

**Factors influencing the level of vegetable value chain participation  
and implications on smallholder farming and food security in  
Swayimane KwaZulu-Natal**

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## **Abstract**

In less developed countries, smallholder farming is important for development that could alleviate poverty, improve livelihoods, and contribute to household food security. However, Smallholder farming in South Africa is synonymous with a myriad of challenges. Key among them being access to markets. Most of the smallholder farmers in South Africa lack access to established commercial markets because of a lack of or limited access to information, assets, and institutions that can support smallholder farmers to produce for formal markets. This study aimed to introduce and test the Smallholder Horticulture Empowerment and Promotion (SHEP) model for vegetable value chain development in Swayimane, KwaZulu-Natal. The SHEP model was used to psychologically empower smallholder vegetable farmers to practice market-orientated agriculture while also acknowledging “Farming as a business”. The study aimed at identifying the existing food value chains in the study area along with the different linkages between value chain actors. The study further identified and explored the factors that influence the participation level in the vegetable value chain and implications on smallholder farming in Swayimane. Furthermore, the study explored the impact of participating in agricultural value chains on household food insecurity. Business linkages between farmers and market actors were identified through the practical implementation of the SHEP. The research approach was both community-based participatory and translational research because it involved training of smallholder farmers. The research adopted a mixed-methods methodology where both qualitative and quantitative approaches to collect data were used. The data was collected from a purposive sample of smallholder farmers using a survey questionnaire, baseline surveys, and a semi-structured focus group discussion questionnaire. The data were analyzed using descriptive analysis, value chain mapping, the nehurstle model, and an instrumental variable Poisson model. The value chain map showed that the coordination among value chain actors is strongly influenced by opportunities and constraints such as a lack of access to credit, lack of access to agricultural inputs, water in-security, infertile soils, lack of storage facilities, packaging, poor infrastructure, lack of market information, and price fluctuations Results from the nehurstle model showed that the age of the respondent, marital status, farm income, household size, cooperative, market information, radio, extension officer, and formal education significantly influenced the participation decisions of smallholder farmers in agricultural value chains. The results further showed that off-farm income, marital status, cooperatives, access to

credit, access to irrigation scheme, radio, extension officer, contact with non-government organizations, and formal education significantly influenced the level of value chain participation of the smallholder farmers. The results from the instrumental variable Poisson model showed that Value chain participation, marital status, age of the household head, formal education, farm income, lease rent on land, access to NGOs, access to credit, access to agricultural agency, access to extension services and access to irrigation schemes were significant in influencing household food insecurity status of smallholder farmers. It can be concluded that the level of endowment in the physical, financial, and human resources influence participation in agricultural value chains. The farmer's level of success and improved outcomes are influenced by access to markets. It is recommended that a market-led approach to farmer development be adopted to improve the commercial prospects of farmers while also enhancing food security. Policy should consider empowerment for market access through effective market-based farmer training and the creation of market and business linkages. This study also concluded that value chain participation had a positive impact on enhancing food security among smallholder farmers. The factors that influence the level of value chain participation among men and women farmers respectively in the study area were identified. Therefore, policymakers must take into consideration and understand the influence that these factors have before drawing policies for value chain development. Furthermore, the SHEP influenced the behavior of the farmers to focus on planting crops that were demanded by the market and to keep records while practice farming as a business.

## DECLARATION 1- PLAGIARISM

I, **Phiwokuhle Ndlovu** declare that:

1. The research reported in this dissertation, except where otherwise indicated, is my original research.
2. This dissertation has not been submitted for any degree or examination at any other university.
3. This dissertation does not contain other person 's data, pictures, graphs, or other information unless specifically acknowledged as being sourced from other sources.
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1 December 2020

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As a research supervisor, I agree with the submission of this dissertation for examination:



1 December 2020

Signed:..... Date.....

Name: Prof. Joyce Chitja

## **DECLARATION 2- DRAFT PUBLICATION MANUSCRIPT**

Details of contribution to draft publication manuscript that form part and/or includes research presented in this dissertation.

### **Publication manuscript 1 (under review)**

**Ndlovu PN, Thamaga-Chitja JM and Ojo TO (2020).** FACTORS INFLUENCING THE LEVEL OF VALUE CHAIN PARTICIPATION AND IMPLICATIONS ON SMALLHOLDER FARMERS IN SWAYIMANE KWAZULU-NATAL.

Author contributions: PN Ndlovu conceived paper with Prof. JM Thamaga-Chitja, PN Ndlovu collected and analyzed data, and wrote the paper. Prof. JM Thamaga-Chitja and Dr. TO Ojo guided the data collection and analysis and guided the manuscript drafting and correction.

### **Publication manuscript 2 (Journal being identified)**

**Ndlovu PN, Thamaga-Chitja JM and Ojo TO (2020).** IMPACT OF VALUE CHAIN PARTICIPATION ON HOUSEHOLD FOOD INSECURITY AMONG SMALLHOLDER FARMERS IN SWAYIMANE KWAZULU-NATAL USING THE INSTRUMENTAL VARIABLE POISSON MODEL.

Author contributions: PN Ndlovu conceived paper with Prof. JM Thamaga-Chitja, PN Ndlovu collected and analyzed data, and wrote the paper. Prof. JM Thamaga-Chitja and Dr. TO Ojo guided the data collection and analysis and guided the manuscript drafting and correction.

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## List of Figures

Figure 2.1: Relationship of value chains and market systems.....	15
Figure 2.2: Market channels for smallholder farmers.....	16
Figure 2.3: Relationship between agency, opportunity structures and empowerment.....	17
Figure 2.4: Two key pillars of SHEP.....	18
Figure 2.5: Asset building for market access.....	21
Figure 2.6: Simplified agricultural value chain.....	22
Figure 2.7: Value chain participation and implications on food security.....	30
Figure 3.1: Map of Swayimane.....	32
Figure 3.2: Workshop to evaluate extension officer readiness to implement SHEP.....	37
Figure 3.3: SHEP implementer conducting a sensitization workshop.....	38
Figure 4.1: Discussion between researcher and research participants.....	47
Figure 4.2: Digitalized value chain map for the Swayimane area.....	47
Figure 5.1: Percentage distributions of the HFIAS score.....	72

## List of tables

Table 2.1: Available water sources in Swayimane and the usage by smallholder farmers.....	13
Table 2.2: SHEP's four essential steps.....	19
Table 2.3: Description of analytical framework.....	29
Table 3.1: Summary of Methodology to specific objectives.....	36
Table 4.1: Profile of the farmers in the study area.....	50
Table 4.2: Factors influencing the level of value chain participation-outcome model-nehurdle model.....	54
Table 5.1: Impact of value chain participation on household food insecurity-Instrumental variable Poisson model.....	74

## **Abbreviations and Acronyms**

**CIMA:** Chartered Institute of Management Accountants

**FAO:** Food and Agriculture Organization

**FGD:** Focus Group Discussion

**IFAD:** International Fund for Agriculture Development

**IFC:** International Finance Corporation

**IFPRI:** International Food Policy Research Institute

**IFSS:** Integrated Food Security Strategy

**ILO:** International Labour Organization

**SHEP:** Smallholder Horticulture Empowerment and Promotion

**UNIDO:** United Nations Industrial Development Organization

**USAID:** United States Agency for International Development

**VCD:** Value Chain Development

**WRC:** Water Research Commission

# Table of Contents

## Table of Contents

Abstract .....	i
<b>DECLARATION 1- PLAGIARISM .....</b>	<b>iii</b>
<b>DECLARATION 2- DRAFT PUBLICATION MANUSCRIPT .....</b>	<b>iv</b>
<b>ACKNOWLEDGMENTS .....</b>	<b>v</b>
List of Figures .....	vi
List of tables .....	vii
Abbreviations and Acronyms .....	viii
Table of Contents .....	ix
<b>1.1 Background Introduction.....</b>	<b>1</b>
<b>1.2 Significance of the study .....</b>	<b>3</b>
<b>1.3 Research problem .....</b>	<b>3</b>
<b>1.4 Specific Research Objectives .....</b>	<b>5</b>
<b>1.5 Research Questions.....</b>	<b>5</b>
<b>1.6 Study Limitations.....</b>	<b>6</b>
<b>1.7 Study Assumptions .....</b>	<b>6</b>
<b>Chapter 2: Literature Review.....</b>	<b>6</b>
<b>2.1 Introduction .....</b>	<b>7</b>
<b>2.2 Smallholder farming vegetable production.....</b>	<b>7</b>
<b>2.2.1 Land ownership and production systems used by smallholder vegetable farmers.....</b>	<b>7</b>
<b>2.2.2 Access to extension services and institutions .....</b>	<b>8</b>
<b>2.2.3 Access to credit.....</b>	<b>10</b>
<b>2.2.4 Access to agricultural inputs and equipment .....</b>	<b>11</b>
<b>2.2.5 Access to water and irrigation technology.....</b>	<b>12</b>
<b>2.2.6 Market access .....</b>	<b>13</b>
<b>2.2.7 Smallholder Farmer Empowerment .....</b>	<b>16</b>
<b>2.2.7 Smallholder Horticulture Empowerment and Promotion (SHEP) Model .....</b>	<b>17</b>
<b>2.2.8 SHEP's Four Essential Steps .....</b>	<b>18</b>
<b>2.2.9 The use of SHEP on market access and vegetable value chains .....</b>	<b>20</b>
<b>2.2.10 The Use of SHEP in South Africa.....</b>	<b>21</b>
<b>2.3 Vegetable value Chain for smallholder farmers .....</b>	<b>21</b>

2.3.1 Value chain analysis .....	21
2.3.2 Vegetable value addition .....	23
2.2.3 Role of gender in value chain development .....	23
2.3.4 Challenges and constraints in value chain participation.....	24
2.4 Smallholder business-farmer linkages .....	25
2.5 Policy implications on vegetable value chains in smallholder farming.....	26
2.6 Food security .....	27
2.7 Theoretical Review .....	28
2.7 Analytical framework.....	28
2.8 Conceptual framework.....	29
<b>Chapter 3: Description of Study Area and Research Methodology.....</b>	<b>30</b>
3.1 Description of the study area .....	30
3.2 Research Design and Methodology .....	32
3.2.1 Sampling Technique and Sample size .....	33
3.2.2 Data collection tools .....	33
3.3 Data analysis .....	34
3.4 SHEP implementation procedures.....	38
3.4.1 SHEP’S four essential steps .....	38
<b>Chapter 4.....</b>	<b>41</b>
<b>Factors influencing the level of value chain participation and implications on smallholder farmers in Swayimane KwaZulu-Natal .....</b>	<b>41</b>
Abstract .....	41
4.1 Introduction & Contextualization.....	43
4.2 Analytical framework.....	45
4.3 Materials and Methods.....	46
4.3.1 Study area and description of sampled farmers .....	46
4.3.2 Research design.....	46
4.3.3 Data Analysis.....	47
4.4 Results and Discussion .....	50
4.4.1 Farmers’ profile .....	50
4.4.2 Factors influencing value chain participation-selection model.....	52
4.4.3 Factors influencing the level of value chain participation-outcome model .....	58
4.5 Conclusions and Recommendations.....	60

4.6 References.....	62
<b>Chapter 5 .....</b>	<b>69</b>
<b>Impact of value chain participation on household food insecurity among smallholder farmers in Swayimane KwaZulu-Natal using the Instrumental Variable Poisson model.....</b>	<b>69</b>
<b>Abstract .....</b>	<b>69</b>
<b>5.1 Introduction and Contextualization.....</b>	<b>70</b>
<b>5.2 Materials and Methods.....</b>	<b>71</b>
5.2.1 Study area and description of sampled farmers .....	71
5.2.2 Research design and Sampling technique .....	71
5.2.3 Data analysis.....	72
<b>5.3 Result and Discussion.....</b>	<b>73</b>
5.3.1 Household Food Insecurity Access Prevalence (HFIAP) in Swayimane .....	73
5.3.2 Results from the Instrumental Variable Poisson model.....	74
<b>5.4 Conclusions and Recommendations.....</b>	<b>81</b>
<b>5.5 References.....</b>	<b>82</b>
<b>Chapter 6: Conclusions and Recommendations .....</b>	<b>86</b>
<b>6.1 Overview.....</b>	<b>86</b>
<b>6.2 Conclusions.....</b>	<b>87</b>
<b>6.3 Policy Recommendations .....</b>	<b>89</b>
<b>7. References.....</b>	<b>90</b>
<b>8. Appendices .....</b>	<b>112</b>

**This thesis represents a compilation of manuscripts (Chapters 4 and 5) where each chapter is an individual entity and some repetition between chapters has therefore been unavoidable.**

# CHAPTER 1: THE PROBLEM AND SETTING

## 1.1 Background Introduction

Smallholder farmers in rural areas farm a variety of vegetables that are green leafy. According to Xaba and Masuku (2013), consuming vegetables is essential for preventing micro-nutrient deficiencies, and vegetable production creates opportunities for smallholder farmers to improve their income and their diet. In south Africa, smallholder farmers in rural areas depend on vegetable production for consumption and for selling to generate household income. According to Ebert (2014), vegetables are valuable to attain food security because they are a source of essential vitamins and micro-nutrients, while playing a very important role as an important source of household income. However, smallholder farmers face production and institutional constraints that limit them from achieving sustainable household income and household food security.

Smallholder farming in South Africa is synonymous with a myriad of challenges (Von Loeper et al., 2016). Key among them being access to markets. The success of the farmers depends on the availability, accessibility, and affordability of lucrative markets (Aku et al, 2018). According to Thamaga-Chitja and Morojele (2014), most of the smallholder farmers lack access to established commercial markets because of a lack of or limited access to information, assets, and institutions that can support smallholder farmers to produce for formal markets. Other constraints that create market access blockages are less developed infrastructure, lack of water, high transaction costs, poor quality produce, price uncertainty, and a high risk of investing and engaging in agricultural production (Van Scalkwyk et al, 2011).

Access to lucrative markets is a long-standing obstacle, even when water and other inputs are provided (Chitja et al, 2016). Most farmers cannot improve their livelihoods even if they obtain irrigation facilities and agricultural inputs because they can produce surpluses, however, they are unable to access lucrative markets, and often those farmers are forced to sell at prices dictated by buyers (Mukwevho & Anim, 2014). The Food and Agricultural Organisation of the United Nations (FAO, 2017), states that smallholder farmers can improve their productivity and income by accessing agricultural inputs and markets through value chain coordination and development.

Furthermore, a lack of market information about how the markets operate can have an impact on the livelihoods of smallholder farmers (Thamaga-Chitja & Morojele, 2014).

According to Stoian et al (2012), value chain development (VCD) can be defined as “an effort to strengthen mutually beneficial linkages among firms so that they work together to take advantage of market opportunities and to create and build trust among value chain participants”. VCD increases the competitiveness of the agricultural sector and improved value chain performance can result in stimulating economic growth and poverty alleviation (Donovan et al, 2015). According to the FAO (2014), the development of sustainable food value chains can offer important pathways out of poverty for the millions of poor households in developing countries. Furthermore, Working on VCD is important because it enhances value chain participation among smallholder farmers and enables them to be more competitive along the value chain while enhancing the opportunity to access and entry to lucrative markets as well as global markets.

Agricultural development has for decades focused more on improving physical assets for farmers. However, there is growing evidence that assessing and strengthening the intangible assets of farmers can bring effective change and empowerment (Murugani & Thamaga-Chitja, 2018). Indicatively, empowerment of smallholder farmers is important, according to the World Bank (2007), empowerment can be defined as “means to enhance the capacity of an individual or group to make purposive choices and to transform those choices and outcomes”. In this study, empowerment will signify the ability for farmers to be able to conduct market assessments themselves, be able to undertake decisions on which crops to produce for the market, and shift from ‘grow and sell’ to ‘grow to sell’.

This study used the Smallholder Horticultural Empowerment and Promotion (SHEP) model to assess and strengthen the intangible assets of the smallholder farmers in Swayimane by initiating and empowering them psychologically. The SHEP model is a development initiative developed by the Kenyan and Japanese governments which bring economic and psychological aspects of empowerment to smallholder farmers (JICA, 2014). This study aims to use the SHEP model for value chain development and to identify and the factors that influence the level of value chain participation among vegetable farmers in Swayimane. Identifying and explaining the influence that these factors have on smallholder farming and food security is important and can of great interest to policy makers and NGOs that aim to improve smallholder farming in developing countries.

Furthermore, SHEP has the potential to equip farmers with the necessary skills for market discovery and to understand the demands of various markets. This can help farmers to access niche markets to sell their produce, and that gives them an opportunity to increase household income and combat household food insecurity.

## **1.2 Significance of the study**

In South Africa and the world over, smallholder farmers practice agriculture for the purpose of consumption and generating income. However, the economic growth of these farmers is inhibited by challenges of production, institutional weakness, and lack of access to lucrative markets (Chitja & Morojele, 2014). There are also constraints that smallholder farmers experience along the value chain that prevent them from having access to high-value markets to increase their farm income (Baloyi, 2010). This study has introduced, initiated, and tested the SHEP model for vegetable value chain development in Swayimane. The SHEP model has been successful in raising farmer's income in Kenya and other African countries and this study aims to bring the success of this model to the smallholder farmers in Swayimane.

The SHEP model will assist smallholder farmers to be more competitive in the value chain of vegetables, by offering training and skills development to empower farmers to be more marketorientated and commercial. The study focuses on improving the human capital in which the farmers are developed with key skills that allow them to access lucrative markets, identify niche markets, and knowledge of market requirements in terms of quality, volume and safety issues. This study helps to reduce the information gap between farmers and the markets Farmers will be able to shift from being price takers as they often sell their commodities to middlemen at low prices.

The findings of this study can be key when developing rural development interventions for smallholder vegetable farmers. Furthermore, the idea of this research is still new in South Africa and this will contribute to the body of empirical literature.

## **1.3 Research problem**

Often smallholder farmers are faced with a lack of essential institutions and where the institutions are available, the implementation is often weak or access to these institutions is often difficult. In rural areas, where most of the smallholders are found, there are no, or poorly functioning formal

institutions (Dzadze et al, 2012). Extension services are not properly emphasized due to poor infrastructural developments to pass information to farmers. In the province of Kwa-Zulu-Natal in South Africa, smallholder farmers receive visits from extension officers once a year, in which the education levels of those officers remain low (Ortmann & King, 2007). Therefore, to improve smallholder farming, extension officers should be empowered, and investment in extension services needs to be improved (Baiphethi and Jacobs, 2009; von Loeper et al, 2016). Consequently, smallholders face high transaction costs trying to seek proper institutions for quality services. Then, they fail to participate competitively in the markets, only depending on less profitable markets such as spot market systems (defined as commodities traded for immediate delivery) (Jari & Fraser, 2012).

Several studies have indicated that farmers can have access to markets, however, they have failed to identify how smallholder farmers can fully benefit from lucrative markets by adding value to their commodities. Smallholder farmers are unable to retain high-value markets, and this can be attributed to the fact that smallholder farmers often face constraints along the value chain such as production, processing, and marketing constraints (Baloyi. 2010). A study conducted by Murungani and Thamaga-Chitja (2018) in Limpopo found that production and market access are influenced by tangible and intangible assets and upgrading of tangible assets as well as the strengthening of intangible assets is key to increasing production and marketing efficiency for smallholder farmers. According to Thamaga-Chitja and Morojele (2014), Key agricultural development interventions have focused on improving physical assets such as inputs, land, and mechanization. Efforts to improve intangible assets i.e. improving human capital by education and training are not fully supported and recognized as key to agricultural development.

Smallholder farmers in Swayimane have been actively involved in farming practices for decades and yet they still encounter challenges with market access. The constraints that hinder smallholder farmers in Swayimane from accessing lucrative markets and going commercial are well established. A study conducted in Swayimane by Khumalo (2014) found that the smallholder farmers in the study area lack access to land, seeds, fertilizer, water, irrigation equipment, proper infrastructure, credit, reliable extension service as well as other institutional support. Furthermore, there is an information gap between smallholder vegetable farmers and the markets.

Most of the farmers in the Swayimane area also do not have off-farm employment and they depend on farming as an income source and to attain food for consumption. This results in many of them to experience household food insecurity because participating at all the levels of the value chain is a major constraint (Khumalo, 2014). Participation at all levels of the value chain is limited because of constraints of or limited access to information, assets, and institutions that can support smallholder farmers to produce for formal markets. Therefore, exploring the factors that influence the level of value chain participation and implications on smallholder farming and food security in Swayimane is imperative to recommend appropriate policy recommendations.

Regardless of these constraints, some smallholder farmers are successful. This can be attributed to the fact that they have identified niche markets. The key challenge is that markets for smallholder farmers will be too competitive and therefore niche is important. Locating the niche for smallholder farmers in Swayimane is key to success and locating an NGO ready to do the systemic training and strengthening skills is key to establishing commercial links. Business linkages between smallholder farmers and business service provider are weak. This can be attributed to asymmetric information between farmers and markets. To improve this situation, the SHEP model aimed to strengthen the organizational management capacity of smallholder farmers by implementing trainings that teach farmers how to gather market information before they engage in production.

#### **1.4 Specific Research Objectives**

- To determine the existing vegetable value chain study area (SHEP Phase 1).
- To identify the factors that influence male and female participation levels in the vegetable value chains (SHEP Phase 2)
- To explore the impact of value chain development on household food security (SHEP Phase 3)

#### **1.5 Research Questions**

- What value chains and skills among the farmers?
- What role does gender play in the vegetable value chains in the study area?
- What factors influence the value chain participation level among farmers?

- How can the SHEP model establish business linkages with various market actors involved in horticulture business?
- Can vegetable value chain development improve household food security in the study area?

### **1.6 Study Limitations**

The study only included a sample of smallholder farmers from the Swayimane area who were sampled using purposive sampling, and therefore findings cannot be generalized because this sample was not a representative of all smallholder farmers in South Africa.

### **1.7 Study Assumptions**

The study assumed that the information provided by the participants was honest, reliable, and accurate. Furthermore, it was assumed that the participants did not withhold any essential information that may affect the research findings. This study also assumed that smallholder farmers do have the capacity to produce for the markets and the markets are willing to do business with the smallholder farmers of the study area.

## **Chapter 2: Literature Review**

## **2.1 Introduction**

The agricultural sector vegetable production can contribute to alleviating poverty and contribute to improving the food and nutrition status of smallholder farmers in less developed countries. The underperformance of the African agricultural sector can be attributed to gender inequality in accessing resources, assets and opportunities that limit innovation in value chain development (VCD) and the capacity to enhance food and nutrition for African people (FAO, 2011). The gender gaps do not allow women farmers to participate in value chains as equally as male farmers (Khumalo, 2014). Therefore, the development of value chains for smallholder farmers requires addressing gender-related issues along the value chain.

VCD primarily works on the improvement of coordination between the actors along the chain (Bokelmann & Adamseged, 2016). These actors can be input suppliers, farmers, NGOs, farmer organizations, companies and business service providers. The main feature of VCD is to increase the competitiveness of the agricultural sector and it has the potential to create opportunities for including large-scale businesses as active partners (Donovan et al, 2015). In recent times, VCD is a key strategy in improving farmer welfare and alleviating poverty for the rural poor.

This chapter provides literature about the characteristics and constraints of smallholder vegetable farming, smallholder vegetable value chains, market access related issues, empowerment, and smallholder farmer business linkages. It further discusses the characteristics of the Smallholder Horticulture Empowerment and Promotion (SHEP) Model, its use in South Africa, and the essential steps to be carried out when implementing the model. The chapter will also discuss the role of gender in value chain development as well as the implications of policies on vegetable value chains in smallholder farming.

## **2.2 Smallholder farming vegetable production**

### **2.2.1 Land ownership and production systems used by smallholder vegetable farmers**

In rural areas, smallholder farmers acquire land that is traditionally owned by chiefs or tribal leaders in which the land is distributed to family lines and it is inherited by members within the family from generation to generation (Muimba-Kankolongo, 2018). Several studies have found that women are more

actively involved in farming practices than men. In smallholder farming, women do the most productive work due to cultural and traditional beliefs of the roles of women's work (Thamaga-Chitja & Morojele, 2014). However, according to Murungani et al (2014), women own very little land and mostly have second property rights as wives. According to the FAO (2010), to promote agricultural value chains, access to land for women should be improved and women must have legal rights to be able to use, inherit and purchase land.

According to Muimba-Kankolongo (2018), the many poor smallholder vegetable farmers in Southern Africa prepare the land without using tractors but using family labor and animal plows on which seeds are recycled for planting every season. The author further states that many smallholder farmers till the land using hand hoes and soil fertility is sustained using manures rather than fertilizer because some farmers have little or no fertilizer. Smallholder farmers also use a wide range of pesticides to control weeds and insects, however, the farmers do not have an understanding of the hazards associated with the use of chemicals and the impact chemicals have on the environment and human health (Ngowi et al, 2007).

Smallholder farmers in the KwaZulu Natal region practice low input production systems and some constraints hinder access to irrigation water and therefore most production is on dry land plots and gardens (Mthembu, 2013). The cropping systems used by most smallholder farmers in developing regions are mostly rainfed. The poor farmers in developing regions rely on the rainfall to be able to produce food and this leaves them to be vulnerable to droughts and low yields (Medici et al, 2014). Commencing of land preparation and planting is determined by rainfall, as soils cannot be tilled with hoes if they are too dry and seeds cannot germinate.

### **2.2.2 Access to extension services and institutions**

In developing countries, agricultural extension services are important because they play the role of providing information and training to rural smallholder farmers to enhance agricultural production and productivity. In South Africa, extension services are pluralistic because they are provided by public and private extension service providers (Shemfe & Oladele, 2018). The role of the extension agent is to help farmers to improve agricultural productivity to improve their livelihoods. According to Nkosi (2017), there are many public extension service providers in South Africa that lack the required education and training to be able to assist smallholder farmers. As a result,

smallholder farmers who have access to agricultural extension are often faced with poor quality extension services.

To improve yields, Smallholder vegetable farmers need access to updated information, necessary tools, and skills development. However, smallholder vegetable producers, especially women, have relatively low access to extension agents in general, and reforming institutions that provide extension services to enable better fit for both men and female smallholder farmers is important (Manfre et al, 2013). According to Farnworth and Colverson (2015), underlying gender relations that hinders access to extension services must be addressed by thinking of extension services as an empowering and advisory facilitation system instead of a service.

Access to essential resources and institutions determines smallholder farmers' participation in value chains and overall farmer performance (Njiraini & Ngigi, 2018). According to Gabre-Madhin (2009), market institutions can be defined as “a set of constraints that are formal or informal, that govern relations between individuals or groups in the process of exchange”. The author further states that market institutions include formal or informal contracts, social norms, and codes of conduct, formal commercial laws, and institutional arrangements. These institutional aspects and their role in the marketing of agricultural produce revolve around the flow of market information, transaction costs, and the institutional environment (Jari & Fraser, 2009). Institutions such as farmer co-operatives enable smallholder farmers to tackle the production and marketing constraints. Farmer groups in the form of co-operatives, enable extension services to be effective because it makes it much easier for training and sharing of information (Ncube, 2017). Smallholder farmers need financial institutions for saving money, making money transfers and accessing credit, but they are often excluded from formal financial institutions because they lack collateral and required documentation (Murungani, 2016; Poulton et al., 2010)

A study conducted by Raleting and Obi (2015), found that institutional factors must be addressed to increase vegetable production and institutions such as extension service, collective action, land tenure, credit institutions, and contract farming contribute to ensuring sustainable vegetable production and improved value chains. Donovan et al (2015) further state that strengthening institutions as well as access to these institutions is important for a better understanding of markets and engaging value chain stakeholders. A study conducted by Obi (2011) identified and explored key institutional innovations that can enable smallholder farmers to be more competitive along the

value chain, and key among them being: contract farming, producer organizations, financial institutions, public-private partnerships and insurance.

### **2.2.3 Access to credit**

The availability of effective credit systems is an important aspect of agricultural value chain development, however, there is a lack in the flow of information between smallholder farmers and other value chain actors (Oni & Adeoye, 2017). Access to credit plays a significant role when smallholder farmers want to transform from subsistence agriculture into commercial agriculture that enhances agricultural development and sustainability (Mayowa, 2015). According to Manganhele (2010), access to credit facilities can assist smallholder farmers to obtain financial resources to be able to capitalize on small business opportunities with the potential of making a profit. Therefore, access to credit can alleviate poverty for many poor rural smallholder farmers in developing countries.

In South Africa, smallholder farmers can access credit from the formal or informal sector, however, they are often faced with constraints that hinder their access to formal credit (Baloyi, 2010). The main sources of formal financial credit are commercial banks, and they often require clients with collateral such as land, high-value property that can be mortgaged, and proof of employment such as payslips, which often smallholder farmers lack (Baiyegunhi & Fraser, 2014). Less than 10% of smallholder farmers have access to value chain finance, and those who are accessing this credit are in well-established value chains linked with high-value cash crops (FAO, 2014).

Smallholder farmers with well-established value chains in-terms of the farmer and buyer relationships and other value chain actors can access credit by using credit screening and alternative collateral such a sales contracts because the relationships can be used to reduce the risk of credit (IFC, 2014). However, access to credit through the value chain principle comes with a challenge of moral risk, where the farmer obtains cash for the produce but defaults to pay for their loan installment as agreed in a contract with the commercial bank (CIMA, 2016).

Productivity may not be directly impacted by access to credit, but access to credit does have a positive indirect impact by its influence on increased capital, ability to hire labor, adoption of modern agricultural technology and improved nutrition and health care for improved household welfare (Awotide et al, 2015). According to Schaffnit-Chatterjee et al (2014), access to credit by smallholder farmers enables them to

be more productive with improved value chains through investment in technology and innovation. Furthermore, the willingness and ability of smallholder farmers to adopt technology that can make them more competitive along the value chain with improved income depend on their access to formal or informal credit.

A study conducted by Chauke et al (2013), found that factors influencing access to credit by smallholder farmers are repayment period, the accumulation of assets, farmer experience, risk and uncertainty, and the distance between the farmer and the credit institutions. Closing the gap between the farmer and the credit institution can be done through education and training programs where farmers can get adequate information about taking loans, risk, and loan repayment. Despite the importance of smallholder farming contributing to poverty alleviation and food security in South Africa, the supply of credit to the smallholder agricultural sector has been slow compared to other sectors of the economy (Chisasa & Makina, 2012).

#### **2.2.4 Access to agricultural inputs and equipment**

Most vegetable smallholder farmers face constraints that hinder them from accessing agricultural inputs and equipment. According to Salami et al (2017), key inputs such as seed and fertilizer are highly costly in developing countries, and the implication is that smallholder farmers often opt to use inferior quality inputs such as pesticides, seed, and fertilizer. Other smallholder farmers are often constrained with a lack of access to quality inputs, implements such as tractors and equipment such as planters, knapsacks, and fertilizer spreaders. Lack of quality inputs can affect vegetable production because poor quality seeds and fertilizer can result in low crop yields with inferior quality.

In developing countries, women smallholder farmers use undeveloped traditional equipment and tools such as hand hoe, mortar, and pestle while in many parts of developing countries men benefit from newly developed, innovative, and advanced equipment (Khumalo, 2014). Women are also deprived of access to agricultural inputs because they are invisible to policymakers as they are not considered to be as productive as male farmers (FAO, 2011). Several studies have found that women farmers are just as productive as men and equal rights need to be given to women farmers when allocating agricultural inputs and equipment.

According to the African center of biodiversity (2016), the South African government targeted input support programs such as the Massive Food Production Programme initiated in the year 2002, aimed to allocate inputs to smallholder farmers with the best farming potential. In the rural areas of South Africa, smallholder farmers are better able to access inputs when the inputs are free, where they are provided by the government extension officers. Furthermore, government, NGOs, and input suppliers are essential for improved access to agricultural inputs and equipment by vegetable smallholder farmers.

Water is one of the most essential agricultural inputs in the food value chain because it is used in every stage of the chain, and these stages include inputs, production, processing, distribution, marketing, and consuming (Baleta & Pegram, 2014). However, access to clean water is still a challenge for smallholder farmers.

### **2.2.5 Access to water and irrigation technology**

During the apartheid era, water access and water distribution were limited towards large-scale commercial farming, resulting in smallholder farmers having to rely on rain-fed agriculture making it challenging for small producers to be consistent in production all year round because the rains are seasonal (Mazibuko, 2018). Access to water for irrigation is important in smallholder farming to improve productivity, create employment opportunities, generate income and improve farming systems adaptation to climate change as well as improving household food and nutrition security (Mango et al, 2018; Njoko & Mudhara, 2017). Smallholder farmers as individuals or in irrigation scheme groups abstract water from a source and transport it to the fields to irrigate crops. According to a review generated by the Water Research Commission (WRC) by van Averbek et al (2011), about 96.7% of farmers obtain their water from rivers in which the water is pumped to the fields or stored into dams, 3% use groundwater, 0.2% use water from the municipality and 0.1% use spring water for irrigation.

According to Murugani and Thamaga-Chitja (2018), even though some smallholder farmers in rural South Africa have access to irrigation water, they still have little market participation and are not commercial as yet. Smallholder farmers are faced with financial constraints from being able to fully utilize irrigation water and technology. It is important that the water price should be set in a way that smallholder irrigators can afford because if prices are set too high, smallholder irrigators

are unable to afford the water supply for irrigation (Njoko & Mudhara, 2017). Most of the smallholder farmers in the area of Swayimane cannot afford to irrigate using innovative irrigation technology, table 2.1 below shows the available water sources and usage in Swayimane.

Table 2.1: Available water sources in Swayimane and the usage by smallholder farmers (Source: Mazibuko, 2018)

<b>Water Source (%)</b>	<b>Availability (%)</b>	<b>Usage (%)</b>
Rainfall	79	84
River/stream	74	79
Communal tap	11	68
Tap inside the house	95	11
Water truck	53	53
Borehole	-	-
Well	5	5
Other	16	16

Irrigation technology plays a crucial role in soil fertility and the distribution of water to crops and household needs while contributing to improving smallholder livelihoods (Chuchid et al, 2017). Technology that is used for irrigation can be expensive, as well as the human resources required to operate the technology can be very expensive for most smallholder producers (Medici et al, 2014). Therefore, smallholder farmers can have access to irrigation technology if they can afford it or if they have been sponsored by the government and NGOs.

Agricultural commodities often have a large water footprint at the production stage rather than the processing stage and water is essential and needed for every stage of the value chain (Baleta & Pegram, 2014). However, according to Khumalo (2014), water rights and land rights are directly linked, in which women farmers face challenges with access to land, access to water, and there is low participation in water programs and therefore impacting productivity and value chain development negatively.

## **2.2.6 Market access**

According to Thamaga-Chitja and Morojele (2014), in South Africa, the challenge of access to markets by smallholder farmers is due to the worsened economic status of the country. It is also noted that several constraints hinder smallholder farmers from accessing lucrative markets and these constraints are lack of institutional and technical support, poor infrastructure, lack of market information, long distances to markets, high transaction costs, and low involvement in collective action (Jari & Fraser, 2012).

A study conducted by Murugani and Thamaga-Chitja (2018) states that smallholder farmers are unable to produce enough food for consumption and selling, they also fail to meet quality requirements demanded by the markets, they lack the finances to transport their produce to the markets and this has resulted in low levels of market access and low participation in domestic and global markets. Furthermore, the study found that market access by smallholder farmers depends on both their tangible (natural, physical, financial) and intangible (education, training) assets.

According to the National Agricultural Marketing Council (2016), commercialization requires market access, and for smallholder farmers to be commercial farmers, they need to address the challenges that limit them from accessing lucrative markets for them to become market-oriented and participate in high-value markets. Value chain development supports development and job creation by strengthening the business environment to enhance business relationships, improve market structures and assist small enterprises in overcoming constraints that lead to poor market access (ILO, 2011). There are many constraints along the value chain that must be addressed for smallholder vegetable farmers to benefit from lucrative agricultural markets.

According to the International Labour Organization (2011), value chains are part of market systems and the value chains that bring products and services to the market are at the center of the market system. Bokelmann and Adamseged (2016), suggest that market access can be increased by strengthening value chain relationships and providing an enabling environment. Figure 2.1 below illustrates the relationships between value chains, markets and business linkages, government, and the private sector. The figure also illustrates how they are interlinked and are part of one system.

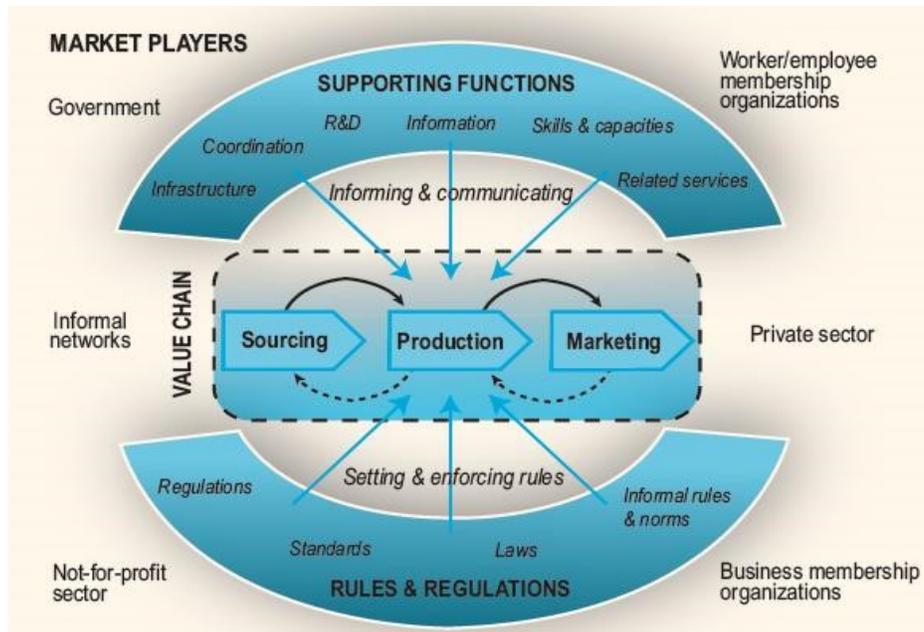


Figure 2.1: Relationship of value chains and market systems (Source: ILO, 2011).

In developing countries lack of access to markets is a major obstacle to value chain development for smallholder farmers especially women. The role that women farmers play in agriculture has a contrary impact on food and nutrition security due to women having limited market participation (Thamaga-Chitja & Morojele, 2014). Women often sell at spot markets in smaller volumes than men, and if they are involved in marketing produce, they are often associated with low-value products at lower levels of the value chain (Oduol et al, 2017).

According to Sikwela (2013), it is easier for smallholder farmers to enter the informal markets (spot mechanisms) rather than formal markets (Contract signed) such as supermarkets (Figure 2.2). According to Khumalo (2014), transaction costs such as transportation costs, costs of gathering market information, searching for trade partners, contract enforcement, and the distance to formal markets are one of the major barriers to entry to formal markets. Therefore, smallholder farmers prefer to sell their produce at the farm gate and informal market systems to minimize the costs. Also, enough safe clean water at the start-up level of the value chains is scarce, making it difficult to practice value addition techniques that can allow entry into formal markets.

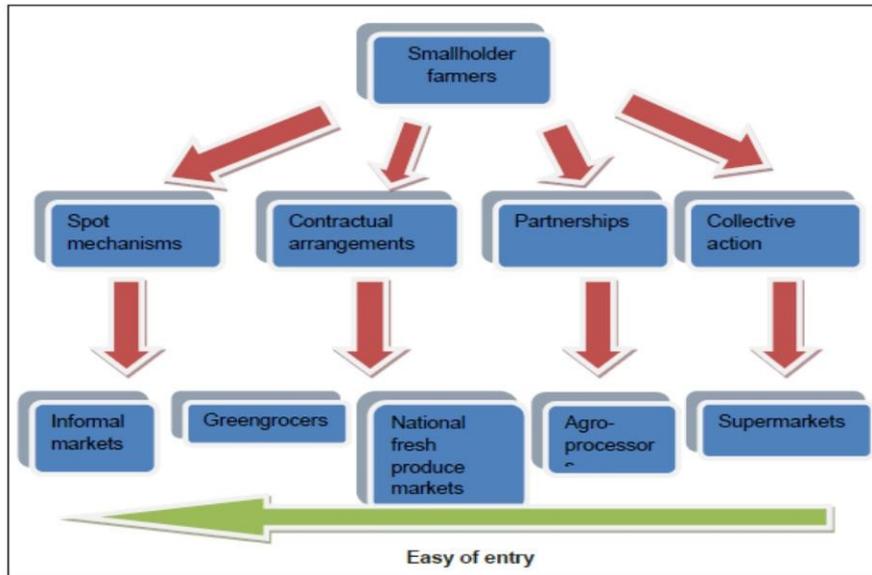


Figure 2.2: Market channels for smallholder farmers (Source: Sikwela, 2013).

Entry to formal markets is constrained by a lack of institutional support. There are market imperfections that are caused by a lack of market institutions, resulting in asymmetric information between the farmers and buyers (Obi et al, 2012). Most smallholder farmers are located in rural areas where there are little to no formal markets, they are forced to sell their produce to local community members at low prices and those who transport their produce to towns incur a high transaction cost (Baloyi, 2010). According to Magingxa and Kamara (2003), access to institutions should be improved to enable the flow of information that can allow smallholder farmers to enter the market while also removing distortions in markets. Focusing on institutions and institutional support can be key in agricultural development and smallholder market access.

### 2.2.7 Smallholder Farmer Empowerment

Smallholder farmer empowerment is an important part of agricultural development and improving human capital. Empowerment is not easy to define, several studies have different definitions, this study adopts the definition of The World Bank (2007). “Empowerment means to enhance the capacity of an individual or group to make purposive choices and to transform those choices into desired actions and outcomes” (World Bank, 2007). According to Kibirige (2013), agricultural development is impacted by the “human element” because of its role in individual or group farm decision making. For empowerment to be a reality, smallholder farmers must have the capacity to

make effective choices that can translate into actions and livelihood outcomes, and this can be achieved by having access resources, agency, and formal and informal institutions (Murungani, 2016; World Bank 2007). Empowerment can be endowed upon a person but rather, a person must actively participate in the empowerment process to be empowered (Jeckoniah et al., 2012).

According to Thamaga-Chitja et al (2016), the process of empowerment requires resources and agency because they are essential as they provide the necessary conditions for the occurrence of empowerment. Agency is the ability to make meaningful choices, it enables smallholder farmers to capitalize on opportunities with resources to enable them to achieve their goals (Murungani, 2016). Figure 2.3 illustrates the relationship between agency, institution-based opportunity structures, development outcomes, and achievements.

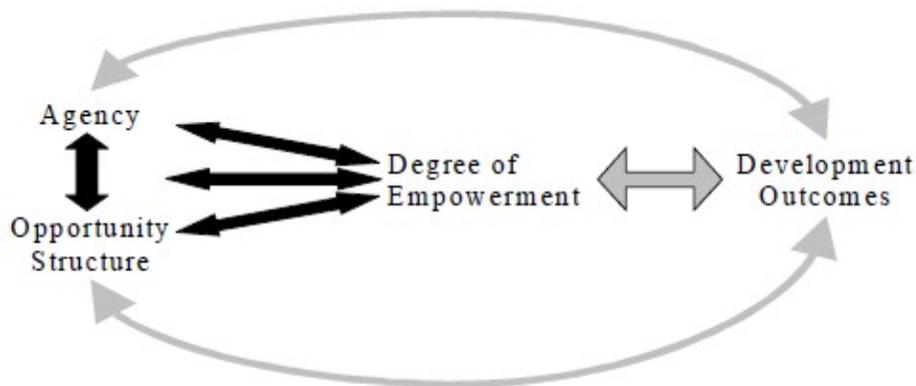


Figure 2.3: Relationship between agency, opportunity structures and empowerment (World Bank, 2007)

Investment in human capacity building through education or training builds the farmer's confidence, improves decision making, and enables farmers to identify solutions to problems (Hennink et al., 2012). Furthermore, according to Kibirige (2013), formal education and training in agriculture can improve the farmer's ability to acquire accurate information on production, new agricultural techniques and can encourage the adoption of new technology. Therefore, investment in capacity building can enable the farmers to identify problems and solutions within the value chains and commercialization of smallholder agriculture.

### 2.2.7 Smallholder Horticulture Empowerment and Promotion (SHEP) Model

According to the Japan International Agency (2014), the Kenyan and Japanese governments joined their efforts and developed a model called the Smallholder Horticulture Empowerment and Promotion (SHEP). The SHEP is an intervention to promote farming as a business by motivating and empowering farmers through effective designs. SHEP has been successful in raising income from horticultural farming by developing the technical and managerial capacity of smallholder farmers to shift them into practicing market-orientated horticultural farming (JICA, 2018).

According to JICA (2018), the SHEP uplifts smallholder farmers through market-orientated agriculture to improve livelihoods, and its unique characteristics such as market surveys conducted by farmers, promoting gender equality, and establishing business linkages between farmers and business service providers are key to its success. The backbone of SHEP is derived from two pillars, which are raised from the issues of “promoting farming as a business and empowering and motivating farmer psychologically”. Figure 2.4 below shows how the SHEP model aims to achieve its vision using the two pillars.



Figure 2.4: Two key pillars of SHEP (Source: SHEP Handbook for Extension Staff, 2018)

### 2.2.8 SHEP’s Four Essential Steps

The SHEP offers a series of capacity development training for farmers with the main aim of motivating farmers through supporting their psychological needs. Four essential steps for the practical implementation of SHEP are discussed in this section. Table 2.2 below shows the order of SHEP’s four steps along with the activities that are to be completed in each step.

Table 2.2: SHEP’s four essential steps (Source: SHEP Handbook for Extension Staff, 2018)

Four Steps	Activities
1. Share goal with farmers	<ul style="list-style-type: none"> <li>• Sensitization workshop</li> </ul>
2. Farmers’ awareness is raised	<ul style="list-style-type: none"> <li>• Participatory baseline survey</li> <li>• (optional) Stakeholder Forum</li> <li>• Market Survey</li> </ul>
3. Farmers make decisions	<ul style="list-style-type: none"> <li>• Target crop selection</li> <li>• Crop calendar making</li> </ul>
4. Farmers acquire skills	<ul style="list-style-type: none"> <li>• Infield training</li> </ul>
Follow-up monitoring (including participatory end-line survey)	

#### Step1: Share goal with farmers

The first step of SHEP is to share the vision of SHEP with the smallholder farmers who will participate in the SHEP training course. A sensitization workshop is conducted for the farmers to explain the goal that SHEP is trying to achieve and to explain the details and timeframe of the SHEP. In this step, the farmers must understand that SHEP does not provide any financial and material support from the government.

#### Step 2: Farmers’ awareness is raised

The second step of SHEP is to raise farmers’ awareness of their current situations while also identifying opportunities that horticultural farming can offer to them. In this step, participatory baseline surveys are conducted to look at the current farming situations. Baseline survey part 1 gathers information on production, income, and cost, while baseline survey 2 gathers information on agricultural techniques. Filling out the two surveys help the implementers and the farmers to identify the areas that can be improved by the SHEP training course. The final activity that is step

is to conduct market surveys to enable the farmers to understand how markets operate and what are the demands of the markets from producers. The market surveys are conducted by the farmer's representatives themselves with assistance from the SHEP implementers. This will enable the farmers to network with various key market players such as wholesalers, retailers, and middlemen.

#### Step 3: Farmers make decisions

After the farmers have identified the available business opportunities in step 2, the next step would be to make important decisions on which crops to grow during which time and the quantity and quality as demanded by the market. The crops that the farmers will target are based on the findings during the market survey. In step 3, crop calendars are made to enable the farmer to plan for the future for which crops to grow and when to market the crops.

#### Step 4: Farmers acquire skills

In this step, farmers are trained to get the knowledge and skills that are essential for growing the targeted crops demanded by the market. The training conducted should be demand-driven training where in-fields training must be done to disseminate knowledge and skills to farmers. Thereafter, a follow-up and monitoring process is done where information is gathered using participatory endline surveys.

### **2.2.9 The use of SHEP on market access and vegetable value chains**

SHEP is a capacity development approach for smallholder farmers to practice market-orientated agriculture. SHEP achieves this by narrowing the information gap between the farmers and both formal and informal markets. Farmers are trained on how to conduct market assessments by conducting market surveys themselves and this enables the farmers to know what the markets require from them, improving their chances of producing for the markets instead of trying to market what they have produced. SHEP is unique because it uses psychological empowerment to improve human capital that is essential to succeed in competitive markets. Figure 2.5 illustrates how SHEP training builds assets by using empowerment which improves human capital and access to markets.

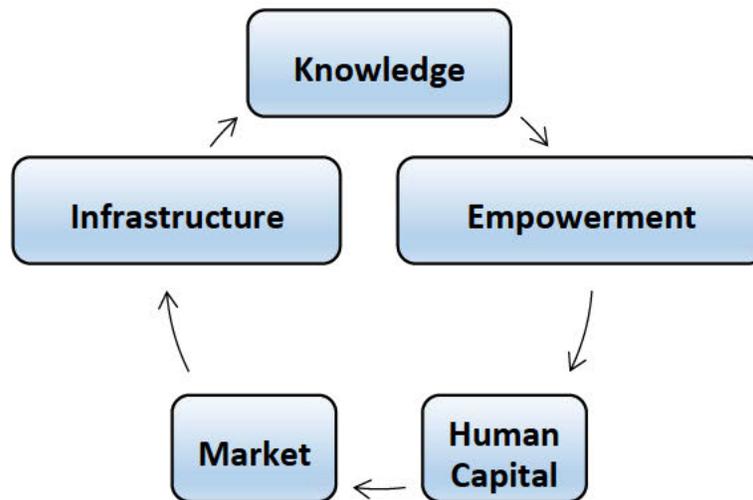


Figure 2.5: Asset building for market access (Adapted from: Cornell SMART presentation, 2014)

### 2.2.10 The Use of SHEP in South Africa

The Department of Agriculture Forestry and Fisheries (DAFF) signed an agreement with JICA to promote SHEP in South Africa. DAFF identified two pilot sites (Mathulini and Mbhava) in KwaZulu-Natal to implement SHEP. In the Mathulini site, 30 members were chosen to represent 10 groups and in the Mbhava site, 10 members working as a single cooperative were used as participants. The Mbhava group was successful in securing markets, and farmers understand the difference between formal and informal markets and how prices link to quality. The farmers see the benefit of record-keeping and farmers are empowered to make informed decisions guided by what the market is demanding.

## 2.3 Vegetable value Chain for smallholder farmers

### 2.3.1 Value chain analysis

According to the FAO (2010), a value chain in agriculture can be defined as “the set of actors and activities that bring a basic agricultural product from production in the field to final consumption, where at each stage value is added to the product”. For smallholder vegetable farmers, the value chain actors that are most important are inputs suppliers, cultivators, harvesters, consolidators and

processors, however, there are also other actors that offer various services such as technical assistance and advice (FAO, 2018). Value chains are complex because there are more than one channel and actors. Figure 2.6 below illustrates a simplified agricultural value chain.



Figure 2.6: Simplified agricultural value chain (Source: Senyolo et al, 2018)

In less developed regions, value chain analysis (VCA) can be an important tool for achieving the goal of reducing poverty and improving food security (Bokelmann & Adamseged, 2016).

According to the FAO (2013), VCA is “the assessment of a portion of an economic system where upstream agents in production and distribution processes are linked to downstream partners by technical, economic, territorial, institutional and social relationships”. VCA targets smallholder farmers in addressing market development in value chains at a local, regional, and national level and it provides a framework for a better understanding of the links among producers and markets. According to Lie (2017), there are four main components in Value chain analysis: (i) value chain mapping, (ii) analysis of institutional governing structures, (iii) upgrading opportunities identification, and (iv) valuation of distribution of benefits within the value chain. Inclusive VCA is a must for the development of gender-equitable value chains and the analysis is important to understand the markets, the role of different actors, and the main constraints that hinder competitiveness (Oduol et al, 2017). A study conducted by Trienekens (2011) presented a framework for less developed country value analysis made up of three components. The first component identifies the key constraints for value chain development, the second component defines the key elements of a value chain and finally, value chain development options are specified around the area of value addition, market discovery, network structures, and value chain governance mechanisms.

A study conducted by Senyolo et al (2018) in the Limpopo province found that the relationships and contractual agreements between value chain actors are weak and farmers face high gross margins because of lack of markets, lack of technical advice for production, poor infrastructure,

lack of access to finance and high marketing and transaction costs. VCA looks beyond the farm and investigates business relationships and linkages among the farm to improve and develop the performance of the value chain by reducing transaction and marketing costs, reducing production losses, improving product quality, and improving the position and agreement of value chain actors (Bammann, 2007). The weakness of VCA is that it does not show changes over time and this is a constraint when developing long term effects of interventions (Lie, 2017). There can also be positive and negative outcomes due to value chain interventions.

### **2.3.2 Vegetable value addition**

Market behavior, consumer preferences, and supermarkets are the main reason for the increased demand for value-added products, which have led to consumers using ready to use vegetable commodities and vegetables in consumer packs (Datta et al, 2015). Value addition on vegetables can be done without changing the physical form of the vegetables by involving practice such as washing, cleaning, sorting, grading and packaging, and labeling. According to the FAO (2012), value addition is an investment in high-value processing and value can also be added by putting in place logistical, marketing, and quality control systems that mostly involve strategic planning and cooperation with value-chain partners.

Transforming vegetables into higher-value vegetables or products does not however only depend on investments in technology but also on value chain systems and capabilities that can be put in place to reduce transaction costs while still improving competitiveness (UNIDO, 2011).

### **2.2.3 Role of gender in value chain development**

The underperforming agricultural sector and value chains in Africa are caused by a large gender gap in potentially having access to essential productive assets and opportunities that threaten innovation in agricultural and value chain development (VCD) along with the ability to improve the food and nutrition status for all people (Njiraini & Ngigi, 2018). Value chains are affected by socio-cultural beliefs where gender norms and values are evident (Stoian et al, 2018). Genderrelated issues have a negative influence on the effectiveness and success of value chains, and therefore, there should be a focus on gender inequality for more competitive sustainable agricultural value chains.

Several studies have documented that women face more constraints than men in farming, women are often receiving fewer services and support in access to inputs and market information which makes it difficult for them to capitalize on lucrative niche markets and economic gains in agricultural value chains (Laven & Verhart, 2011). According to the International Development Cooperation (IDC), it is important to acknowledge the position of women in value chains, and supporting gender empowerment along with women empowerment is key to the development of value chains (IDC, 2010). In modern value chains, gender inequality is evident, there are cultural stereotypes on the roles and abilities of gender, where men control land, labor, machinery and contract farming, so they are in a higher status while women are considered to be unskilled laborers and generally assigned processing and packing duties along the value chain (FAO, 2010). Women need special support to participate in value chain development. According to Khumalo (2014), Women are often placed at lower levels of the value chain, and this is because they lack resources, assets, they have low literacy levels and lack institutional support which will allow them to fully participate.

If value chain interventions and development do not address gender-related issues, gender inequality in workloads and incomes will continue to increase and women will face the risk of being directly excluded from the benefits of development (Farnworth, 2011). From a business perspective, it is important to identify different roles played by men and women in value chains and to address constraints hindering value chain development. According to the FAO (2016), gender equality should be considered and integrated into the value chain development and this can close the gender gap in accessing agricultural inputs and increase the performance of women. Enhancing value chain development will require investment in smallholder women farmers to help them to improve and increase their participation in value chains effectively (Farnworth, 2011).

#### **2.3.4 Challenges and constraints in value chain participation**

There are major constraints and challenges that hinder smallholder farmers from participating or being competitive in value chains. According to Swinnen et al 2013, smallholder farmers are faced with market imperfections and there are not enough actors that can provide linkages to retail sectors, provide technical and financial assistance to assist smallholder farmers to overcome market imperfections. Smallholder farmers are unable to meet all the requirements of high-value

markets, and this is can be attributed to the rapidly changing food regulations, quality standards, and lack of access to essential information.

Value chains are moving towards tighter vertical coordination, and this includes moving from spot market systems to more explicit forms of co-ordination (Maertens & Swinnen, 2015). The move towards vertical coordination can take the form of contracting between different agents along the chain. Contract farming reduces transaction costs as it eliminates costs of hired labor to monitor at spot markets, however, even though it is beneficial, buyers may prefer to be in business with farmers with large landholdings and assets, therefore excluding the small and poorest smallholder farmers from high-value chains (Briones, 2015). Furthermore, processes such as certification, labeling, and controlling hazards often require large investments which may only be feasible on a large scale and therefore excluding the poor rural smallholder farmers from participating in highvalue chains (Swinnen et al, 2013).

Supermarkets and large processors require quality, safety standards, packaging, and volumes that are a challenge for smallholder farmers to meet. The value chains require suppliers to be able to ensure that all safety and health standards are met and smallholder farmers who are not able to comply with the required standards are excluded from competing in the agricultural value chain successfully (Baloyi, 2010). There are also customary and contractual laws associated with a gender division of labor assets that have negative implications on women's participation in value chains and value chain development (Khumalo, 2014). There are also cultural expectations that women must perform household domestic duties and take care of children, and therefore impedes women's full participation in agricultural value chains (Thamaga-Chitja & Morojele, 2014).

## **2.4 Smallholder business-farmer linkages**

Business linkages such as contract farming, out-grower schemes, and joint ventures provide an alternative to large-scale land acquisitions as well as opportunities for smallholder farmers to have market linkages and commercialize (FAO, 2013). According to Bellemare and Bloem (2018), “contract farming is an agreement between the grower and a processor or buyer regarding the production of an agricultural commodity” and the out-grower scheme can be defined as “those arrangements involving public enterprises, parastatals, government agencies or NGOs”. Contract farming is a successful tool for linking smallholder farmers to value chains, overcoming production

constraints such as lack of access to inputs, technology, credit, and providing a form of secure markets (FAO, 2013).

Out-grower schemes can be key to successful smallholder farming because the schemes attract agro-food companies while controlling over sourced supply and grant access to local markets (Felgenhauer & Wolter, 2008). In Africa and globally, various types of out-grower schemes provide smallholder farmers with capacity building, technical and financial support that link them to improved crop yields with improved quality and linkages to domestic and international markets (AgDevCo & MasterCard Foundation, 2017).

The FAO (2013) defines a joint venture as “a business agreement in which two independent market actors agree to develop new business by contributing equity, sharing assets, ownership, revenues, and expenditures”. A joint venture has the advantage that financial risks and benefits are shared in which that could ease the shortcomings faced by smallholders. According to the International Fund for Agricultural Development (IFAD), joint ventures between local farmers, communities, and companies have received attention in debates about inclusive business models in agriculture, and this is because poor farmers and communities have been linked and partnered with large companies, small or medium enterprises and non-profit organizations (IFAD, 2012). Business service providers are input supply services that provide seeds, irrigation equipment, fertilizer, and chemicals, other service providers are credit institutions, micro-finance institutions, funders, NGOs, co-operative traders, and marketing agencies.

## **2.5 Policy implications on vegetable value chains in smallholder farming**

The shift from traditional export crops toward non-traditional high-value products has brought structural changes in which high-value chains are linked with high food standards and high levels of consolidation and vertical coordination (Swinnen et al, 2013). The shift has created opportunities for reducing poverty in Africa by increasing agricultural productivity and raising farmer incomes and the opportunities create a role for policy to address constraints that hinder participation and development of agricultural value chains.

According to Humphrey (2006), agricultural development policies should first aim to match the capabilities of farmers with the requirements of markets; secondly, there should be smallholder farmer upgrading initiatives in place supported by key actors in value chains and thirdly, in

circumstances where smallholder farmers are uncompetitive in some markets, development options are to search for other alternative markets with the aim of shifting to large-scale farming. A growing concern is that most policy attention is towards the effect on smallholder farmers but it is important to acknowledge the welfare effects of employment in value chains which are often overlooked by policymakers (Swinnen et al, 2013).

In South Africa, policies aimed at providing support to smallholder farmers still face the challenge of gender issues in which customary and cultural beliefs hinder women from having access to essential resources that are needed for them to actively participate in high-value chains (Khumalo, 2014). A study conducted by Thamaga-Chitja et al (2010) found that the Land Reform program initiated to address ownership and access to land for black African people including women farmers in South Africa is weak in gender sensitivity as cultural practices and beliefs prevent women from owning land even though it is in their constitutional right to be able to own land. Therefore, the policies should ensure that the constraints that limit women's participation in value chains are addressed to enhance gender equity (FAO, 2012).

Enabling and stimulating the development of value chains can be done by increasing the capacity of farmers to produce high-quality and adhere to the emerging food safety issues, and therefore it is important that policies that aim to develop value chains, enable farmers to get enough information, technical support and are exposed to farmer-assistance programs (Swinnen et al, 2013).

## **2.6 Food security**

According to the FAO (2002) and Coates et al (2007), “food security is a state in which all people at all times have both physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life. South Africa is described as food secure at a national level but food insecure at a household level (Altman et al.,2009). Households that are food insecure when they have limited access to food and when their dietary requirements are not being met and that may result in poor physical and mental health (Carter et al., 2010). This makes it important to identify and evaluate policy options and to monitor household food security especially in rural areas of South Africa. According to Matshe (2009), most poor rural households rely on agriculture to generate household income, and therefore increasing

agricultural productivity is key to increase food security and improve livelihoods. Meinzen-Dick et al (2011) argued that agricultural productivity in less developed countries was low because of factors such as a lack of inputs, technology, credit, infrastructure, and access to markets. Successful market participation is critical for improving household food security among smallholder farmers in the Swayimane area.

A study conducted in Msinga KwaZulu-Natal, by Maziya et al (2017) found that a number of household's socio-economic factors impact food security. These factors are key in explaining the variations in the food security status among different farming households. Gebru et al (2019) found that participation in market-orientated vegetable production resulted in higher food availability and access but lower diet diversity scores. Therefore, value chain participation and market-led approaches to improving food security can assist smallholder farmers to improve their food security status. Value chain participation has the potential to boost smallholder farmer's incomes which can enable smallholder farmers to reduce their food insecurity levels (Mwangi et al.,2020).

## **2.7 Theoretical Review**

The study of Maziya et al (2017) who cited the FAO (2002) defines food security as “food security exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life. This definition is constructed around four distinct but inter-related pillars which are availability, access, utilization, and stability. Theoretically, this study hypothesizes that smallholder farmer participation in vegetable value chains would improve their food security. Farmers' food security is positively affected by participation in the market chain (Montalbano et al., 2018), and theoretically, successful market participation is associated with an increase in household income and welfare. There are income links to food security, however, according to Kirk et al (2018), an increase in income alone does not imply food and nutrition security because households may purchase and consume less nutritious foods. This study hypothesizes that theoretically, successful market participation will result in an increase in household income and will improve food security among the farmers.

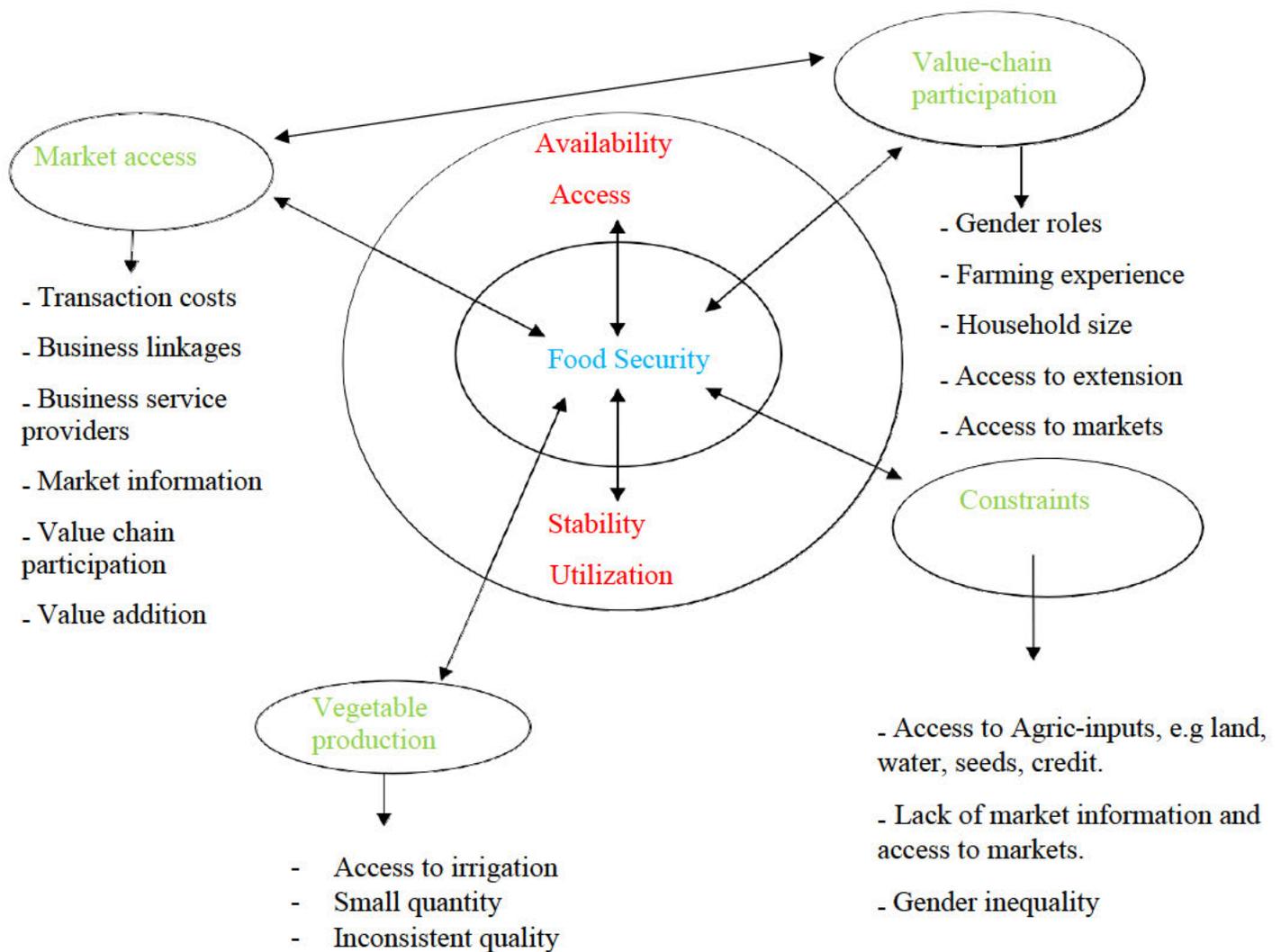
## **2.7 Analytical framework**

This section provides a list of the variables collected for each objective and how they were analyzed. This section is fully expended in the methodology chapter.

Table 2.3: Description of the analytical framework

Objective	Variables collected	Method of analyses
To identify the factors that influence male and female participation levels in the vegetable value chains	Age of respondent, Off-farm income, Marital status, Farm income, Household size, Land rent, Cooperative, Access to credit, Access to irrigation, Market information, Access to extension, ICT television, ICT radio, Contact with NGO, Formal education	Nehurdle model
To explore the impact of value chain development on household food security	Value chain participation, Age of household head, Marital status, Formal education, Farming experience, household size, Farm income, Lease rent on land, Access to NGOs, Access to agricultural agency, Access to credit, Access to grant, Access to ICT radio, Access to extension services, Access to irrigation scheme.	Instrumental Variable (IV) Poisson model

## 2.8 Conceptual framework



**Figure 2.7: Value chain participation and implications on food security**

The study adopted a value chain participation approach to seek to understand the existing vegetable value chains, from input suppliers, production, value addition, market actors to end market buyers. The approach also enables the study to understand supporting actors, business service providers, and constraints within the vegetable-value chain in Swayimane.

## **Chapter 3: Description of Study Area and Research Methodology**

### **3.1 Description of the study area**

The study was conducted in a rural community called Swayimane, which is located just outside Wartburg in KwaZulu-Natal under uMshwathi municipality (Fig 3.1). Swayimane covers an area of 36.35 km<sup>2</sup> and lies from latitude -29.431277° S and -29.513402° S and from longitude 30.582431° E to 30.649214° E. The soil form distribution is classified as deep shortlands (Orthic A/ red structured B), Lusiki (Humic / pedocutanic) and Valsrivier (Orthic A/ pedocutanic B). The land is owned and administered by the Gcumisa traditional authority. The study area is a rural area with rich soils for agriculture because of its climatic and weather conditions and therefore, agriculture has become a source of income for most residents in the area. Swayimane has a mean annual rainfall that ranges from 694-994mm, making the soils to be fertile and the area to be suitable for farmers to plant crops such as sugar cane, madumbe, sweet potato, green mealies, cabbage, spinach, and other varieties of vegetables.

According to Khumalo (2014), most of the households in the area are female-headed households, which are food insecure because of high levels of unemployment and poverty in the area. The households produce vegetables for consumption to sell to generate income to purchase other types of food. Therefore, for households Swayimane area, agriculture is the main livelihood strategy (Zondi, 2003), however, the households do not make enough money to be able to pay for needs such as education, health, and healthy food because of a lack of market access.

Most of the farmers rely on the rains for water, and therefore they produce crops such as sugar cane, green mealies, madumbe, beans, and sweet potato because they do not require intensive irrigation. The smallholder farmers in Swayimane face various constraints, they do not have sufficient access to agricultural inputs, extension services, and institutional support (Khumalo, 2014). These constraints hinder the smallholder farmers from capitalizing from formal markets and they remain in the trap of poverty and food insecurity.



Figure 3.1: Map of Swayimane (Source: Mazibuko, 2018)

### 3.2 Research Design and Methodology

The study adopted both qualitative and quantitative approaches to collect data and a survey questionnaire and focus group discussions were implemented. The research employed a mixedmethods methodology where both qualitative and quantitative approaches to collect data and survey questionnaire to determine skills, type of value chains, and who are the actors in the value chain. Focus group discussions and key informant interviews were conducted to assess the challenges that the farmers are facing and what needs to change in the study area. The quantitative approach involves the use of numerical measurement and statistical analyses of the measurements to examine the phenomena under study (Khumalo, 2014).

The research approach was both community-based participatory and translational research because it involves the training of smallholder farmers. Community-based participatory research is a collaborative research approach that involves community members, researchers, and other stakeholders in the research process (Collins et al, 2018). The SHEP model required farmers to participate voluntarily to be involved in training, and it involved researchers, extension officers, and other stakeholders to participate in the training. The research approach is also translational,

where translational research is an approach where knowledge is passed along the translational pathway and the research findings are translated into practice (Davidson, 2011).

### **3.2.1 Sampling Technique and Sample size**

The target population for the study was smallholder farmers, both male, and female, residing in the Swayimane area, and are practicing vegetable production and participating in some level in the market. The targeted farmers participated in the SHEP training and they were also interviewed to share their beliefs and knowledge of the vegetable value chain, actors, and stakeholder engagement in the study area. Purposive sampling is a technique that is also called judgmental sampling because of its deliberate choice of selection of participants due to certain qualities (Etikan et al, 2016). The study used a purposive sampling technique to sample 51 smallholder farmers who were already valued chain participants at various levels.

### **3.2.2 Data collection tools**

#### **3.2.2.1 Structured questionnaire**

The quantitative data was collected using a structured questionnaire by conducting face to face interviews with the farmers. The interviews were conducted in IsiZulu which is the local language in Swayimane, and trained research assistants were used to translating the questionnaires from English to IsiZulu. The structured questionnaire was designed to capture data on the demographics of farmers, production, value chains, markets, food security, and farmer-business linkages. The questionnaire served the purpose of gathering information to understand the beliefs, thoughts, and perceptions of farmers (Denzin & Lincoln, 2000), and what vegetable value chains exist in the study area along with gender-related issues in value chain development. Both open-ended and closed-ended questions were included in the questionnaire and were also piloted to assess the acceptability of the questions, quality of the data, comprehensibility, and validity of the questionnaire (Tarrant et al, 2014). The food security conditions of the households were measured before the intervention using the Household Food Insecurity Access Scale (HFIAS) and the Diet Diversity Score (DDS).

#### **3.2.2.2 Focus group questionnaire**

The study employed focus group discussions (FGD) to have a better understanding of the vegetable value chain in the study area and the role of gender in value chain development as well as opportunities for business linkages. Focus group discussions FGS enables respondents to talk and interact with each other (Nthabeleng, 2017). The FGDs involved an organized discussion with selected individuals to gain information about their views on value chains and markets.

### **3.2.2.3 Participatory Baseline Survey**

During the practical implementation of the Smallholder Horticulture Empowerment and Promotion (SHEP), the selected farmers are asked to fill out two kinds of survey sheets. The first is the baseline survey part 1, which requires information on production, income, and cost. The second is the baseline survey part 2, which requires information on the agricultural techniques practiced by the target farmers. The sheets were filled in by the farmer themselves with the help of the researcher and extension officers where necessary.

### **3.3 Data analysis**

The data collected was coded on Microsoft excel, then it was imported and analyzed using the statistical software package Stata 15. The software package makes it possible to store the data and perform statistical analysis to create tables and graphs that will be useful to analyze and interpret the data. The use of descriptive statistics and econometric models was used to analyze the data set. The nehurdle model was used to analyze the factors influencing the level of value chain participation on smallholder farmers in the study area. Different studies have mostly used dichotomous choice models such as Logit, Probit and Tobit; count data, namely, Poisson or negative binomial; double-hurdle model and selection bias model -Heckman two-stage. According to Adesina (1996); Waithaka et al. (2007); Beadgie and Zemedu, (2019), The tobit model is mostly employed to estimate the combined effects of factors influencing the probability and intensity of participation. However, the tobit model has underlying assumptions that have been criticized because the discrete and continuous decisions may not be necessarily joint decisions (Wiredu et al. 2015). To address this possible setback, this study uses a nehurdle model instead of the tobit to analyze the data because, with nehurdle, heteroskedasticity and multiplicative heteroskedasticity can be modeled by representing the natural logarithm of the standard deviation (Sánchez-Peñalver, 2019).

An Instrumental Variable (IV) Poisson model was used to analyze the impact of value chain participation on household food insecurity among smallholder farmers in the study area. The study adopted an instrumental variable approach because it adopts a General method of Moments (GMM) estimators of Poisson regression and allows endogenous variables to be instrumented by excluding instruments (Nichols, 2008). According to Larochelle & Alwang (2014), a basic Poisson model does not account for endogeneity if there exist instrumental variables, therefore this study adopted an IV-Poisson model to account for endogeneity.

Table 3.1 below provides a summary of the objectives, data to be collected, data collection tools, and data analysis techniques.

Table 3.1: Summary of Methodology to specific objectives

<b>Objective</b>	<b>Data to be collected</b>	<b>Data collection tools</b>	<b>Data analysis</b>
To determine the existing vegetable value chains in the study area (SHEP Phase 1)	<ul style="list-style-type: none"> <li>• Types of value chains, actors, and supporting actors.</li> <li>• Different linkages between value chain actors.</li> <li>• Value chain constraints.</li> </ul>	<ul style="list-style-type: none"> <li>• Focus groups</li> <li>• Questionnaires (survey interviews)</li> <li>• Baseline surveys</li> </ul>	<ul style="list-style-type: none"> <li>• Descriptive analysis</li> <li>• Value Chain Mapping</li> </ul>
To identify the factors that influence male and female participation levels in the vegetable value chains (SHEP Phase 2)	<ul style="list-style-type: none"> <li>• Factors influencing value chain participation decisions.</li> <li>• Factors that influence value chain participation level.</li> <li>• Gender disparities in the value chain.</li> </ul>	<ul style="list-style-type: none"> <li>• Focus groups</li> <li>• Questionnaire (survey interviews)</li> </ul>	<ul style="list-style-type: none"> <li>• Descriptive analysis</li> <li>• Nehurdle model</li> </ul>
To explore the impact of value chain development on household food security (SHEP Phase 3)	<ul style="list-style-type: none"> <li>• Food security data.</li> <li>• Factors influencing household food security.</li> </ul>	<ul style="list-style-type: none"> <li>• Focus groups</li> <li>• Questionnaire (survey interviews)</li> <li>• Market survey</li> </ul>	<ul style="list-style-type: none"> <li>• Descriptive analysis</li> <li>• Instrumental Variable Poisson model</li> </ul>



### **3.4 SHEP implementation procedures**

Before the SHEP was implemented, the researcher invited the trained SHEP extension officers from the KwaZulu-Natal Department of Agriculture and Rural Development. The researcher prepared a questionnaire for the extension officers to evaluate their own readiness to implement the SHEP and to discuss the key challenges faced by the extension officers when they implemented SHEP in other areas. Figure 3.2 below shows the extension officers and researchers in a workshop at the University of KwaZulu-Natal. During the workshop, the extension officers filled in their own readiness to implement SHEP questionnaire.



Figure 3.2: Workshop to evaluate extension officer readiness to implement SHEP.

#### **3.4.1 SHEP'S four essential steps**

There are four essential steps that were used as a guide to implementing the SHEP model.

##### **3.4.1.1 Step 1- Share goal with farmers**

The first step to implementing SHEP is to share the goal of SHEP with the target farmers. The farmers are made to be aware that SHEP does not provide any financial assistance or materials to the farmers, but rather it provides the farmers with capacity development where farmers gain new skills and knowledge throughout the implementation of the SHEP. During this step, a sensitization

workshop is conducted to explain to the farmers the details and timeframe of the SHEP training and what is the overall aim of the SHEP (Figure 3.3).



Figure 3.3: SHEP implementer conducting a sensitization workshop

#### **3.4.1.2 Step 2- Farmers' awareness is raised**

The second step is for the SHEP implementers to provide opportunities for the farmers that can raise awareness of their current situations and opportunities that horticultural farming can offer to them. The current situations of the farmers are recorded using baseline surveys and opportunities for farmers are investigated using market surveys. This step allows the SHEP implementers to gather hard data that will be used to monitor the results of the SHEP intervention at a later stage.

#### **3.4.1.3 Step 3- Farmers make decisions**

After conducting market surveys in step 2, a target crop selection is conducted in this step so the farmer groups can identify the specific types of crops and quality that the market demands. Some of the decisions include what crops to grow and when, what quantity and quality, as well as the selling price. In the third step, a crop calendar is also made to allow the farmers to plan for future production and marketing of the target crops selected.

#### **3.4.1.4 Step 4- Farmer acquire skills**

In this final step, the extension officers impart the farmers with the knowledge and skills that are required to produce the crops that the market demands. The SHEP implementers conduct infield training with the target farmers to disseminate knowledge, techniques, and skills for practical production and marketing of the chosen target crop

## Chapter 4

# Factors influencing the level of value chain participation and implications on smallholder farmers in Swayimane KwaZuluNatal<sup>1</sup>

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### Abstract

Governments in less developed countries have identified the need to support smallholder farmers and intervene to alleviate poverty and positively contribute to household food security. In Africa, there has been a growing emphasis on value chain development so that smallholder farmers can benefit from participation in agricultural value chains. Smallholder farmers are however still faced with constraints that negatively influence their participation decisions and the level of participation in agricultural value chains. This study, therefore, investigated the factors that influence the level of value chain participation and implications on smallholder farmers in KwaZulu-Natal, Swayimane area. Primary data was collected from farming households selected through a purposive sampling technique. The data were analyzed using descriptive analysis and the nehurstle model. Results from the nehurstle model showed that the age of the respondent, marital status, farm income, household size, cooperative, market information, radio, extension officer, and formal education significantly influenced the participation decisions of smallholder farmers in agricultural value chains. The results further showed that off-farm income, marital status, cooperatives, access to credit, access to irrigation scheme, radio, extension officer, contact with non-government organizations, and formal education significantly influenced the level of value chain participation of the smallholder farmers. It can be concluded that the level of endowment in the physical, financial, and human

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<sup>1</sup> This chapter has been submitted for review in a peer review journal

resources influence participation. Further, the farmer's connectivity with the external world outside the village improves the outcomes and level of success. It is recommended that a market-led approach to farmer development be adopted to improve the commercial prospects of farmers whilst bolstering food security.

**Keywords: Value chain, Smallholder farmers, Swayimane, Nehurdle model.**

## 4.1 Introduction & Contextualization

Smallholder farming in less developed countries has the potential to generate income and improve food security among rural households. As a result, smallholder farming development interventions and improving farmer productivity have received much attention over the number of years (Onya et al, 2016). Governments in less developed countries have identified the need to support smallholder farmers and intervene to alleviate poverty and positively contribute to household food security (Thamaga-Chitja & Morojele, 2014). In the Swayimane area, vegetable farming has been used as a method to improve and sustain livelihoods. Smallholder vegetable farmers grow fresh leafy vegetables such as spinach, cabbage, lettuce, and other vegetables such as potatoes, beetroot, butternut, green mealies, carrots, and chilies. Smallholder farming has great potential to create employment and contribute to household income, however smallholder farmers lack participation in commercial and high-value markets because of institutional and socio-economic constraints (Senyolo et al., 2018). In Swayimane, the farmers mostly sell through informal markets (i.e. Street vendors, bakkie traders, local tuckshops), and participation in formal commercial markets remains a challenge.

Smallholder farmers need to participate in agricultural value chains and value addition processes to be able to partake in commercial markets, however, the major challenge is high transaction costs in value-added products. Furthermore, there is a lack of business opportunities and linkages that hinder farmers from fully participating in agricultural value chains (Baloyi, 2010).

The Smallholder Horticulture Empowerment & Promotion (SHEP) model adopted by this study can help solve the mentioned problems using a value chain participation approach. SHEP uses effective training methods to physiologically empower farmers to be market-orientated and consider farming as a business. SHEP also assists to reduce the information gap between farmers, input suppliers, business service providers, and market actors. This enables the farmers to be able to address production and marketing problems associated with value chain participation. According to FAO (2010), agricultural value chains can be defined as “the set of actors and activities that bring a basic agricultural product from the production in the field to final consumption, where at each stage value is added to the product”. Examining the agricultural value chains for smallholder farmers is important to identify major constraints for value chain development and for identifying linkages and partnerships for developing the value chain (Trienekens, 2011). Webber and Labaste (2010) define value chain development as “an

effort to strengthen mutually beneficial linkages among firms so that they work together to take advantage of market opportunities, that is to create and build trust among value chain participants”. The level of participation in the agricultural value chain can be improved through value chain development.

Value chain analysis is critical for understanding the participation of different actors and to identify the gender dimensions in value chains and how they influence the level of value chain participation among smallholder farmers. According to Khumalo (2014), it is still a challenge for women to participate in all the levels of the value chain and they are usually situated at lower levels of the value chain (i.e production, value addition), and they are absent in the distribution and marketing stage. The author further states that there are institutional, cultural, and social constraints that limit women’s attempt to participate in all levels of the value chain. Furthermore, addressing gender disparities in value chains along with other factors that influence the level of value chain participation is key for value chain development.

The key to value chain development is to improve the performance of the chain by reducing transaction costs strengthening linkages and partnerships between the actors involved (Bammann, 2019). Re-enforcing linkages between actors is essential for improving the level of value chain participation among smallholder farmers. Value chain participation of different agricultural commodities is a strategy for improving food security and alleviating poverty among the value chain participants (Singh et al., 2011). Inclusive value chain development is a new concept that focuses on linking smallholder farmers to local markets by considering the smallholder farmer participation in value chains, and therefore, is linked with income generation, opportunities for employment, and food security (Lie, 2017). Investigating the determinants of the level of value chain participation could be key for rural development interventions.

The objective of this study is to identify and explore the factors influencing the level of value chain participation and the implications among smallholder farmers in the Swayimane area. Identifying these factors can help to recommend interventions aimed at improving value chain participation among smallholder farmers in South Africa. The findings of the study will be of interest to stakeholders and value chain actors in the vegetable value chain. The results of the study can be essential in value chain development interventions implemented by government and non-government organizations. Furthermore, the findings of this study will contribute to the existing literature by identifying which factors are significant in influencing the level of

value chain participation among smallholder farmers and what implications that has on smallholder farming in a rural setup.

## **4.2 Analytical framework**

Empirical studies have employed different methodologies to analyze factors influencing the value chain participation of smallholder farmers (Jitmun and Kuwornu, 2019; Rabbi et al. 2019). Mostly, participation decisions in literature are measured using dichotomous choice models such as Logit, Probit, and Tobit; count data, namely, Poisson or negative binomial; double-hurdle model and selection bias model -Heckman two-stage. The tobit model is used when the data set for the outcome variable is censored, and there are continuous effects of the covariates on the outcome variable. The tobit model developed by Tobin (1958) is a combination of the discrete and continuous dependent variables. The tobit model is mostly employed to estimate the combined effects of factors influencing the probability and intensity of participation (Adesina 1996; Waithaka et al. 2007; Beadgie and Zemedu, 2019). However, this assumption underlying the tobit model has been criticized because the discrete and continuous decisions may not be necessarily joint decisions (Wiredu et al. 2015). To address this possible setback, a nehurdle model instead of the tobit model was employed to analyze the data because, with nehurdle, heteroskedasticity and multiplicative heteroskedasticity can be modeled by representing the natural logarithm of the standard deviation (Sánchez-Peñalver, 2019).

The double-hurdle model was introduced by Cragg (1971) and it exemplifies the idea that an individual's decision on the extent of participation in an activity is the result of two processes: the first hurdle, determining whether the individual is a zero type, and the second hurdle, determining the extent of participation given that the individual is not a zero type. Using the nehurdle estimation procedure captures the double-hurdle model while also modeling of heteroskedasticity. The nehurdle model estimates dependent variables with corner solutions at 0. It collects the following maximum-likelihood estimators: Tobit (Tobin (1958)), Truncated Hurdle (Cragg (1971)), and Type II Tobit. It allows for both linear and exponential specification of the value equation, as well as for modeling exponential (multiplicative) heteroskedasticity, as used by Harvey (1976), in both the selection and value processes where appropriate. In version 14, Stata introduced *churdle*, a command that allows estimations of models with bounded dependent variables. *churdle* is, in fact, a Truncated Hurdle estimator that allows linear and exponential specifications of the value equation, as well as modeling

heteroskedasticity both in the selection and the outcome equation. `nehurdle` differs from `churdle` in that `nehurdle` works on versions 11 and later, not just 14 and later, in that `nehurdle` only works on variables that are bounded from below at zero, a subset of variables on which `churdle` works, and in that `nehurdle` also has the Tobit and Type II Tobit estimators for linear and exponential specifications of the value equation that allows modeling of heteroskedasticity in the value and selection processes, while `churdle` only does this with the Truncated Hurdle estimator (Sánchez-Peñalver, 2019).

## **4.3 Materials and Methods**

### **4.3.1 Study area and description of sampled farmers**

The study was conducted in the province of KwaZulu-Natal, in the area of Swayimane, which is a rural community located 13km outside of Wartburg under the uMshwathi municipality. The area is a rural community under the leadership of the Gcumisa Traditional Authority, and traditional customs continue to govern the community (Martin & Mbambo, 2011). The land in Swayimane is predominantly used for agricultural production because the area is characterized with rainfall of up to 500-800mm per annum, furthermore, the land is also characterized with good arable soils which are in the top 2% of South Africa's highest potential arable soils (Khumalo, 2014). The majority of the households in the study area were female-headed households, which are mildly food insecure and poor because of high levels of unemployment, with agriculture being the main livelihood strategy (Khumalo, 2014; Zondi, 2003).

This study sampled 51 smallholder farmers from the area of Swayimane. The sampled farmers commonly produced crops such as madumbe (taro root), sweet potato, maize, cabbage, beans, spinach, and potatoes. Other common vegetables produced by the farmers were onions, carrots, green peppers, chilies, butternut, and beetroot. The farmers were market participants at certain levels because they sold their produce after harvesting. Most of the farmers sold their produce through informal markets such as selling at farm gate, selling to community members, bakkie traders, small tuckshops, schools, and street vendors. Access to formal markets such as contract farming, large retailers, and wholesalers remains a challenge for the sampled farmers. Access to formal markets remains a challenge for the farmers because of institutional constraints.

### **4.3.2 Research design**

The study employed a mixed-methods methodology where both qualitative and quantitative approaches to collect data were used to reveal information under the research question. This type of methodology is essential for providing a strong foundation for community-based participatory research (Ivankova, 2017). The research approach is community-based research and the research methodology was designed to involve smallholder farmers, different stakeholders, market actors, researchers, and government extension officials to participate in the different stages of the research process. Community-based participatory research is a research approach that is collaborative because it involves community members (farmers), researchers, and other stakeholders such as extension officers in the research process (Collins et al, 2018). A Purposive sampling technique was used to sample 51 cases of smallholder farmers, and the data was collected using a survey questionnaire to gather information on existing value chains, the level of value chain participation outcomes, and the implications on the food security status of farmers in the study area.

### **4.3.3 Data Analysis**

#### **4.3.3.1 Data collection and analysis**

The data was collected using a survey questionnaire through one on one interviews. It was then coded and captured on Microsoft excel and then exported to Stata version 15 for analysis. Descriptive statistical analysis was used to summarize the demographic data of the sampled respondents. The qualitative data were analyzed using value chain mapping. Further analysis was done using the nehurst model, and it identified the variables that were significant in influencing the level of value chain participation-outcomes.

#### **4.3.3.2 Value Chain Mapping**

Value chain mapping was used to map the value chain activities, processes, and linkages between actors in the vegetable value chain. A key component of value chain analysis is mapping the value chain, as it can be very difficult to see the important linkages in a complex system without mapping the value chain (Stein & Barron, 2017). A value chain map helps us to understand all the activities of a product when it moves from its raw form until it reaches the consumer. As a guide to mapping the vegetable value chain of the sampled farmers, the study mapped each transformation process, identified end markets, identified different value chain actors, connected linkages between actors, represented support services, and mapped the

waterusage at each value chain activity. Furthermore, as a guide to mapping the value chain of the sampled farmers, the study adopted the mapping canvas from the study conducted by Stein and Barron (2017). Figure 4.1 below shows the researcher working with farmers to map the value chain.



Figure 4.1: Discussion between researcher and research participants to map the value chain.

Figure 4.2 below shows a digitalized value chain map for the sampled farmers in the community of Swayimane according to the information provided by the farmers. The value chain map shows the current value chain activities, value chain actors, linkages between actors, and constraints faced by value chain actors in the study area as described by the sampled farmers.

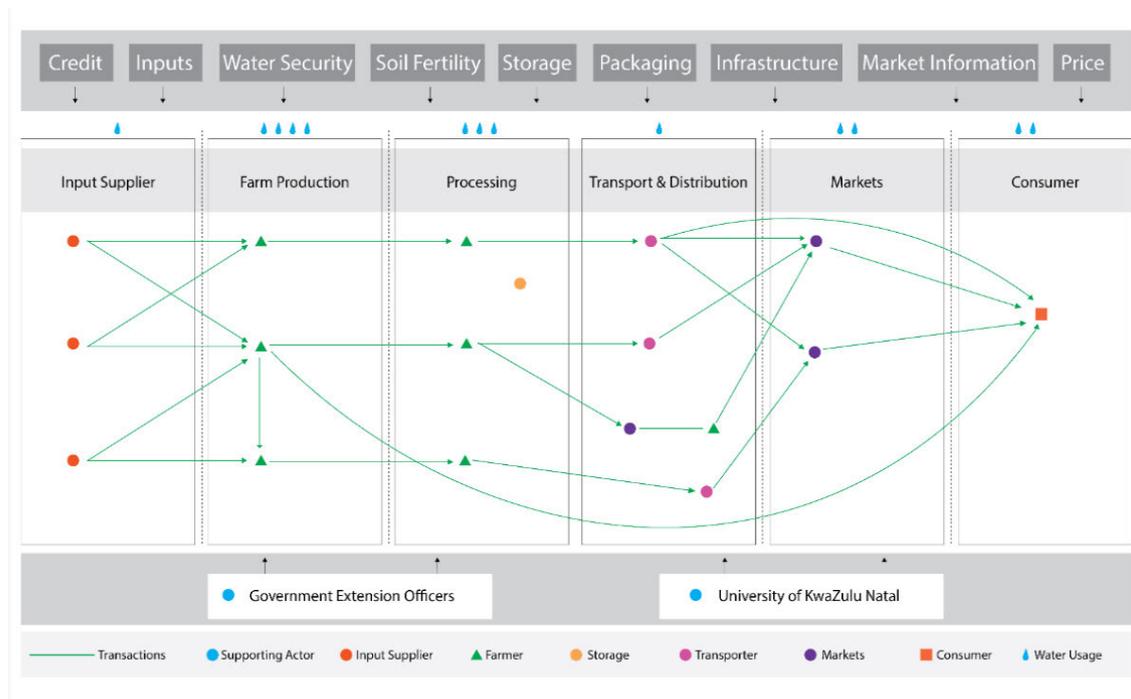


Figure 4.2: Digitalized value chain map for the Swayimane area. (Ndlovu et al., 2020 Adapted: from Stein and Barron, 2017)

The main actors in the vegetable value chain of Swayimane were input suppliers (i.e. extension officer, University of KwaZulu-Natal, input shops), smallholder farmers, traders (i.e. Bakkie traders, tuckshops, retailers, street hawkers), and consumers. The farmers either received free inputs from supporting actors such as government extension officers or the University of KwaZulu-Natal, or they purchased inputs from companies such as UCL Company (Pty) Ltd that is situated in Dalton, Spar in Wartburg, and TWK Agri (Pty) Ltd located in Pietermaritzburg. The produce moves in different marketing channels, the first being from farmer to the trader (i.e. Bakkie trader, street hawkers, middlemen) or straight to the consumer through farm gate purchasing. The produce also moves from the farmers to traders (i.e. local tuck-shops, retailers) and then to the end consumer for consumption. The water-usage at each activity of the value chain has been mapped (Figure 4.2), in which the farm production stage requires and uses the most amount of water. It is then followed by the processing stage for value addition (e.g. washing and cleaning of surfaces) and other processing activities. Most of the smallholder farmers face water access constraints because water is not provided by the municipality, as a result, they mainly rely on rainwater and water collected from the river. Where water is provided by the municipality, there is only one communal tap to access the water, however, they are often dry because of water cuts and failure to supply water constantly.

The map identified constraints faced by value chain actors of the vegetable value chain in Swayimane area. Key constraints identified by the map were access to credit, access to agricultural inputs, water security, soil fertility, storage facilities, packaging, poor infrastructure, asymmetric market information, and price fluctuations. Input suppliers are located far from the farmers of Swayimane and they generally receive low demands for inputs. The key constraints that are facing the farmers are lack of access to credit, inputs, supplementary, and market information. The farmers rely on informal markets to sell their products and that often results in them being price takers and receive low market prices. The traders that are involved in the value chain are faced with constraints of poor infrastructure (i.e. roads, telecommunication), in which the inner roads to the farms and network coverage is poor in the area although the district road is in good condition. As a result of the constraints, farmers are unable to supply the products to external consumers all year round at the desired quality and quantities.

#### **4.4 Results and Discussion**

##### **4.4.1 Farmers' profile**

The results in Table 4.1 showed that 68.6% of the respondents were female and 31.4% were male. The majority of the active smallholder farmers in the study area are female. This is a common feature of smallholder farming in South Africa (Thamaga Chitja, 2012; ThamagaChitja & Morojele, 2014). The results show that the majority of the respondents were between the ages of 41-50 years. The results imply that the value chain participation level is influenced by age and this is in line with the study of Maponya et al., (2015) who found that age had a significant association with agricultural market participation in the Sarah Baartman District in the Eastern Cape of South Africa. Table 4.1 shows that 54.9% of the respondents were in households that were female-headed and 45.1% were in male-headed households, depicting that the majority of the households were female-headed. This finding is in line with the study of Pienaar and Traub (2015) who posited that the majority (55%) of smallholder households in South Africa are headed by females. Approximately a tenth (9.8%) of the respondents had a household size of persons less than 4 persons, 35.3% of the respondents had a household size of 4-6 persons while 31.4% of the respondents had 7-9 persons and 23.5% of the respondents had more than 10 persons in their households.

Table 4.1 below shows a profile of the sampled farmers in the study area.

Table 4.1: Profile of the farmers in the study area

Socio-demographic variables	Category	Frequency	Percentage
<b>Race</b>	Black	51	100
<b>Age</b>	<25	8	15.7
	25-30	8	15.7 21.6
	31-40	11	25.5
	41-50	13	17.16
	51-60	9	3.9
	>60	2	
			38.6
	0	35	31.4
<b>Sex of responded</b>	1	16	
			54.9
	0	28	45.1
<b>Sex of household head</b>	1	22	
			29.4
	<5	19	37.3
<b>Farming experience (years)</b>	5-10	19	7.8
	11-15	4	5.9
	16-20	3	13.7
	21-30	7	5.9
	>30	3	
			78.4
	0	40	21.6
	1	11	
<b>Employment</b>			9.8%
	<4	5	35.3% 31.4%
	4-6	18	23.5%
<b>Household size</b>	7-9	16	
	10 or more	12	19.6
			80.4
	0	10	
	1	41	56.9
<b>Off-farm income</b>			43.1
	0	29	
	1	22	7.8%
			9.8%
<b>Market information</b>	No school	4	41.2%
	Primary	5	29.4%
	Secondary	21	3.9%
	Matric	15	7.8%
<b>Education level</b>	College Certificate/Diploma	2	
	University	4	

As depicted in Table 4.1, about 37.3% of the respondents had farming experience of between 5-10 years. The expectation is that farming experience will enhance the participation level in

value chains because those with experience tend to have more farming and marketing knowledge and are more efficient at allocating resources (Okoli et al., 2014). Table 4.1 shows that 21.6% of the respondents received their main income from off-farm employment and this implies that 78.4% of the respondents are unemployed and they depend on farm income, family remittances, other businesses, and government grants for income. The results further show that 80.4% of the respondents received off-farm income and 19.6% of the respondents did not receive off-farm income, in which they are only dependant on farm income. Table 4.1 shows that the majority (41.2%) of the respondents had secondary education as their highest level of education and 56.9% of the respondents did not have access to market information and therefore, they did not have secure lucrative markets.

#### **4.4.2 Factors influencing value chain participation-selection model**

The results of the nehrudle model for men, women, and pooled are as presented in Table 4.2.

The coefficient of age of respondents had a negative and significant effect on men's level of value chain participation and no significant effect on the participation of women and pooled (men and women) among the smallholder farmers. The result implies that as the farmer grows older, the probability of participating in the agricultural value chain is reduced. This could be attributed to the fact that farmers become more risk-averse and are less likely to adapt as they grow old while young farmers are more likely to take the risk associated with farm innovation technology. The result of this study substantiate the findings of Ghosh-Jerath et al., (2015) and Rahman et al., (2016) who acknowledged that younger farmers adopt new agricultural techniques and innovations because they are innovative, risk-takers and have better access to information, while older farmers prefer not to change their regular familiar farming practices.

The coefficient of marital status had a positive and significant effect on men's level of value chain participation and no significant effect on women's participation and pooled among the smallholder farmers. This implies that married men are more likely to participate in the value chain because they are the household heads and they believe that they have to financially provide for the household. This could also be attributed to that married men tend to have larger household sizes because of many children and thus the need to participate in the value chain to be able to feed the dependants (Ojogho, 2010). The result of the study substantiates the findings of Onya et al., (2016) who acknowledged that married household heads are more likely to participate in agricultural value chains because of the need to increase the household income.

Futhermore, Achandi, and Mujawamariya (2016) in their study found that married household heads sell more produce than un-married household heads.

The results further show that farm income had a positive and significant effect on men's level of value chain participation and no significant effect on women's participation and pooled among the farmers. This implies that when farm income increases, more men are likely to participate in agricultural value chains because of the need to financially provide for their families and attain a decent standard of living. According to Gneiting and Sonenshine (2018), more women are engaged in farm production activities than men, however, more women are still concentrated in subsistence production and they lack access to productive assets and services that can allow their level of value chain participation to increase. Reasons for this result could be linked to time poverty experienced by many women farmers due to being mostly responsible for household reproductive and care roles culturally assigned to women. (Chitja et al 2016).

Household size had a negative and significant effect on men's level of participation and no significant effect on women's participation and pooled among the farmers. This implies that the larger the household size, the probability of participating in the agricultural value chain is reduced. A negative effect was not expected because household heads with larger household sizes are more likely to sell more produce to feed all the household members (Ojogho, 2010). However, The result of this study is consistent with the findings of Adenegan et al., (2012) and Egbetokun et al., (2017) who found that larger households with more dependants are more likely to sell less of their farm produce and increases in household members will incline households to decrease market participation and the level of commercialization. This can be attributed to that not all the household members participate in agricultural activities and the agricultural produce that has been harvested is used more for family consumption as a result of more household members who need to eat.

The results in table 4.2 show that cooperatives had a positive and significant effect when pooled among the farmers. This suggests that when male and female farmers are part of a cooperative, the probability of participating in the agricultural value chain is increased. This could be attributed to the fact that farmer cooperatives in South Africa are important in commercial agriculture as input suppliers, providers of services, and as marketing agents (Ortmann & King, 2007). The result of the study substantiates the findings of Sumalde and Quilloy (2015); Ojo and Baiyegunhi (2020a), who acknowledged collective action through cooperatives have been successful for empowering smallholder farmers in terms of enhancing

their participation in value chains by improving farm productivity and access to markets which allows for better income and economic opportunities.

Market information had a positive and significant effect on women's level of value chain participation and no significant effect on the participation of men and when pooled among the farmers. The implication of the result depicts that as women gain access to market information, the probability of participating in agricultural value chains is increased. This could be attributed to the fact that women farmers need reliable and accessible market information to be able to better market their products and they constantly need to receive information through both informal and formal channels (Ahmadu & Idisi, 2014). The result is consistent with the work of Kiptot and Franzel (2012), in which they acknowledged that with access to market information, women farmer's decision-making is improved with regards to farm production and marketing of produce which will strengthen their participation in agricultural value chains.

The results in table 4.2 show that the extension officer had a positively significant effect on men's level of value chain participation and when pooled among the farmers and had no significant effect on the participation of women. The implication of the result depicts that if male farmers have access to an extension officer, the probability of participating in agricultural value chains is increased. This can be attributed to the fact that extension agents provide smallholder farmers with inputs, advisory services, agriculture information, and knowledge and skills that are essential for them to be active participants in agricultural value chains (Maliwichi et al., 2017). The result substantiates the findings of Abdu-Raheem and Worth (2011) who acknowledged that extension officers develop the human capital and social capital through training for knowledge and skills and by helping farmers to form cooperatives or farmer associations that can link them to produce markets. Furthermore, the results are in line with the study of Manfre et al., (2013) and the World Bank (2010) who posited that in general, contact between women farmers and extension agents remains relatively low and there is still a need to reduce gender inequalities in accessing extension services.

**Table 4.2: Factors influencing the level of value chain participation-outcome model-nehurdle model**

Participation decision	MEN			WOMEN			POOLED		
	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value	Coef.	Std. Err.	P-value
Age of respondent	-0.126	0.047	<b>0.007***</b>	-0.059	0.042	0.159	-0.019	0.038	0.613
Off-farm Income	-1.538	1.097	0.161	-1.007	1.429	0.481	-0.712	1.453	0.624
Marital status	2.220	0.927	<b>0.017**</b>	0.409	1.035	0.693	-0.846	1.033	0.413
Farm income	1.726	0.995	<b>0.083*</b>	1.134	0.976	0.245	-0.199	0.824	0.809
Household size	-0.305	0.139	<b>0.028**</b>	-0.027	0.161	0.867	-0.082	0.139	0.555
Land rent	-0.009	1.024	0.993	1.054	1.577	0.504	1.884	1.971	0.339
Cooperative	-1.581	1.017	0.120	-1.307	0.975	0.180	2.443	1.391	<b>0.079*</b>
MSTATUS	-0.106	0.902	0.906	-3.897	1.861	<b>0.036**</b>	2.503	1.283	<b>0.051*</b>
Access to Credit	-2.167	1.122	0.053	7.163	263.117	0.978	-0.822	1.248	0.510
Access to Irrigation scheme	0.590	0.920	0.521	0.648	0.882	0.463	-0.927	1.171	0.428
COFARM	0.160	0.703	0.820	-1.818	1.214	0.134	0.160	0.844	0.850
Market Information	-2.228	1.451	0.125	-3.045	1.764	<b>0.084*</b>	3.730	358.352	0.992
Access to extension	-0.306	0.870	0.725	1.695	1.217	0.164	-1.540	1.548	0.320
ICT_TV	1.053	0.755	0.163	-0.413	0.902	0.647	1.607	0.980	0.101
ICT_RADIO	-0.138	0.874	0.875	-4.320	1.776	<b>0.015**</b>	1.562	1.517	0.303
EXTOFFIC	1.895	1.060	<b>0.074*</b>	1.053	0.817	0.197	2.762	1.478	<b>0.062*</b>
Contact with NGO	0.117	1.263	0.926	1.838	1.970	0.351	6.339	307.243	0.984
Formal Education	0.071	0.629	0.911	-1.373	0.858	0.110	2.015	0.844	<b>0.017**</b>
Constant	7.034	2.927	<b>0.016**</b>	8.169	4.294	<b>0.057*</b>	-1.226	2.168	0.572

**Level of Participation**

Age of respondent	-0.034	0.013	<b>0.007***</b>	0.035	0.018	<b>0.044**</b>	0.005	0.014	0.716
Off-farm Income	0.988	0.415	<b>0.017**</b>	0.615	0.560	0.272	0.347	0.458	0.450

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54

Marital status	0.882	0.396	<b>0.026**</b>	0.077	0.470	0.869	0.358	0.411	0.385
Farm income	-0.429	0.302	0.155	0.244	0.423	0.565	-0.507	0.374	0.176
Household size	-0.013	0.058	0.816	-0.063	0.069	0.361	-0.090	0.056	0.106
Land rent	-0.129	0.325	0.692	-0.061	0.653	0.926	-0.669	0.462	0.148
Cooperative	-0.692	0.279	<b>0.013**</b>	-0.337	0.532	0.526	-0.840	0.435	<b>0.054*</b>
MSTATUS	0.695	0.284	<b>0.014**</b>	0.003	0.467	0.995	0.852	0.447	<b>0.057*</b>
Access to Credit	-0.084	0.533	0.875	0.746	0.502	0.137	-1.651	0.619	<b>0.008***</b>
Access to Irrigation scheme	-0.482	0.242	<b>0.047**</b>	0.233	0.454	0.608	0.225	0.410	0.584
COFARM	-0.160	0.235	0.495	-0.644	0.385	<b>0.094*</b>	-0.437	0.366	0.233
Market Information	-0.261	0.391	0.505	-1.628	1.411	0.248	0.312	0.462	0.500
Access to extension	-0.207	0.224	0.356	0.651	0.624	0.297	-0.399	0.483	0.409
ICT_TV	0.722	0.454	0.111	-0.385	0.450	0.392	-0.223	0.337	0.507
ICT_RADIO	-0.527	0.257	<b>0.040**</b>	-0.870	0.644	0.177	1.417	0.430	<b>0.001***</b>
EXTOFFIC	0.001	0.379	0.998	-1.780	0.565	<b>0.002***</b>	-0.782	0.361	<b>0.030**</b>
Contact with NGO	-0.328	0.368	0.373	-0.313	0.604	0.605	-1.429	0.497	<b>0.004***</b>
Formal Education	-0.024	0.274	0.931	-0.859	0.449	<b>0.056*</b>	-0.491	0.336	0.144
Constants	2.844	0.796	<b>0.000***</b>	1.674	1.055	0.113	3.215	0.992	<b>0.001***</b>

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Insigma	-1.293	0.154	0.000	-0.283	0.138	0.040	-0.493	0.124	0.000
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**Wald chi2(38) 85.730**

**Prob > chi2 0.000**

<b>Log Likelihood</b>	<b>-19.761</b>
<b>Pseudo R-squared</b>	<b>0.467</b>

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Formal education had a positive and significant effect on the farmer's level of value chain participation among pooled-headed households. The implication of the result depicts that when farmers are educated through a formal education system, the probability of participating in agricultural value chains increases. The explanation is that formal education improves the decision making of the farmers, equips farmers with knowledge and skills, as well as the ability to process and understand information that is important for producing and selling of agricultural produce. There is an association between formal education and technical efficiency (Nyagaka et al., 2010), in which formal education increase human capital and improve the productivity of farmers. The result is consistent with the work of Awotide et al., (2016) who found that formal education improves the household's understanding of markets and will, therefore, increase the probability of selling produce.

#### **4.4.3 Factors influencing the level of value chain participation-outcome model**

The result in Table 4.2 shows that income from off-farm activity positively and significantly influences the level of participation in the value chain among men-headed households but not significant with women and pooled households. The income of households from an off-farm activity which represents earnings from other businesses by the farmers tends to contribute positively to the level of VC participation among men-headed households. This could be attributed to the fact that a rise in non-farm income such as petty trading, woodworking, and animal trading provides extra finance that could allow farmers to invest in capital intensive farm activities. The result of this study (Table 2) conforms to the study of Kassie *et al.*, (2015) and Ojo et al., (2020) who found that non-farm income provided farmers with the additional financial power to adapt to climate change strategies such as the application of improved crop varieties and fertilizers. The result also corroborates the findings of De Janvry et al., (2005) and Ojo and Baiyegunhi (2020b) who noted that non-farm income helps to enhance the investment capacities in farm activities, and reduce income fluctuations to household enhance agricultural production as well.

Access to credit negatively and significantly influences the level of participation in value chain among pooled- households but not significant among women and men households. This depicts that having access to credit contributes negatively to the level of value chain participation among pooled- households. This could be attributed to the fact that smallholder farmers may acquire credit but use it for non-agricultural uses such as purchasing food, health, paying school fees, and for gatherings such as traditional ceremonies, marriage, and funerals. The result is

contrary to the work of Sinyolo et al (2016), who acknowledged that access to credit enhances agricultural productivity which increases farm revenues and provides incentives for farmers to increase agricultural practices. However, the result of the study conforms to the study of Elahi et al., (2018) who found that farmers with larger households tend to use agricultural credit for non-farm purposes to make the livelihoods of the entire household to be sustainable

The result (Table 4.2) of the study shows that access to irrigation scheme negatively and significantly influences the level of participation in the value chain among men-headed households but not significant with women and pooled households. This result depicts that the level of value chain participation is most likely to be reduced in men-headed households when they have access to an irrigation scheme. A possible explanation is that in irrigation schemes that can be water-based scheme conflicts and well as free riders. Irrigation can also reduce crop production as a result of pest infestation, waterlogging, less fertile soils because of a lack of aeration and there are health effects of irrigation which can cause diseases for both man and livestock (Asayehegn, 2012).

Information communication technology (ICT) and radio had a negative and significant effect on the level of value chain participation among men-headed households and had no significant effect on the level of participation among women-headed households. However, the radio also had a positive and significant effect on pooled households. This implies that the use of radio negatively influences the level of value chain participation among men-headed households but positively influences the level of participation among pooled households. This could be attributed to the fact that radio can facilitate agricultural advisory and extension service in which agricultural production and market information are disseminated to farmers. The result is consistent with the work of Shema (2012) who acknowledged the role of radio in addressing information gaps in agricultural value chains. The result also substantiates the finding of Kelemu et al., (2016) who acknowledged that the use of radio increased the level of technical efficiency among farm households.

The results in table 4.2 show that the extension officer negatively and significantly influences the level of participation among women-headed households and pooled households but not significant with men-headed households. The implication of the results depicts that extension contacts with farmers negatively affects the level of value chain participation among women and pool-headed households. This result is unexpected and contradicts the findings of

(Omonona et al.,2010; Luan et al.,2016; Ojo et al.,2019) who found that there is a positive relationship between credit access and extension contact with farmers. A possible explanation is that farmers who are credit-constrained may not have sufficient capital to adopt and implement innovations disseminated by the extension officers (Amsalu & De Graaff, 2007). The result is consistent with the findings of Margono and Sugimoto (2011) who acknowledged that the linkages of extension-farmer interactions in distributing information to farmers have been persistently weak and ineffective.

Contact with a non-government organization (NGO) had a negative and significant influence on pooled households. The implication of the result depicts that the level of value chain participation will be reduced among pooled-households if they are in contact with an NGO. A possible explanation could be that farmers will tend to over-rely on the NGO for information and linkages between different farmers and actors and it may change the innovation and how the farmers were previously operating, especially if no empowerment of farmers takes place. However, the NGO may not be permanent in the area, and over-relying on the NGO may have negative effects on the farmers. The result is consistent with the work of Hartmann (2019) who found that the NGO changed the local power structure and network centrality of farmers in which the NGO became the main actor for information.

The results (Table 4.2) show that formal education had a negative and significant influence on women's level of value chain participation and had no significant effect on the level of participation of men-headed households and pooled households. The implication of the result depicts that formal education tends to contribute negatively to the level of value chain participation among women-headed households. The result is unexpected since educated women are more knowledgeable about key farm tasks such as record keeping, taxes, bookkeeping, and market discovery (Ilak Persuric & Zutinic, 2008). This can be attributed to the fact that women who are educated through a formal system are more likely to look for employment in urban areas rather than engaging with agricultural activities in rural areas. The result of the study conforms to the study of Muenstermann (2010), who found that younger educated women do not believe that family farming can make enough money to secure livelihoods, and they are often encouraged by their parents to seek employment or a profession outside the farming sector.

#### **4.5 Conclusions and Recommendations**

The study investigated the factors influencing the level of value chain participation and implications on smallholder farmers in Swayimane KwaZulu-Natal. The results from value chain analysis (value chain mapping) showed that the coordination among value chain actors is strongly influenced by opportunities and constraints such as a lack of access to credit, lack of access to agricultural inputs, water in-security, infertile soils, lack of storage facilities, packaging, poor infrastructure, lack of market information, and price fluctuations. The smallholder farmers are more active as producers and traders in the value chain, in which most of their produce is sold through informal market systems. Access to formal lucrative markets remains a challenge for the farmers and this can be attributed to a lack of updated market information, high transaction costs, and major financial constraints.

The results from the nehurstle model showed that that the age of the respondent, marital status, farm income, household size, cooperative, market information, radio, extension officer, and formal education significantly influenced the participation decision of smallholder farmers in agricultural value chains. The results further showed that off-farm income, marital status, cooperatives, access to credit, access to irrigation scheme, radio, extension officer, contact with non-government organizations, and formal education significantly influenced the level of value chain participation of the smallholder farmers. The study recommends that policies should account for these factors to improve value chain participation and the level to which farmers participate in agricultural value chains. It can be concluded that the level of endowment in the physical, financial, and human resources influence participation. Further, the farmer's connectivity with the external world outside the village influences the outcomes and level of participation and success. It is recommended that a market-led approach to farmer development be adopted to improve the commercial prospects of farmers whilst bolstering food security. Furthermore, it is recommended that the factors that influence the participation decisions and the value chain participation level should attract policy attention to enhance value chain participation and the participation level among smallholder farmers. Market information had a positive and significant effect on women's level of value chain participation and since women are the main producers in smallholder farming, it is recommended that this factor (market information) be policy centered.

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## Chapter 5

### **Impact of value chain participation on household food insecurity among smallholder farmers in Swayimane KwaZulu-Natal using the Instrumental Variable Poisson model**

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#### **Abstract**

South Africa has largely been characterized as food secure at the national level but food insecure at a household level. Agricultural productivity has been found to significantly determine whether farming households are food secure or food insecure. This has resulted in the need to fully explore the impact of value chain participation on the food security status of households in South Africa. This paper explores the impact of value chain participation on household food insecurity among smallholder farmers in Swayimane KwaZulu-Natal. A Purposive sampling technique was used to sample cases of smallholder farmers who were value chain participants at various levels. This study aims to investigate if participating in agricultural value chains has any impact on the food insecurity status of the smallholder farmers in the study area. The study uses the Household Food Insecurity Access scale (HFIAS) and the Instrumental Variable Poisson model to assess the household food insecurity status and the factors that influence household food insecurity among the respondents. This study found that 66.7% of the farmers in the sample were food secure, 17.65% were mildly food insecure, 7.84% were moderately food insecure and 7.84% were severely food insecure. Value chain participation, marital status, age of the household head, formal education, farm income, lease rent on land, access to NGOs, access to credit, access to agricultural agency, access to extension services, and access to irrigation schemes were significant in influencing household food insecurity status of smallholder farmers. The study concluded that participation in value chains was significant in reducing food insecurity among smallholder farmers in Swayimane and therefore,

strategies focusing on enhancing value chain participation among farmers should be adopted along with interventions that enhance value chain participation among smallholder farmers.

**Keywords: Value chain, household food insecurity, Instrumental Variable Poisson model, Swayimane.**

## **5.1 Introduction and Contextualization**

Poverty alleviation has been a major task for the government of South Africa over recent years. Alleviating poverty has the potential to decrease the number of households that may experience household food insecurity. The Republic of South Africa has been characterized as food secure at a national level but food insecure at a household level (Maziya et al., 2017). Therefore, according to De Cock et al., (2013), the government adopted and implemented the Integrated Food Security Strategy (IFSS) in 2002 which its vision and goals are linked to alleviating poverty to reduce hunger and household food insecurity. However, at a household level, many rural households are still food insecure or are vulnerable to food insecurity because of high unemployment, income inequality, and asset ownership.

According to the Food and Agriculture Organization (FAO), food security can be defined as “a situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO, 2002). Therefore, food insecurity exists when people do not have access to enough safe nutritious food that can allow them to live an active and healthy life. According to Maziya et al., (2017), agricultural productivity largely determines whether farming households will be food secure or food insecure. Therefore, there is a need to fully explore the impact of value chain participation on food insecurity among farming communities in South Africa. There is a need to further investigate the association between participation in agricultural value chains and food security because the impact of smallholder participation in high-value agricultural chains on food security is not established by recent literature (Ragasa et al.,2018).

Value chain participation has a positive effect on improving the livelihoods of smallholder farmers by increasing household income, improving their welfare status, and opportunities for employment (Asfaw et al., 2012; Tirkaso, 2013; Geday et al., 2016). The studies of Asfaw et al., (2012) and Nangole et al., (2011) found that participating in the value chain had positive

impacts on the food and nutritional status of farmers. It is therefore evident that participating in agricultural value chains can improve household income and alleviate poverty among farmers. This study aimed to investigate and explore the impact of value chain participation in agricultural value chains on household food insecurity among smallholder farmers in Swayimane KwaZulu-Natal using the Instrumental Variable Poisson model. Identifying the impact can help government and non-government organizations to implement appropriate interventions that enhance value chain participation for improved food security among rural farming households. The results of this study will be of interest to food and nutrition policymakers and the findings can be essential in developing interventions aimed at combating food insecurity among rural farming households.

## **5.2 Materials and Methods**

### **5.2.1 Study area and description of sampled farmers**

The study was conducted in the area of Swayimane which is located in a rural area in the province of KwaZulu-natal under the uMshwati municipality. Swayimane is a rural area under the Gcumisa Traditional Authority and the land is mainly used for farming purposes because of the fertile soils and good annual rainfall). Swayimane covers an area of 36.35 km<sup>2</sup> and lies from latitude -29.431277° S and -29.513402° S and from longitude 30.582431° E to 30.649214° E. The land in Swayimane is predominantly used for agricultural production because the area is characterized by rainfall of up to 500-800mm per annum, furthermore, the land is also characterized by good arable soils which are in the top 2% of South Africa's highest potential arable soils (Khumalo, 2014). The sampled farmers were smallholder farmers who were participants in agricultural value chains mainly as producers and traders. Most of the farmers produce field crops such as maize, madumbe, beans, sweet potato, and fresh vegetables such as spinach, cabbage, carrots, onions, green pepper, and chilies. The smallholder farmers are value chain participants but they still lack linkages to formal lucrative markets.

### **5.2.2 Research design and Sampling technique**

The study employed a quantitative approach to collect data that can be used to investigate the research question. Quantitative approaches can enable an organized study of change, development, and organizational communication across different analytical levels over some time (Miller et al., 2011). During the research process, 51 smallholder farmers were sampled

using purposive sampling, and this type of sampling procedure was used to sample farmers who are value chain participants at various levels. A survey questionnaire was used to interview respondents and collect data on farmer profiles, value chain participation, and the food insecurity status of the sampled farmers.

### **5.2.3 Data analysis**

#### **5.2.3.1 Food insecurity indicators**

The food security data of the farming household in Swayimane was assessed using the household food insecurity access scale (HFIAS). The HFIAS is a food insecurity indicator that was developed by the United States Agency for International Development (USAID) in the Food and Nutrition Technical Assistance (FANTA) Project (Maziya et al, 2017). According to Coates et al., (2007), the HFIAS measures the degree of food insecurity (access) in the past 30 days. The HFIAS score was calculated for each household by adding the coded frequency for each of the nine occurrence questions relating to household-level food access. Each of the nine questions has a maximum score of 3 and when summed has a maximum of 27 and a minimum score of 0. The higher the HFIAS score of a household, the more food insecurity is experienced, and the lower the score, the household is more food secure (Coates et al., 2007). The choice of the HFIAS score was motivated by studies of Kirkland et al., (2011); Taylor et al., (2011); De cock et al., (2013), and Maziya et al., (2017) who used the tool in their studies in South Africa. Furthermore, this study used the Household Food Insecurity Access Prevalence (HFIAP) to categorize households into four types of household food insecurity. The four types were namely, food secure, mildly food insecure, moderately food insecure, and severely food insecure.

#### **5.2.3.2 The Instrumental Variable Poisson model**

The food security data was analyzed using the HFIAS and therefore an instrumental variable Poisson model was adopted because it is the most appropriate to capture the count nature of the dependent variable. The instrumental Variable model estimates the parameters of a Poisson regression model in which some of the regressors are endogenous and the model is often frequently used to model count outcomes and to model non-negative outcome variables (Stata manuals13). A basic Poisson model does not account for endogeneity if there exist instrumental variables (Larochelle & Alwang, 2014). Therefore, this study adopted an instrumental variable

approach because it adopts a General Method of Moments (GMM) estimators of Poisson regression and allows endogenous variables to be instrumented by excluding instruments (Nichols, 2008). The selection of an instrumental variable was used to account for unexpected behavior between variables and using an instrumental variable to identify the unobserved correlation allows for the identification of a correlation between the explanatory variable and response variable. The model may be specified using either additive or multiplicative error terms. The exponential conditional mean model has an error form representation in which the dependent variable  $y$  is a function of the exogenous regressors  $x$ , endogenous regressors  $y_2$ , and an error  $\varepsilon$ . The regressors  $x$  are independent of  $\varepsilon$ , while  $y_2$  are not.

Instrumental variable poisson allows  $\varepsilon$  to enter either additively,

$$y_i = \exp(x_i' \beta_1 + \gamma_2 y_{2,i} \beta_2) + \varepsilon_i$$

Or multiplicative,

$$y_i = \exp(x_i' \beta_1 + \gamma_2 y_{2,i} \beta_2) \varepsilon_i$$

## 5.3 Result and Discussion

### 5.3.1 Household Food Insecurity Access Prevalence (HFIAP) in Swayimane

The HFIAP (Figure 5.1) was used as part of the HFIAS methodology and the results in figure 5.1 show that 66.7% of the sampled farmers were food secure, 17.65% were mildly food insecure, 7.84% were moderately food insecure and 7.84% were severely food insecure. The average HFIAS score of the households was 7.21, depicting that the majority of sampled farmers were food secure because a high score indicates that households are food insecure (De cock et al., 2013).

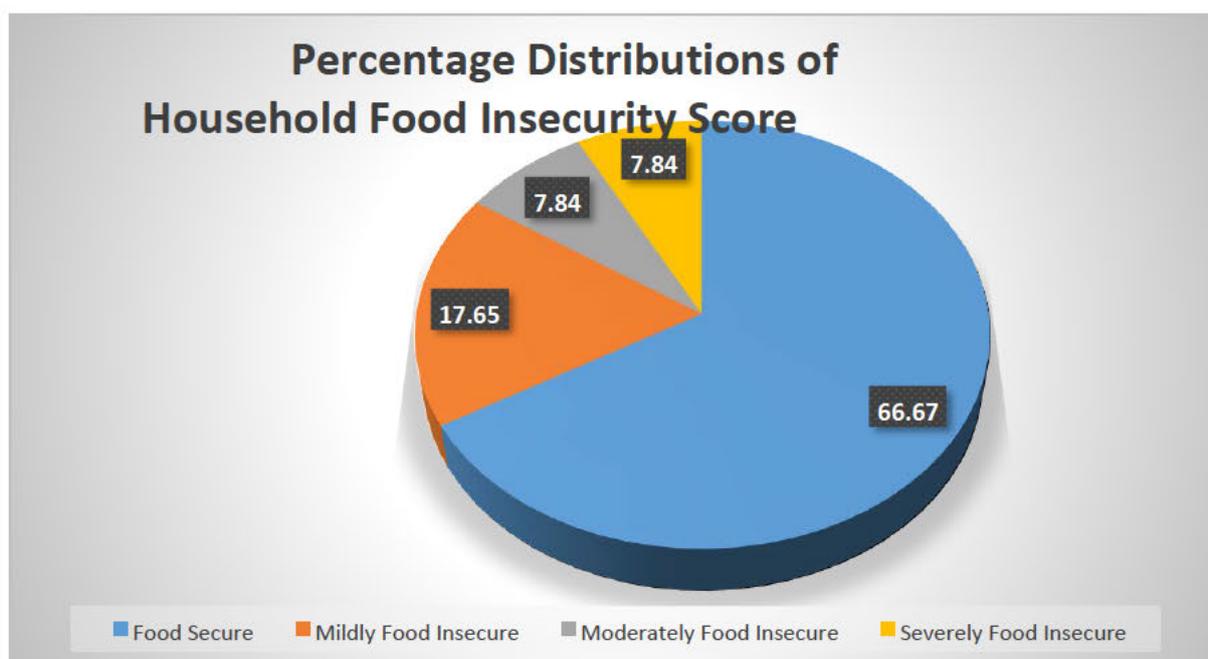


Figure 5.1: Percentage distributions of the HFIAS score.

### 5.3.2 Results from the Instrumental Variable Poisson model

The Instrumental Variable Poisson model was run on STATA version 15. From the fifteen predictor variables fitted in the instrumental variable Poisson model, ten variables had a statistically significant influence on household food insecurity (Table 5.1). seven of the significant variables were negatively signed with household food insecurity, indicating that an increase in either of these variables would be associated with a decrease in HFIAS, meaning an increase in household food security level. Conversely, three significant variables had a positive sign suggesting that an increase in any of these variables would be associated with an increase in HFIAS, suggesting that households will be less food secure as a result of an increase in any of these variables.

Value chain participation was the variable of interest and how it influences the food insecurity status of households participating in the agricultural value chain. A negative relationship was expected because chain participation has the potential of reducing food insecurity within households by improving access and availability of diversified food at all times. Correspondingly, value chain participation had a negative and significant relationship with food insecurity. The implication of the result as depicted by the marginal analysis shows that

as the participation of households in value chain increases by a unit, the household food insecurity is decreased by 2.195 provided that the other variables in the model are held constant.

This finding is in line with the study of Ochieng et al., (2019) who suggested that commercialization increases the household food security status among food crops smallholder farmers in the rural regions of Central Africa. This is also in consonance with Mmbando et al., (2015) who found that market participation was associated with improvements of household food security as a proxy for welfare in terms of per capita expenditures. In the same vein, Kissoly et al., (2017) in their study, found that participation in agricultural markets is linked with improved food security, especially for smallholders who used improved input varieties or store produce to sell.

The coefficient of age of the household head was negative and significant in influencing the food insecurity status of households. The implication of the result as depicted by the marginal analysis shows that as the age of the household head increases by a unit, the household food insecurity is decreased by 0.161 with other variables in the model held constant. This finding is in line with the study of Arene and Anyaeji (2010) who found that as the household head gets older, the probability of being food insecure is increased because their income is more likely to be increased as a result of staying longer on the private and public endeavors. This finding is also in line with the study of Beyene and Muche (2010) who found that the age of the household head has a positive influence household food security due to the fact that older household heads devote more of their time to farming practices compared to young farmers.

**Table 5.1: Impact of value chain participation on household food insecurity-Instrumental variable Poisson model**

	<b>Coef.</b>	<b>St. Err.</b>	<b>P-value</b>	<b>dy/dx -</b>	<b>Std. Err.</b>	<b>P-value</b>	<b>VIF</b>	<b>1/VIF</b>
Value chain participation	-1.060	0.626	0.090*	2.195	1.302	0.092*		
MEANVC_MEN	-1.293	0.254	0.000**	-2.678	0.501	0.000***	7.445	.134
MEANVC_WOMEN	-0.952	0.210	0.000***	-1.972	0.424	0.000***	5.969	.168
MEANVC_BOTH	-0.770	0.198	0.000***	-1.595	0.402	0.000***	4.099	.244
Age of the household head	-0.078	0.016	0.000***	-0.161	0.031	0.000***	3.816	.262
Marital status	1.027	0.379	0.007***	2.128	0.767	0.006***	3.549	.282
Formal education	-1.993	0.330	0.000***	-4.128	0.670	0.000***	2.302	.434
No formal education	0.549	0.415	0.186	1.136	0.856	0.185	2.245	.445
Farming experience	0.318	0.334	0.342	0.658	0.690	0.340	2.909	.344
Household size	-0.071	0.052	0.174	-0.147	0.107	0.167	3.138	.319
Farm income	1.435	0.379	0.000***	2.973	0.783	0.000***	3.156	.317
Lease rent on land	1.438	0.330	0.000***	2.978	0.677	0.000***	3.048	.328
Access to NGOs	-0.512	0.299	0.087*	-1.060	0.617	0.086*	2.959	.338
Access to Agricultural agency	-2.223	0.554	0.000***	-4.605	1.105	0.000***	2.381	.42
Access to credit	-0.928	0.555	0.094*	-1.923	1.149	0.094*	2.866	.349
Access to Grant	-0.646	0.409	0.114	-1.339	0.842	0.112	2.754	.363
Access to ICT_RADIO	-0.139	0.309	0.652	-0.288	0.640	0.653	2.445	.409
Access to Extension services	-0.618	0.213	0.004***	-1.280	0.434	0.003***	2.417	.414
Access to Irrigation scheme	-0.657	0.208	0.002***	-1.362	0.437	0.002***	2.384	.419
Constant	5.127	1.042	0.000***					
Mean VIF							<b>2.977</b>	
Mean dependent	2.176							

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$



Marital status had a positive coefficient and was statistically significant in influencing the food insecurity status of households. The implication of the result as depicted by the marginal analysis shows that as the marital status of household increases by a unit, household food insecurity is increased by 2.128 provided that other variables are held constant in the model. This can be attributed to the fact that the marital status of the household head is negatively linked with how much is spent on food (Sekhampu, 2013). This result is in contradiction with the result of Maziya et al., (2017) who in their study found that the marital status of a household head was negatively related to food insecurity and there is a lower probability of experiencing food insecurity if a household is headed by married individuals. However, The findings of this study are in line with the study of Ojogho (2010) who found that households headed by unmarried people are more likely to be food secure compared to households who are headed by married household heads, and this could be due to the fact that married household heads tend to have larger families because of many children in the household and therefore many people to feed within the household.

The results in table 5.1 show that formal education had a negative coefficient and was statistically significant in influencing the food insecurity status of households. The implication of the result as depicted by the marginal analysis shows that as formal education of a household increases by a unit, household food insecurity decreases by 4.128 provided that the other variables are held constant in the model. A negative relationship was expected because formal education improves human capital and knowledge on the production, distribution, and marketing of agricultural commodities and therefore contributing towards availability and access to diversified foods at all times. Formal education also equips the farmer with knowledge of diversified food groups for a balanced diet which can also influence their decision on nutritional intake. The findings of this study are in line with the study conducted in the Limpopo province by De Cock et al., (2013) who found that households with educated household heads had a lower probability of experiencing food insecurity, and promoting formal education in rural households can contribute improving food security levels significantly.

Farm income had a positive coefficient and was statistically significant in influencing the food insecurity status of households. A positive relationship was not expected because farm income improves access and availability of food. The implication of the result as depicted by the marginal analysis shows that as the farm income of households increases by a unit, household food insecurity increases by 2.973 with other variables in the model held constant. A possible

explanation could be that Smallholder farmers may also invest their farm income on other things rather than food. Furthermore, increased farm income may expose households to prices that are volatile and therefore accessing food from food markets does not guarantee improved food and nutrition security (Jaleta et al. 2009; Fischer and Qaim 2012a). The result of this study substantiates the findings of Anderman et al., (2014) who found that market integration had a negative influence on household food security.

The coefficient of lease rent on land was positive and the variable had a significant effect on the food insecurity status of households. The implication of the result as depicted by the marginal analysis shows that as lease rent on land increases by a unit, household food insecurity increases by 2.978 with other variables held constant in the model. A positive relationship was not expected because lease rent on land improves household income which results in improved availability and access to food. This could be attributed to the fact that lease rent on land can increase income but the percentage increases are often not large enough in absolute terms to reduce the poverty levels of smallholder farmers (Jin & Jayne, 2013). This finding is in line with the study of Chamberlin and Ricker-Gilbert (2016) who found in their study that renting out land had negative returns to landlords in Malawi and negligible returns to lands in Zambia, and some landlords experienced a net loss in income from leasing out land. Furthermore, if the farmers are renting in the land, an increase in lease rent may reduce their profitability from farming and may affect their food security.

Access to NGOs had a negative coefficient and was statistically significant in affecting the food insecurity status of households. The implication of the result as depicted by the marginal analysis shows that as access to NGOs increases by a unit, household food insecurity decreases by 1.060 provided that other variables are held constant in the model. This can be attributed to the that NGOs often pursue explicit poverty reduction goals by value chain development and they can improve value chain participation by strengthening business linkages between value chain actors (Stoian et al., 2012). The finding of this study supports the study of Banks and Hulme (2012) who posited that NGOs essential for filling in the gaps left by government failure by identifying social, environmental, and value chain problems and to implement tools that can improve the current situations to meet the improve the needs of the poor.

The results in table 5.1 show that access to agricultural agency had a negative and significant effect on the food insecurity status of households. The implication of the result as depicted by the marginal analysis shows that as access to an agricultural agency is increased by a unit,

household food insecurity decreases by 4.605 if the other variables in the model are held constant. A possible explanation could be that agricultural agencies can act as a catalytic vehicle that provides institutional support for the development and growth of smallholder farming and that might improve the food security of farmers.

Access to credit had a negative and significant effect on the food insecurity status of households. The implication of the result as depicted by the marginal analysis shows that as access to credit increases by a unit, household food insecurity decreases by 1.923 provided that the other variables are held constant in the model. This finding could be attributed to that access to credit can enhance technology adoption resulting in increased productivity, and accessing credit is important especially during the off-season because it can be used for non-farming purposes and household consumption (Ojo et al., 2019). The finding is in line with the study conducted by Osabohien et al., (2018) who found that there is a positive relationship between access to agricultural credit and food security, where access to credit improves the productivity level and thus leading to improved food security. In the same vein, the study of Du et al., (2019) found that access to agricultural credit can reduce farmland abandonment and farmland can be used for farming to increase food availability.

The results in table 5.1 show that access to extension services had a negative and significant effect on the food insecurity status of households. The implication of the results as depicted by the marginal analysis shows that as access to extension services increases by a unit, household food insecurity decreases by 1.280 provided that the other variables are held constant in the model. This could be attributed to that access to extension services aims at closing the gap between the yields attainable on the farm by introducing new production methods and new technologies that can make significant contributions to agricultural growth (Olagunju & Adesiji, 2011). The result is in line with the study of Ragasa et al., (2013) who found that extension services in the form of advice are positively related to the adoption of improved seed and fertilizer varieties that can improve agricultural productivity. Furthermore, the study of Maponya and Mpandeli (2013) in the Limpopo province found that extension services are important for farmers to attain adaptation strategies against high food prices causes by the changing climatic conditions and, there is a great association among extension services, food scarcity, and food security.

Access to irrigation schemes had a negative and significant effect on the food insecurity status of households. As depicted by the marginal analysis, the results show that as access to irrigation

scheme increases by a unit, household food insecurity decreases by 1.362 provided that the other variables are held constant in the model. This result is expected because access to irrigation leads to poverty reduction by increasing the area under cultivation, allowing for crop diversification, and increased crop production (Hussain & Wijerathna, 2004; Namara et al., 2010). The finding of this study is in line with the study of Sinyolo et al., (2014) who found the welfare of rural households is positively influenced by access to smallholder irrigation schemes. In the same vein, the study of Tesfate et al., (2008) found that having access to irrigation enabled smallholder farmers to produce crops in more than one season and that improved their food security status because of increased production, income, and consumption.

#### **5.4 Conclusions and Recommendations**

The research aimed at assessing the impact of participating in agricultural value chains on food insecurity among smallholder farmers in Swayimane. The variable of interest in this study was value chain participation and the relationship it has with household food insecurity conditions. The study found that value chain participation had a negative effect on household food insecurity among smallholder farmers in Swayimane KwaZulu-Natal. The negative relationship explains that households that participate in agricultural value chains have a higher probability of being food secure because increased value chain participation leads to decreased food insecurity levels among smallholder farmers.

Key factors that influence food insecurity include marital status, age of the household head, formal education, farm income, lease rent on land, access to NGOs, access to agricultural agency, access to television, access to extension services, access to credit, and access to irrigation schemes. These factors are key in explaining the variations in the food security status of different farming households. The study recommends that policymakers and rural development agents have a good understanding of these factors before developing policies and interventions aimed at reducing food insecurity among rural households. Participation in agricultural value chains was found to be significant in reducing food insecurity among smallholder farmers in Swayimane. Therefore, this study recommends that a value chain participation approach should be the focus for policymakers. Interventions aimed at enhancing value chain participation among farmers should be implemented and constraints that hinder value chain participation among smallholder farmers should be fully explored.

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## **Chapter 6: Conclusions and Recommendations**

### **6.1 Overview**

Smallholder agriculture is a key livelihood strategy to sustain livelihoods for rural households in South Africa (Thamaga-Chitja & Morojele, 2014). Despite the large contributions of smallholder agriculture to sustainable livelihoods, smallholder farmers in South Africa are currently unable to capitalize on the potential of farm income due to limited market access (Mduli et al., 2014). It is easier for smallholder farmers to enter the informal markets (spot mechanisms) rather than formal markets (Contract signed) such as supermarkets because there are fewer barriers to entry (Sikwela, 2013). Entry to formal markets is constrained by a lack of institutional support. There are market imperfections that are caused by a lack of market institutions, resulting in asymmetric information between the farmers and buyers (Obi et al, 2012). This study used the SHEP to improve the information flow between farmers (sellers) and buyers. The potential of using empowerment (SHEP) for value chain development especially enhancing market access was investigated. A mixed-methods methodology including both qualitative and quantitative approaches to collect data was used to address the research questions which are namely:

- What value chains and skills exist among the farmers?
- What role does gender play in the vegetable value chains in the study area?
- What factors influence the value chain participation level among farmers?
- How can the SHEP model establish business linkages with various market actors involved in horticulture business?
- Can vegetable value chain development improve household food security in the study area?

The initial phase of this study was to gather baseline information to understand the current existing value chains and business linkages among the farmers and other value chain actors in the vegetable value chain. The second phase was for the researcher along with extension officers to implement the SHEP using the SHEP handbook for extension staff which is a practical guide to the

implementation of the SHEP. The data were collected during the SHEP implementation process, and it was coded on Microsoft Excel and imported to STATA 15 for further analysis. The data were further analyzed using descriptive analysis, value chain mapping, the nehurst model, and an instrumental variable Poisson model.

## **6.2 Conclusions**

The sampled smallholder farmers were mainly involved as producers in the vegetable value chain in which they were producing vegetables to sell and for household consumption. The main actors in the existing vegetable value chain of Swayimane were input suppliers (i.e. extension officer, University of KwaZulu-Natal, input shops), smallholder farmers, traders (i.e. bakkie traders, tuckshops, retailers, street hawkers) and consumers. The produce moved in different marketing channels, the first being from farmer to the trader (i.e. Bakkie trader, street hawkers, middlemen) or straight to the consumer through farm gate purchasing. The produce also moved from the farmers to traders (i.e. local tuck-shops, retailers) and then to the end consumer for consumption. The smallholder farmers were mainly producing for informal markets because there were fewer barriers to entry and there was not enough market information being disseminated to farmers in the study area on how they can access, enter and participate lucrative formal markets. Access to formal markets remained a challenge for the farmers mainly because of high transaction costs and financial constraints.

The value chain map showed that the coordination among value chain actors is strongly influenced by opportunities and constraints such as a lack of access to credit, lack of access to agricultural inputs, water in-security, infertile soils, lack of storage facilities, packaging, poor infrastructure, lack of market information, and price fluctuations. The farmers in the study also face water access constraints in which they mostly rely on harvested rainwater and water collected from the river. Water constraints make it challenging for the farmers to engage in value addition and processing activities because water is a necessity during these stages. The value chain actors in the study area are also faced with constraints of poor infrastructure where the inner roads to the farms are poor and the cellular network coverage is also weak. As a result, farmers miss out on business opportunities because the poor network coverage limits communication between farmers and business service providers.

The results from the nehurstle model showed that the off-farm income, marital status, cooperatives, access to credit, access to irrigation scheme, radio, extension officer, contact with NGO, and formal education had a significant influence on the level of value chain participation among the smallholder farmers. According to nehurstle model, the factors that had a significant influence on the level of value chain participation among female farmers were the age of the respondent, access to market information, access to an extension officer, and formal education. These factors directly impact the level of value chain participation for female smallholder farmers respectively. The factors that had a significant influence on the level of value chain participation among men farmers were Age of the respondent, off-farm income, marital status, cooperative, access to irrigation, and access to information and communications technology (radio). It is therefore evident that gender plays a role in the vegetable value chains in the study area. Previous studies conducted in Swayimane found that women were often found at the lower levels in the value chain (production stages) compared to men who were often found at higher levels (Marketing stages). This study found that in Swayimane, women were present and active at all levels of the value chain, including trading and marketing. This can be attributed to the fact that over the years, South African agricultural development interventions have recognized the role of women in smallholder farming and have since placed great emphasis on women empowerment to enhance smallholder farming and improve livelihoods. Furthermore, this study used empowerment (SHEP) during training sessions to address gender issues to provide equal opportunities, review gender roles along the value chain, and promote joint decision making among men and women in married households.

The results from the instrumental variable Poisson model showed that value chain participation had a significant negative relationship with household food insecurity. The finding depicts that participating in agricultural value chains has a positive impact on increasing household food security in the study area. Other key factors that were found to be significant in explaining the variations in the food security status among the households were the age of the household head, marital status, formal education, farm income, lease rent on land, access to NGOs, access to agricultural agency, access to credit, access to television, access to extension services and access to an irrigation scheme. Market access and participation in agricultural markets are associated with improvements in household food security. Hence, this study implemented SHEP as an intervention for value chain development, focusing on improving market access and participation among the sampled respondents.

The SHEP enabled farmers to be identify existing business linkages with various market actors, and this was achieved through networking with market actors during the process of conduction market surveys. Farmers were trained to be able to conduct market surveys on their own to make informed decisions on which crops to produce. The behavior of the farmers was influenced to focus on planting crops that were demanded by the market and to keep records while practice farming as a business. The SHEP was successful in shifting the mindset of farmers to be market and business orientated while taking all farming costs into account.

### **6.3 Policy Recommendations**

This study concluded that value chain participation had a positive impact on enhancing food security among smallholder farmers. There are factors that influence the level of value chain participation among men and women farmers respectively. Therefore, policymakers must take into consideration and understand the influence that these factors have before drawing policies for value chain development. Policymakers should also consider gender dynamics and the impact of gender roles in value chain participation before the making and implementation of value chain development interventions. It can be concluded that the level of endowment in the physical, financial, and human resources influence participation in agricultural value chains. The farmer's level of success and improved outcomes are influenced by access to markets. It is recommended that a market-led approach to farmer development be adopted to improve the commercial prospects of farmers while also enhancing food security. Policy should consider empowerment for market access through effective market- based farmer training and the creation of market and business linkages. Linking smallholder farmers to markets is influenced by the farmer's connectivity to the external and enabling environment and therefore policies should also focus on associations that provide smallholder farmers with opportunities to access credit, formal education, agricultural inputs, and other essential institutions and agency.

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## 8. Appendices

### Appendix 1: Questionnaire

#### Questionnaire Section A: Personal Information

1. Name \_\_\_\_\_

2. Race \_\_\_\_\_ 3. Sex of respondent

1. Male	0. Female
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4. Age of respondent \_\_\_\_\_

#### 5. Marital status of respondent

- Married
- Single
- Divorced
- Widow

#### 6. Education level

Education: What is the highest degree or level of school you have completed?

- No formal education
- Primary
- Secondary
- Middle level collage certificate or diploma [
- ] University degree

Highest number of years of formal education \_\_\_\_\_

#### 7. Main source of income

1. Farm income?

- Yes
- No

2. Off farm income

- Government grant
- Employed
- Family remittances
- Business

3. What is the total monthly income level in your household? R.....

**8. Does the household head own any livestock?**

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

If yes (Specify)

---

**Section B: Markets, Production and Value Chains**

**1. Which market/s do you supply your produce?**

Type of market	Mark with an X
0. Retailers	
1. Fresh produce markets	
2. Street hawkers	
3. Schools	
4. Middlemen (Bakkie)	

Other (specify) \_\_\_\_\_

**2. What is the distance to the nearest input market (Km)?**

---

**3. What is the distance to the nearest output market (Km)?**

---

4. **How is the state of the road to the nearest market?**

1. Good	0. Poor
---------	---------

5. **Do you have enough information about the quality requirements of the produce required by different markets?**

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

If no, Why? \_\_\_\_\_

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6. **Do you receive any help from extension officers to identify markets?**

1. Yes	0. No
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If \_\_\_\_\_ yes/no, \_\_\_\_\_ Explain

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7. **Do you receive any government or NGO support for production?**

1. Yes	0. No
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If \_\_\_\_\_ yes, \_\_\_\_\_ specify

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8. **Where do you receive inputs such as seed, fertilizer etc?**

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9. **How much land do you own (Ha)?**

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10. Do you hire labour to work on your farm?

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

If yes/no, explain why? When? How many? \_\_\_\_\_

11. Do you keep records?

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

12. Do you have water enough water for production when you need it?

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

In no, Why? \_\_\_\_\_

13. What skills do you have that set u aside from other farmers?

14. Do you participate in value vegetable value chain?

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

14. What type of value addition do you practise on your produce?

Washing	
Sorting & grading	
Processing	
Packaging	
None	

Other (Specify) \_\_\_\_\_

**15. Who assists you in harvesting and grading of your produce for the market?**

Family	
Hired Labour	
Government	
Neighbour	
Community	

Other (Specify) \_\_\_\_\_

**16. Do you harvest all at once or on- demand and where do you store your harvest?**

\_\_\_\_\_

**17. How do you transport your produce to the markets?**

Family car	
Hired car	
Middlemen car	
Neighbours car	
Public transport	

Other (specify) \_\_\_\_\_

**Do you have a storage facility where you can store your produce?**

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

If yes, where \_\_\_\_\_

**Do you own a cell phone?**

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

**18. Do you know about prices of your produce before going to the market? How do you get this information?**

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

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**19. Who determines the price of your produce?**

---

**20. Do men and women participate equally in the vegetable value chain?**

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

If No, why?

---



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**21. At which levels of the value chain are women more present and active?**

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**22. At which levels of the value chain are men more present and active?**

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**23. Fill in the table (use a tick)**

Activities	Men					Women					Both				
	N	R	S	O	VO	N	R	S	O	VO	N	R	S	O	VO
Seed establishment															
Land preparation															
Fertilizer application															
Pesticide application															
Harvesting															
Cleaning, grading, packaging															
Marketing															
Income control															

Code:

0- Never (**N**); 1- Rarely (**R**); 2- Sometimes (**S**); 3- Often (**O**); 4- Very often (**VO**)

**24. What are the key constraints for women's participation in value chains?**

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**25. Do men and women have equal access to resources? Eg Land, inputs**

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

If \_\_\_\_\_ no, \_\_\_\_\_ why?

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**26. Are there any cultural beliefs and laws that have an influence in women accessing resources and participation in value chains?**

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

If yes, explain \_\_\_\_\_

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**27. Who are the key value chain actors in your community?**

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**28. Do you think that Value chain development can improve household income and household food security?**

1. Yes	0. No
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If yes/no, why? \_\_\_\_\_

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### **Section C: Institutional factors**

1. Do you have access to credit?

Yes

No

2. Membership of agricultural related group

Yes

No

3. Do you have access to extension officer?

Yes

No

If yes how many extension officers? \_\_\_\_\_

4. Do you have access to market?

Yes

No

5. What is the distance from your home to the market? \_\_\_\_\_

6. Do you have any funds from government?

Yes

No

7. Do you have support from government on farm input?

Yes

No

### **Section D: Farmer-Business Linkages**

**1. Do you consider farming to be a business?**

1. Yes	0. No
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If \_\_\_\_\_ no, \_\_\_\_\_ why?

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**2. Are there business service providers available to farmers at your community?**

1. Yes	0. No
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If \_\_\_\_\_ yes, \_\_\_\_\_ specify

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**3. Do you have any contracts to supply your vegetable produce?**

1. Yes	0. No
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If yes, with who \_\_\_\_\_

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**4. Who are the key players that can enable business linkages in your community?**

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**5. What can be done to attract business service providers to farmers in your community?**

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**6. What are the existing barriers that are hindering or limiting business linkages between farmers and business service providers in your community?**

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**7. How can business linkages help to develop the vegetable value chain for farmers in your community?**

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**8. Do you think that Identifying business linkages between farmers and business service providers can improve household income and food security?**

1. Yes	0. No
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If yes/no, why? \_\_\_\_\_

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**Section E: Food Security**

No	Question	Response Options	Code
1.	In the past 4 weeks, did you worry that your household would not have enough food?	0= No (skip to Q2) 1= Yes	
1.a	How often did this happen?	1= Rarely 2= Sometimes 3= Often	
2.	In the past 4 weeks, were you or any household member not able to eat the kinds of foods you preferred because of lack of resources?	0= No (skip to Q3) 1= Yes	
2.a	How often did this happen?	1= Rarely 2= Sometimes 3= Often	

3.	In the past 4 weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	0= No (skip to Q4) 1= Yes	
3.a	How often did this happen?	1= Rarely 2= Sometimes 3= Often	
4.	In the past 4 weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	0= No (skip to Q5) 1= Yes	
4.a	How often did this happen?	1= Rarely 2= Sometimes 3= Often	
5.	In the past 4 weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	0= No (skip to Q6) 1= Yes	
5.a	How often did this happen?	1= Rarely 2= Sometimes 3= Often	
6.	In the past 4 weeks, did you or any household member have to eat fewer meals in a day because of lack of resources to get food?	0= No (skip to Q7) 1= Yes	
6.a	How often did this happen?	1= Rarely 2= Sometimes 3= Often	
7.	In the past four weeks, was there ever no food to eat of any kind in your household because of a lack of resources to get food?	0= No (skip to Q8) 1= Yes	
7.a	How often did this happen?	1= Rarely 2= Sometimes 3= Often	
8.	In the past 4 weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0= No (skip to Q9) 1= Yes	
8.a	How often did this happen?	1= Rarely 2= Sometimes 3= Often	
9.	In the past 4 weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	0= No 1= Yes	

9.a	How often this this happen?	1= Rarely 2= Sometimes 3= Often	
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In the last 24hours, which foods did you eat?

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**Appendix 2: Focus group questionnaire**

1.Where do u get/purchase your production inputs and who assists you?

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2.How do you decide which produce and what quantity of it you are going to Sell and where do you sell it?

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3. What are the challenges you are facing in accessing markets for your produce?

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4. Do you add value to your produce? For example, packaging, Washing.

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5. What skills do you have and where or how did you obtain them?

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5. What factors influence the male and female participation level in Value chain development?

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6. What influences the disparities in men's and women's participation in value chains?

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7. Are there any stakeholder engagement along the value chain? If Yes, who are they?

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8. Who are the Key players that identify and enable business linkages between the farmers and business service providers?

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9. What are the factors or existing barriers that are limiting linkages between farmers and business service providers?

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10. Do you have storage for produce? If yes or no, where do you store the produce after harvest?

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## Appendix 3: SHEP Baseline Survey Part 1

### Baseline Survey Part 1- Production, Income and Cost

Date: \_\_\_/\_\_\_/\_\_\_

Name of District: \_\_\_\_\_ Name of Sub-District: \_\_\_\_\_

Name of the Farmer Group: \_\_\_\_\_

Name of Farmer: \_\_\_\_\_ Male/Female: \_\_\_ Tel. No.: \_\_\_\_\_

\* Please indicate the information of horticultural crops (do not include other crops such as maize and sugarcane) in the last cropping season.

1.Crop Name and Variety	2.Area under the Crop in meter x meter (m <sup>2</sup> ) or in ha 100m <sup>2</sup> =0.01ha 1,000m <sup>2</sup> =0.1ha 10,000m <sup>2</sup> =1ha		3. Production sold at market in various unit (e.g. bags, crates, bundles, bushels, etc.)	4. Production sold at market in kg (converted into kg)	5.Production sold at market in kg per ha	6. Average Price per various unit (local currency per unit)	7. Average Price per kg (converted into kg) in local currency	8.Total Income in local currency	9.Total Cost of Production in local currency (incl. inputs, transportation, labor, etc.)	10.Net Income (profit) in local currency
1	2 a.	2 b.	3	4	(4./2 b.	6	6./unit conversion in box	(3. x 6.)or (4. x7.)	9	8. – 9.
1 <sup>st</sup> Crop:	M x M (m <sup>2</sup> )	ha	(unit: )	kg	kg	(unit: )				
2 <sup>nd</sup> Crop:	M x M (m <sup>2</sup> )	ha	(unit: )	kg	kg	(unit: )				
3 <sup>rd</sup> Crop	M x M (m <sup>2</sup> )	ha	(unit: )	kg	kg	(unit: )				
4 <sup>th</sup> Crop	M x M (m <sup>2</sup> )	ha	(unit: )	kg	kg	(unit: )				

Please indicate unit conversions in the box below. (e.g.) 1 bag of Irish Potato = 110 kg, 1 head of Cabbage = 2 kg

Appendix 4: SHEP Baseline Survey Part 2

**Baseline Survey Part 2- Agricultural Techniques**

Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Name of District: \_\_\_\_\_ Name of Sub-District: \_\_\_\_\_  
 Name of the Farmer Group: \_\_\_\_\_ Male/Female: \_\_\_\_ Tel. No.: \_\_\_\_\_  
 Name of Farmer: \_\_\_\_\_

\* Please tick "YES" or "NO" to the following questions. Write any additional information in the margin.

Pre to Post Cultivation Stages	Items	Horticultural Techniques Advocated for Adoption	Yes	No
1 Pre-Cultivation Preparation	Q 1	Do you undertake a <b>market survey</b> to determine the crop(s) to cultivate each season?		
	Q 2	Do you prepare and use <b>crop calendar(s)</b> based on the market survey results?		
	Q 3	Do you undertake <b>soil testing</b> at least once in two years for vegetables/annual flowers; or before the planting for fruit trees/perennial flowers?		
	Q 4	Do you use recommended <b>composting</b> practices by using different organic materials to supply major nutrients: Nitrogen (N), Phosphorus (P), and Potassium (K) in preparing compost/manure?		
	Q 5	Do you use recommended <b>quality planting material(s)</b> with one or more of the following characteristics: disease resistance and tolerance, high yield, early maturity, better tastes, size, and longer shelf life?		
2 Land Preparation	Q 6	Do you use with one or more following recommended <b>land preparation practices</b> in management of pests & diseases: solarization, timely ploughing, appropriate depth of ploughing, and minimizing movement of soil to check possible spread soil borne pests & diseases?		
	Q 7	Do you <b>incorporate crop residue</b> at least two months before planting into the farm during ploughing to enhance recycling of nutrients?		
	Q 8	Do you incorporate compost/manure or organic fertilizer as a <b>basal application</b> at least 1-2 weeks before the planting?		
3 Crop Establishment (Planting/Transplanting)	Q 9	Do you use recommended practices in <b>raising seedlings</b> for vegetables/annual flowers or use seedlings for fruit trees/perennial flowers raised from recognized nursery(s)?		
	Q 10	Do you use recommended planting/transplanting <b>spacing</b> ?		
	Q 11	Do you plant/transplant using recommended <b>fertilizer application rates</b> ?		
4 Crop Management	Q 12	Do you <b>supplement crop water requirement</b> through one or more of the following irrigation methods: watering can, overhead, drip, and furrow to meet the minimum crop water requirement?		
	Q 13	Do you ensure timely weeding and use of appropriate weeding tools in <b>managing of weeds</b> ?		
	Q 14	Do you undertake appropriate <b>top-dressing</b> practices: timeliness, type and recommended rate of application, and method of application?		
	Q 15	Do you use at least two of the following <b>Integrated Pests Management (IPM) practices</b> : cultural, biological, physical and chemical?		
5 Harvest	Q 16	Do you observe the following safe and effective use of pesticides: appropriate doses, recommended pesticides, and Pre Harvest Interval (PHI)?		
	Q 17	Do you use at least one of the following <b>harvesting indices</b> : color, size, shape, and firmness?		
6 Post-Harvest Handling	Q 18	Do you use <b>harvesting/storage/transportation containers/standard packaging materials</b> with following characteristics: well-ventilated, easy to clean, and smooth thus minimizing damages?		
	Q 19	Do you apply one of the following recommended value addition techniques: <b>cleaning, sorting, grading, packaging or processing of the produce</b> ?		
7 Cost and Income Analysis	Q 20	Do you keep records on cost of production and sales and undertake <b>cost and income analysis</b> ?		
	Q 21	Do you purchase agricultural inputs such as seed, fertilizer and chemicals as a group (group purchasing)?		
8 Collective Action	Q 22	Do you arrange transportation of the produce collectively or sell your produce collectively (group selling)?		
	Q 23	As a group, do you select target crops and plan production/ marketing strategies collectively with the group members?		



## **Appendix 5: Ethical Clearance**



UNIVERSITY OF  
KWAZULU-NATAL  
INYUVESI  
YAKWAZULU-NATALI

13 November 2019

Mr Phiwokuhle Nqubeko Ndlovu (213546920)  
School Of Agri Earth & Env Sc  
Pietermaritzburg Campus

Dear Mr Ndlovu,

**Protocol reference number:** HSSREC/00000761/2019

**Project title:** Vegetable Value chain Development of Climate Smart Aware Smallholder Farmers in Swayimane using the Smallholder Horticulture Empowerment and Promotion Model

### Full Approval – Expedited Application

This letter serves to notify you that your application received on 01 November 2019 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid for one year from 13 November 2019.

To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

Yours sincerely,

Professor Urmilla Bob  
University Dean of Research

/dd

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