SN and Nesamvuni AE. 2018. The Determination of the Potential Constraint of Rainwater on the Establishment and Expansion of Agroforestry in Limpopo Province, South Africa. Proc. 2018 International Commission on Irrigation & Drainage Conference, Saskatchewan, Canada.

2) Mpandeli N.S., Moeletsi M., Masupha T., Liphadzi, SM., Nesamvuni AE., and Tshikolomo KA., 2018. Assessment of climate change-related risks on smallholder farmers in the Capricorn district of Limpopo Province, South Africa. Proc. 2018 International Commission on Irrigation & Drainage Conference, Saskatchewan, Canada.

3) Maponya P., Venter, SL., Du Plooy CP., Backeberg GR., Mpandeli SN and Nesamvuni AE. 2018. Perception on constraints to agro-forestry competitiveness: A case study of smallholder farmers in Limpopo Province, South Africa. Proc. Of the IX International Agriculture Symposium “Agrosym 2018”, Bosnia & Herzegovina., 2189-2195

4) Maponya P, Venter SL, Du Plooy CP, Backeberg GR, Mpandeli SN and Nesamvuni AE, 2019. Research, Extension Services and Training as Key Drivers to Agroforestry Adoption in Limpopo Province, South Africa. 3rd World Irrigation Forum (WIF3), Bali Indonesia.

5) Maponya P, Venter SL, Du Plooy CP, Backeberg GR, Mpandeli SN and Nesamvuni AE, 2019. Evaluation of the Timber Based Mixed Farming/Agro-Forestry Systems: A Case of Farmers in Limpopo Province, South Africa. 4th World Congress of Forestry

6) Nesamvuni, A.E., Tshikolomo, K.A, Lekalakala, G.R., Raphulu, T., Petja, M.B., Van Niekerk, J., and Mpandeli, N.S., 2020. Agro-Ecological Characterization of Smallholder Livestock Farming System in Limpopo-Mpumalanga Provinces. Southern African Society of Grassland Sciences Virtual Congress 2020

7) Nesamvuni, A.E., Tshikolomo, K.A, Lekalakala, G.R., Raphulu, T., Petja, M.B., Van Niekerk, J., and Mpandeli, N.S., 2020. Vulnerability Assessment for Smallholder

Livestock farmer to the Changing Climate. Southern African Society of Grassland Sciences Virtual Congress 2020.

8) Syed Md. T. M., Van Loon, A., Artur, L., Bharucha, Z., Chinyama, A., Chirindja, F., Day, R., Franchi, F., Geris, J., Hussey, S., Nesamvuni, A.E., Nhacume, A., Petros, A, Roden, A., Rohse, M., Tirivarombo, S. and J.C. Comte. 2020. Multisector collaborative groundwater-surface water modelling approach to improve resilience to hydrological extremes in the Limpopo River Basin. Geo-Ethics and Groundwater Management Congress, Porto, Portugal 2020

9) Syed Md Touhidul Mustafa, Oluwaseun Franklin Olabode, Luis Artur, Zareen Bharucha, Annatoria Chinyama, Farisse Chirindja, Rosie Day, Fulvio Franchi, Josie Geris, Stephen Hussey, Edward Nesamvuni, Alcino Nhacume, Alfred Petros, Hanne Roden, Melanie Rohse, Sithabile Tirivarombo, Anne Van Loon and Jean-Christophe Comte. 2020. Increasing resilience to floods and droughts in the Limpopo river basin: development of a basin scale hydrological model to support sustainable groundwater management. 2020 3rd SADC Groundwater Conference, Number: 21

10) Nesamvuni, A.E., Ndwambi, K., Tshikolomo, K.A., Van Niekerk, J., Raphulu, T., Lekalakala, G.R., Petja, M.B. 2020. Smallholder Farmers Perceptions on the Impact of Climate Variability & Extremes on Livestock Production in Limpopo & Mpumalanga Provinces. South African Society of Agricultural Extension Congress 2020/2021

11) Nesamvuni, A.E., Ndwambi, K., Tshikolomo, K.A., Van Niekerk, J., Lekalakala, G.R., Petja, M.B. 2020. Climate Vulnerability and Smallholder Livestock Water and Fodder Use Analyses. South African Society of Agricultural Extension Congress 2020

12) Tshikolomo, K.A., Nesamvuni, A.E., Van Niekerk, J., Raphulu, T., Petja, M.B. 2020. Livestock Farmer Demography and Adaptive Capacity to Climate Change and Variability: A Case of Limpopo and Mpumalanga Province of South Africa. South African Society of Agricultural Extension Congress 2020/2021

13) Raphulu, T., A.E. Nesamvuni, K.A. Tshikolomo, G.R. Lekalakala, B.M. Petla, J. Van Niekerk & P.J. Sebei. 2021. Adaptive capacity of smallholder livestock farmers to the impacts of climate change. South African Society of Animal Sciences Congress 2021

14) Nesamvuni, A.E., K.A. Tshikolomo, G. R. Lekalakala, T. Raphulu, B.M. Petla & J. Van Niekerk. 2021. A Framework to Monitor and Evaluate Vulnerability of smallholder

livestock farmer: A case study of Limpopo & Mpumalanga. South African Society of Animal Sciences Congress 2021

11.2.2. *Journal Publications*

11.2.2.1 Project Based

1) Ndwambi, K., Nesamvuni, A.E., Mpandeli, N.S., Tshikolomo, K.A., and Van Niekerk, J. 2020. GIS based Land Suitability Modelling for the Selected Subtropical Fruit – Case of Limpopo Province, South Africa. J Hum Ecol, 71(1-3): 49-61

2) Lebohang M Maele, Azwihangwisi E Nesamvuni, Khathutshelo A Tshikolomo, Sylvester N Mpandeli, David B Afful and David Norris. 2020. Characterization of Youth Agricultural Projects in Limpopo Province of South Africa. Prime Archives in Agricultural Research. In: João Silva Dias, editor. Prime Archives in Agricultural Research. Hyderabad, India: Vide Leaf. 2020. www.videleaf.com

3) Tsumbedzo J. M., Nesamvuni, A.E., Tshikolomo, K. A., Raphulu, T., van Niekerk, J., and Mpandeli, N. S., 2021. Characterization of Irrigated Smallholder Agricultural Entrepreneurs Households Led by Women and Youth in Vhembe District. South African Journal of Agricultural Extension S. Afr. J. Agric. Ext., 49 (3): 104-122.

4) Ndwambi, K., Nesamvuni, A.E., Tshikolomo, K.A., Mpandeli, N.S., Van Niekerk, J., Petja, B.M. 2021. Integrated agro-ecological and groundwater resource for the assessment of the crop suitability potential modelling, a Case of Limpopo Province, South Africa. Asian Journal of Agriculture and Rural Development, 11 (4): 334-345

5) Nesamvuni, A.E., Tshikolomo, K.A., Mpandeli, N. S., De Bruyn, M., Hlophe-Ginindza, S., Van Niekerk, J., 2021.Perceptions on irrigation water supply and utilisation by smallholder agricultural enterprises in Vhembe district of Limpopo Province, South Africa. Technium Journal of Social Sciences 27 (1): 968-979.

11.2.2.2. Other Projects

1) Phokele Maponya, Sonja L. Venter, Christiaan Philippus Du Plooy, Gerhard R. Backeberg, Sylvester Mpandeli, and Edward Nesamvuni. 2020. Timber-Based Mixed Farming/Agroforestry Benefits: A Case Study of Smallholder Farmers in Limpopo Province, South Africa. In: Global Climate Change and Environmental Policy Agriculture Perspectives. Springer pp 275.

2) Van Koppen, B., Hofstetter, M., Nesamvuni, A.E. and Chiluwe, Q. 2020. Integrated management of multiple water sources for multiple uses: rural communities in Limpopo Province, South Africa. Water SA 46(1) 1-11

3) Nesamvuni, A.E., Ndwambi, K., Tshikolomo, K.A., Lekalakala, G.R., Raphulu, T.R., Petja, M.B., Van Niekerk, J., 2021. Smallholder Farmers Knowledge and Information on The Impact of Climate Variability & Extremes on Livestock Production In Limpopo & Mpumalanga Provinces. Technium Journal of Social Sciences 27 (1): 854-869.

4) Tshikolomo, K.A., Nesamvuni, A.E., Petja, M.B., Van Niekerk, J., Mpandeli, N. S., 2021. Livestock Farmer Demography and Adaptive Capacity to Climate Change and Variability in Limpopo and Mpumalanga Province of South Africa. Technium Journal of Social Sciences 27(1): 870-898.

11.3. Conclusions

The project achieved its major objectives in terms of:

(a) Creating a Centre of Excellence with standing networks of academics in SMME, HEI, Science Councils, Government and Farmers.
(b) Human Capital Development: with four Doctoral Students already publishing articles before they graduate.
(c) Dissemination of Knowledge: The total number of publications developed through the project and collaborations funded through the WRC counts to 25. Out of the 25 papers project-based papers were eight (8) being three (3) conference proceeding papers and four (5) publications.
(d) Through the collaborative project a model to predict crop suitability based on both surface and ground water was developed and published as paper number 21.
(e) Developing policy briefs based on the chapters done for support of government initiatives.