Effects of Collective Action on Market Participation and Food Security among Smallholder Farmers in Msinga Local Municipality

Thobani Cele

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ABSTRACT

Smallholder farmers have little to no access to lucrative markets due to poor infrastructure, lack of government services, market information, and higher transaction costs. The government, policymakers, and non-government organizations (NGOs) have identified collective action as a strategy to address smallholder farmers' market failures, which could ultimately improve their livelihoods, welfare, and household food security. However, there is low participation in collective action by smallholders. Therefore, this study aimed to contribute to literature about the impact of collective action on market participation and food security amongst smallholder farmers. Data was collected using a questionnaire survey from 243 randomly selected smallholder farmers in Msinga Local Municipality.

The first objective explored the socio-economic factors that influence household decisions to join farmers' groups and the intensity of participation by using descriptive statistics, Principal Component Analysis (PCA), and regression analysis. Logistic regression results revealed that age, gender, education, household size, farm size, off-farm income, and extension services had a positive statistically significant effect on farmers' decision to join farmers' groups. Ordered probit model results indicate that age, household size, farm size, education, and perception about the effect on economic capital positively impact the intensity of participation. The second objective identified household factors influencing the decision to participate in the market and intensity of participation using the double hurdle model.

The double hurdle regression results show that farmers' groups, market information, training, income from livestock, and farm size had a positive and statistically significant effect on market participation. Distance to market had a negative effect on market participation. Farmers' groups, market information, and transaction costs significantly impacted the intensity of market participation. Lastly, the study explored the impact of market participation and collective action on smallholder farmers' food security status using logistic. The logistic model results indicated that gender, age, education, social grant, credit access, market participation, farm size, total livestock unit, and food expenditure positively and significantly impact household food security. Furthermore, the farmers' groups had no impact on household food security status.

This study concludes that collective action has a positive effect on market participation, and in turn, market participation improves household food security status. This study recommends that before forming farmers' groups the government, and NGOs should educate farmers through workshops, training, and seminars about farmers' groups to ensure that they understand the impact of collective action on their livelihoods.

Keywords: Collective action, market participation, household food security, smallholder farmers

[redacted]

Signed **Date**

[redacted] 15/12/2020

Thobani Cele

As Research Supervisor, I agree to the submission of this mini-dissertation for examination.

Signed [redacted] **Date**

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LIST OF ACRONYMS AND ABBREVIATION

CAB	Collective Action Behaviour
DAFF	Department of Agriculture, Forestry, and Fisheries
FAO	Food and Agriculture Organization
HDDS	Household Dietary Diversity Score
KMO	Kaiser-Meyer-Olkin
MRIS	Mooi River Irrigation Scheme
NGO	Non-Governmental Organisation
PCA	Principal Component Analysis
SMS	Short Message Services
SSA	Sub-Saharan Africa
STATA 15	Software for Statistics and Data Science version 15
StatSA	Statistics South Africa
TAM	Technology Acceptance Model
TFIS	Tugela Ferry Irrigation Scheme
TLU	Total Livestock Unit
USAID	United States Agency for International Development
VIF	Variance Inflation Factor

CHAPTER 1: BACKGROUND AND ITS SETTING

1.1 Introduction and background

Regardless of the increased global food supply since the 1990s, food security remains a significant challenge in Sub-Saharan Africa (Ochieng et al. 2018). Food insecurity at the national level is aggravated by insufficient food production for the growing populations and high food price volatility in the global market that stifles food importation to meet the shortfalls (Ochieng et al. 2018). The population will increase to 9.7 billion in 2050 (StatSA 2012). Due to the estimated population growth, the focus has shifted to agriculture, mainly on smallholder farming, to reduce food insecurity utilizing sustainable methods (Beharielal 2017).

Globally, poor people directly or indirectly rely on agriculture for their livelihoods and food security (Fischer and Qaim 2010; Maziya et al. 2017). Smallholder farmers are having difficulties in participating in the modern economy because most of these farmers have limited access to credit and markets to sell their produce (Von Loeper et al. 2016). Smallholder farmers encounter challenges when accessing the markets because they are in remote rural areas with poor infrastructure, lack of access to market information, and higher transaction costs (Markelova and Mwagi 2010). According to Sinyolo and Mudhara (2018), higher transaction cost reduces smallholder farmer's incentives in both input and out market supply.

Linking smallholder farmers to the market can contribute significantly to raising smallholder farmers' productivity and achieving income growth, which will, in turn, enhance their livelihoods, household food security, and overall economic growth (Gyau et al. 2014). In South Africa, too much emphasis has been put on the smallholder farming sector as a driving vehicle in alleviating household food insecurity (Beharielal 2017). Improving household food security can be done by improving market access for smallholder farmers through collective action in the form of a farmer's organization, i.e., informal and formal farming groups, cooperatives, or farmers' classes. Collective action can help smallholder farmers overcome market failures, enhance their agricultural productivity, farm income, and improve technology adoption and welfare of smallholder farmers (Mojo et al. 2016, Sinyolo and Mudhara 2018). Poteete and Ostrom (2004a) describe collective action as an action that happens when more than one individual smallholder contributes to achieving the desired outcome. Smallholder farmers do not only use collective actions in rural

areas to market their products, but they also use them to plant and harvest together and in the maintenance of a local irrigation scheme.

1.2 Problem statement

Despite poverty alleviation and economic liberalization strategies targeted at creating market-oriented economic growth opportunities, the results in many Sub-Saharan countries vary, including South Africa (Shiferaw et al. 2009). Many smallholder farmers in these countries continue to engage in semi-subsistence agriculture are, therefore, unable to take advantage of liberalized markets (Shiferaw et al. 2009, Shiferaw et al. 2016). Smallholder farmers produce a large part of their subsistence food requirements mainly to protect themselves from food insecurity arising from the marketing system's failure. Market failure means that farmers cannot sell their products and subsequently use the profit for buying other basic requirements (Nangobi and Mugonola 2018). Inadequate infrastructure (roads, communication), lack of access to market information or institutions, and long distance to the market (Sinyolo and Mudhara 2018) are common in the subsector, leading to high transaction costs coordination failure and pervasive market imperfections.

Collective actions address smallholder farmers' market failures. According to Ochieng et al. (2018), collective action is significant for smallholder farmers in developing countries to sustainably access markets and increase their marketing performance. Improving smallholder farmers' market performance can contribute tremendously toward poverty reduction and reducing food insecurity incidence among vulnerable groups in rural areas (Ochieng et al. 2018). However, there is low participation in collective action.

Previous empirical studies have considered determinants of market participation and intensity (Fischer and Qaim 2014, Ojulu 2020), food security (Andersson and Gabrielsson 2012), effects of market participation on food security (Seng 2016, Salami et al. 2020), but little on collective action on market participation and food security. Therefore, this study seeks to investigate whether collective action through farmers' groups has improved market participation and household food security among smallholder farmers.

1.3 Objectives

This study's main objective was to investigate whether collective action through farmer groups had improved market participation and household food security among smallholder farmers in Msinga Local Municipality. Specific objectives of this study were as follow:

- To investigate the determinants of participation and intensity of the involvement in collective action
- To analyze the intensity and determinants of smallholder farmers' market participation: evidence from Tugela Irrigation Scheme and Mooi River Irrigation Scheme.
- To measure the impact of market participation and collective action on household food security

1.4 Research questions

- What are the factors that influence smallholder farmers to participate in collective action?
- What are the factors that influence smallholder farmers to participate in the market?
- Do market participation and collective action have an impact on household food security?

1.5 Justification of the study

The opportunity for smallholders to raise their incomes depends on their ability to compete in the market. Nevertheless, many rural market failures in developing countries make it difficult for them to do this (Markelova and Mwangi 2010). Collective action is one strategy that could address market failures. However, there is low participation in collective action. Understanding how collective action can help address the inefficiencies, coordination problems, or barriers to market participation is particularly important. The need to engage with smallholder farmers, listen to them and understand their roles, concerns, challenges, and perceptions regarding collective action in farmers' groups arises. Therefore, the study identifies factors influencing collective action and market participation and the impact market participation has on household food security.

This study's findings and recommendations provided knowledge to agricultural policymakers for the amendments and formulation of agricultural policies and interventions to improve market participation in the smallholder farming sector. The chances of successfully collective action policies or interventions in agriculture may increase. The study findings contribute significantly to the global and national efforts to increase agricultural production and address food insecurity by

increasing smallholder farmers' participation in farmers' groups, which will improve market participation and improve their livelihoods and food security. National policy in Food and Nutrition Security and some of the Sustainable Development Goals such as eradicating poverty (SDG 1) and zero hunger (SDG 2) can be achieved.

1.6 Limitation of the study

The study only included 243 smallholder farmers from the Msinga Local Municipality. As a result, this sample is not presentative of all South African smallholder farmers. Therefore, findings cannot be generalized.

1.7 Organisation of the dissertation

This dissertation is written in paper format and consists of six chapters, which involve the introductory and concluding chapters, the study's literature review chapter, and three empirical chapters. The purpose of chapter 1 was to introduce the dissertation by providing a brief description of the study to be conducted. This chapter discussed the study's background, research problem, objectives, research questions, and the importance of the study. Chapter 2 provides a literature review, giving a brief overview of collective action, factors affecting smallholder farmers' participation in collective action. Chapter 3 addresses the determinants of participation and intensity of the involvement in collective action. Chapter 4 is another empirical chapter on the determinants of market participation and the extent of the participation using the double-hurdle model. Chapter 5 presents the impact of market participation and collective action on household food security. The data is analysed using the logistic regression model. Lastly, Chapter 6 concludes the entire dissertation by presenting the conclusion, policy recommendations, and implication on further research.

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CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter looks at collective action, smallholder farmers, market participation, and food security concepts. It also discusses the theoretical approaches to collective action and categories of farmer association that facilitate collective action. The literature review also examines related studies discussing the motivations for joining farmers' groups and benefits to members and factors affecting smallholder farmers' participation in collective action. This chapter explores smallholder farmers' determinants in market participation and the challenges faced by smallholder farmers in market participation. Lastly, it discusses the impact of participation in collective marketing on household income and food security.

2.2 Concept and definitions

2.2.1 Collective action

Collective action takes place when people work together as a group to solve a common problem. It may be in the community's context taking voluntary action to attain a common goal (Meinzen-Dick and Di Gregorio 2004). It includes setting a mutually acknowledged set of rules and regulations by the group. Rules and regulations enable the group to attain a common goal if followed. Ostrom (2004) describes collective action as an action that happens when more than one smallholder farmer contributes to a farmers' organization to achieve the desired outcome. The desired result of collective action includes smallholder farmers marketing their produce, planting, and harvesting together, buying agricultural input, and maintaining a local irrigation scheme.

2.2.2 Smallholder farmers

Smallholder farming has been identified as the driving vehicle that could help Sub-Saharan Africa achieve poverty reduction and rural development goals, although their ability is often not considered (Pienaar and Traub 2015; Khapayi and Celliers 2016). There is no universal definition for smallholder farmers; the definition depends on the context, nation, and even ecological zone. The word 'smallholder' is often used interchangeably with 'small-scale' and 'peasant farmer' at times (Ntshangase 2014; Mdlalose 2016). Smallholder generally refers to only their limited resource allocation compared to other farmers in the agricultural sector. Smallholder farmers own

small-scale land on which they grow subsistence crops and one or two cash crops that rely almost solely on household labour (Pienaar and Traub 2015).

Outdated techniques, low agricultural yields, substantial seasonal labour changes, and females playing a crucial part in production are among the primary attributes of smallholder farmers' production systems (Pienaar and Traub 2015). Smallholder farmers vary in terms of individual traits, farm size, allocation of resources between food and cash crops, livestock and off-farm operations, use of external inputs and paid workers, the percentage of food crops sold, and habits of family spending (Pienaar and Traub 2015; Khapayi and Celliers 2016).

Smallholder farmers among rural poor play a significant role in creating livelihoods. Despite the importance of smallholder production for household food security, this sector's productivity is relatively small (Von Loeper et al. 2016). Low returns can be one reason why urban and rural families either give up on agricultural production or are not interested in it. Therefore, to guarantee long-term food security, it is necessary to considerably boost smallholder farmers' productivity (Von Loeper et al. 2016). Promoting smallholder farmers through enhanced outputs to achieve sustainable production intensification will increase the productivity of smallholder farmers.

According to the Department of Agriculture, Forestry, and Fisheries (DAFF) (2012), declining farm yields are the leading cause of growing poverty among African smallholders. Their recovery offers the most significant opportunity for disadvantaged groups to escape poverty. Food insecurity among vulnerable agricultural workers leads to a risk-minimizing conservative strategy for farming systems. In this sense, smallholder farming's potential role allows it to be ignored or treated as another adaptation sector for the small market economy.

2.2.3 Market participation

There are numerous definitions of market participation proposed by different studies. Other studies consider market participation as an activity that has to do with agricultural products (Moyo 2010). According to William et al. (2008), market participation refers to sales as a fraction of total output for the sum of all agricultural crop production in the household, which includes annuals and perennials, locally-processed and industrial crops, fruits, and agro-forestry. Mmbando (2014) defined market participation by using household expenditure and agricultural produce sold, whereby the volume of agricultural products sold determines market participation.

Market participation refers to commercialization, which means that increased market participation implies moving from subsistence farming to commercial farming, whereby in the market, farmers exchange products and services (Musara et al. 2018).

2.2.4 Household food security

The United Nations Food and Agriculture Organization (FAO) currently uses the following definition: Food security occurs when all individuals have physical, financial, and social access to adequate, secure, and nutritious food that serves their nutritional requirements and food preferences. South Africa adopted the FAO definition of food security. The concept of food security used by the U.S. Department of Agriculture (USDA) is "access to enough nutrition for effective, safe life by all individuals at all moments."

The opposite of food security is food insecurity, described by the USDA as a household-level economic and social condition of limited or uncertain access to adequate food. Food insecurity is the component of a spectrum that involves starvation (food deprivation), malnutrition (deficiencies, nutrient imbalances, or excesses), and famine. The long-term absence of food security ultimately becomes hunger, described by the USDA as "a physiological condition at the individual level that may arise from food insecurity" (Nord 2007).

2.3. Theoretical approaches to collective action

In the 1960s, the notion of 'collective action' emerged. It was commonly used among resource and political economists, sociologists, and social psychologists in the 1970s and onwards (Asfaw 2018). Initially, the collective action was primarily discussed concerning western European societies experiencing different forms of social movements. More importantly, since the 1970s, the emergence of collective institutions on issues such as civil rights, environmental protection, global peace, and sexuality has contributed to the growth of the concept of collective action (Hardin 1971). Since then, collective action perspectives have continued to evolve in modern literature, and in the 21st century, are implemented to a great diversity of social phenomena.

The notion of collective action currently lies at the heart of so many critical societal discussions. Therefore, individuals' engagement and cooperation in community affairs, voluntary and charitable activities, religious, economic, social, political groups, and associations are linked to collective action issues. The concept is also widely used in the study of participation in social movements, political voting, property rights, and poverty reduction (Paumgarten et al. 2012).

In this study, the collective action concept is used to look at smallholder farmers' participation in groups and their possible contribution to smallholder farmers' market access and household food security. There exist three dominant theoretical schools of thought that explain collective action and collectivism. These are the traditional collective action theory, known as Olson's theory', resource mobilization or social movement theory, and social-psychology theory. The next sections will elaborate on the three views.

2.3.1 Traditional (Olson's) Collective Action Theory

Through his work 'The logic of collective action,' first published in 1965, the economist Mancur Olson founded the theory of collective action. Olson's theory explains 'collective action problems' using the concepts of rational choice, self-interest, and a free-rider problem (Olson 1989). Olson's work questioned the traditional narrative that states that 'collective interest' gives rise to collective action. He argued convincingly that common interest and group consensus do not produce spontaneous voluntary collective action because it does not provide an incentive for individuals' participation in groups.

According to his analysis, Olson's s theory states that there is less collective action than what the traditional model explains. This is because the objective of collective action, which is a public good, benefits everyone, even those not in the group of collective action, leaving a rational self-interested individual without any interest or motivation to join the action (Olson 1989). Moreover, Olson argued that collective action might be challenged by the free rider, especially in larger groups. Sufficiently motivated and resourceful people would take over and provide the benefits, and where scale conceals free rider (Olson 1989). Groups and collective actors, for Olson, are not effective. Olson argued that collective action significantly decreases a nation's economic development because collective action requires benefits to be redistributed, which leads to incompetence, delays, complexity, and exclusivity. Olson has tried to prove that the economic growth rate is inversely proportional to communities' interests and distributional coalitions in the nation (Padovan et al. 2019).

Olson firmly believed that it is a benefit and incentive for group members in private goods and a penalty or coercion for free riders, leading to collective action (Olson 1989). In other words, for a rational individual to enter a collective action, the theory proposed that a person requires a 'selective motivation' to behave in a group-oriented manner (Olson 1989; Asfaw 2018). Olson's

theory contributed to understanding the barriers to successful collective action, such as the desire to free-ride, challenges in seeking appropriate participants to collective action, non-exclusiveness of public resources. Also, difficulties in convincing individuals to participate under circumstances where individual costs outweigh personal benefits and the considerable responsibility of organizing group members (Bimber 2017).

2.3.2 Resource Mobilization Theory

In the early 1980s, resource mobilization attitudes towards collective action, also known as social movement theories, became popular and were mainly used to study social movements in Western countries (McAdam 2010). Resource mobilization theorists raised longstanding 'grievances' as arguments for group actors to collaborate. However, the theory explains that grievance alone is not adequate to generate collective action. Instead, grievance mobilizes and brings access to and control over resources for collective action to be created (Polletta and Jasper 2001).

The theory suggests a grievance that motivates group actors to act together and seek to get the capital they need to succeed and create progress, including funds, allies, media coverage, and partnerships with those in power. Therefore, having access to the resources required to do something collectively and opportunities for resource mobilization are essential determinants of collective action in this theory (Polletta and Jasper 2001; McAdam 2010). The resource mobilization theory countered Olson's earlier perceptions that regarded engagement in collective actions as unreasonable and illogical. In comparison, the philosophy of resource mobilization saw collective action organizations as rational democratic organizations formed and staffed by social agents to take concrete political or economic action (Miller 2013).

The theory suggests that people are rational and weigh the costs and rewards of social action engagement and respond only if the benefits outweigh the costs and only if they can improve their condition at an acceptable rate. Thus, the theory suggests that self-interest' is an essential construct for social behaviour to occur in the form of expected costs and rewards. Like Olson's theory, the resource mobilization theory suggested that when collective action objectives take the form of public goods, the 'free-rider dilemma' must be considered (Pinard 2011).

Unlike Olson's 'selective incentive' approach, the theory of resource mobilization presented a solution to the free-rider dilemma by suggesting that self-interested persons are not responsible for

the creation of collective actions and thus do not require selective incentives. Altruistic elites instead devote capital, allowing collective actions to arise (Asfaw 2018).

2.3.3 Social-Psychology Theories

Social psychology theories emerged in the 1990s and onwards to describe collective action, with the core concepts flowing from criticisms of Olson's theories and resource mobilization. Social psychology concepts clarify that human beings seek to interact with people and be embraced by them. The ideals also suggest that individuals support and improve the well-being of those with whom they have social relations, that as they earn benefits, they are much more likely to do so. Centered on these principles, the explanation of collective action in social science focuses that people are social agents that are psychologically rooted (Stangor et al. 2014).

Social psychology suggests that collective identity explanations capture the factors that persuade individuals to mobilize and collaborate to alternative the material and selective incentives proposed by earlier theories. Polletta and Jasper (2001) stressed that in the absence of selective incentives or coercion, collective identity theories address the issue of why individuals engage in collective actions and describe people's motives to collaborate. In other words, people's engagement takes place in groups that inspire them to partake in group affairs and work hard to accomplish their group goals. Polletta and Jasper (2001) also presented that high levels of group identification increase group cooperation benefits. This suggests that collective identity generates engagement and overcomes the problem of free-riding since it makes free-riding less desirable and expensive to take for a person.

2.4 Categories of farmer organizations that facilitate collective action.

2.4.1 Agricultural co-operatives

The importance of collective action via co-operatives for smallholder farmers has demonstrated mixed outcomes over the years (Narrod et al. 2009; Fischer and Qaim 2012). For example, co-operatives have reduced the marketing costs of grapes in India (Roy and Thorat 2008). Cooperative has also positively affected Ethiopia's dairy sector (Holloway 2000) and has encouraged Costa Rica's coffee producers (Wollni and Zeller 2007). Literature has also recorded instances where co-operatives have disappointed farmers (Ortmann and King 2007).

In South Africa, agricultural co-operative fail because of a lack of knowledge and information in production, soil nourishment, and disease control (Thamaga-Chitja 2008). Secondly, co-operatives' fail to involve members in policy decision-making and to compete with other businesses (Özdemir 2005). Lastly, the lack of communication services, relevant marketing skills, land, and own transport (Mthembu 2008).

2.4.2 Farmers' associations

Farmers' associations are created when several farmers' groups unite to form a more prominent organization. A producer association increases collective bargaining power and offers farmers a larger voice. Therefore, South Africa's government supports the development of many farmers' associations in the country to help fill the marketing gap faced by smallholders after the failure of several co-operative societies (Ampaire et al. 2013). In South Africa, Magingxa and Kamara (2003) have stressed establishing smallholder marketing associations to address smallholder market access obstacles. Associations promote the delivery, supply, and distribution of inputs to their members through extension service. Farmers' associations in South Africa were developed as an organized solution to improving social well-being through increased food security and household incomes when farmers engage in collective action.

2.4.3. Farmers' groups

The smallest divisions of farmers' associations are farmers' groups. They are currently the critical strategy implemented to transform South Africa's agricultural sector because they are considered essential ingredients for improving market access, securing credit information for their members, and encouraging technology adoption (Adong et al. 2012). However, many of these farmers' organizations remain decentralized, lack proper coordination in their membership systems, and face high transaction costs in crops' supply chain.

Several authors have previously offered evidence for using a farmer group approach in agriculture; for example, Mbowa et al. (2012) reported that farmer groups have contributed to increased value added in Uganda's milk value chain. Farmers' organizations are also boosting economies of scale (Loevinsohn et al. 1994), improving market access, and encouraging access to emerging agricultural technology (Aliguma et al. 2007). Despite these advantages, South Africa has a limited number of farmer groups. Therefore, farmers continue to face difficulties with high transaction costs due to low economies of scale and do not provide their members with significant bargaining

power. Also, farmers' groups need to unite to create farmers' associations that can produce more collective power and influence.

There is also minimal research on factors affecting the membership of farmers' associations. However, some data on attributes such as gender, age, education, farm size, involvement in off-farm activities, and household size impact participation in groups for producer organizations such as farmers groups (Adong et al. 2012). However, there is a shortage of knowledge on factors affecting South Africa's membership of farmers' associations. Gender, age, farm size, education, credit, extension contacts, and off-farm income are socio-economic variables measured in this study.

2.5 Farmers' motivations for joining groups.

In developing countries, smallholder farmers have identified a series of challenges to raising incomes through selling their agricultural produce individually, highlighting their motivations for choosing to collaborate. The key to the success and sustainability of collective action arrangements is translating these motivations into benefits. The benefits of joining a farmers group are presented below:

Collective action contributes to enhancing smallholder farmers' agricultural productivity by accessing farming land, training, and logistical support (Ochieng et al. 2018). Collective action reduces transaction costs, increases product quantity and quality, and improves producers' bargaining power.

Improved access to and distribution of market information to the farmers' group members encourages farmers to respond to market opportunities. This knowledge dissemination is enabled by the increasing opportunities that information and communications technology introduced into the marketing chain. In Zambia, for example, farmers profit from a mobile phone short message service (SMS) that offers information on prospective buyers and their prices, thus facilitating informed negotiation by the farmers' group (Deichmann et al. 2016).

New and innovative information and communication technologies have the potential to improve marketing. The capacity of smallholder farmers to succeed in high-value markets was also improved by collective action. Markelova and Mwangi (2010) illustrate the role of collective action in targeting broader metropolitan, regional and international markets (as opposed to local

markets) and in long market chains, where the benefits of collective action outweigh those of individual action. Hidden government subsidies (e.g., free auditing and co-operative training) are an added advantage of collective action, but they are not necessarily delivered successfully. Farmers' groups also serve a social role.

2.6 Factors affecting smallholder farmers' participation in collective action.

It is estimated that participating farmers' relative costs and advantages in collective action will vary across individuals. This may rely on various organizational variables, including attributes of members (age, education, race, place, production ability, asset endowment, education, and prior collaborative knowledge), prevalent commodity or financial function features, and external climate (Araral 2009). It has also been discovered that farmers' socio-cultural and economic heterogeneity influences farmers' involvement in collective activities. Economic heterogeneity relates, among other characteristics, to differences in wealth, income, and access to loans. In contrast, socio-cultural heterogeneity refers to variations in race, beliefs, and cultural understanding of the shared asset or economic activities (Ostrom 2010).

The impact on the collective action of socio-cultural heterogeneity can be either good or bad. Ruttan (2008) argues that social heterogeneity may have adverse effects arising from distinct social norms, making it difficult to make decisions and to enforce them. However, socio-cultural homogeneity may cause ideas to stagnate. It may promote farmers' groups or organizations to remain unchanged, leading to reduced general organizational ability compared to societies with greater socio-cultural variety (Katungi et al. 2007). Regarding the economic status of members, Ruttan (2008) argues that economic heterogeneity makes reaching agreements mutually beneficial to everyone more difficult as wealthy members find it in their interest to assume leadership and benefactor roles within the group. In Kenya, wealthy members among livestock-keeping communities tend not to favour collective initiatives because their cost was higher than that of relatively low members (Ouma and Abdulai 2009).

On the contrary, Poteete and Ostrom (2004b) discovered, among other variables, higher rates of collective action in Indian communities characterized by more considerable economic heterogeneity. Another significant factor that facilitates collective action is the extent to which group members depend upon a common commodity or commercial activity for their livelihoods (Araral 2009). Dependency captures the extent to which the group members require the commodity

or economic activity for its consumption (Naidu 2009). Dietz et al. (2003) argue that product (or economic activity) must be sufficiently important and relevant for participants to spend their viable leadership funds. Thus, in communities characterized by a comparatively large number of alternative livelihood options, participants' likelihood of working together on a specific activity is less likely. Such exit options can weaken social cohesion, making collective decisions hard to establish and implement (Bardhan 1993). Some collective initiatives face various challenges in establishing the rules on which their organizations are based. They also experience significant problems in monitoring and implementing compliance and ensuring that group members have obligations to comply with collectively accepted guidelines (Stockbridge et al. 2003).

Other groups are experiencing the issue of having free riders, promoting people with restricted or no investment in the organization's generation and maintenance (Ostrom 1990). Based on the collective action theory, Dasgupta and Beard (2007) claim that an individual member's decision to participate in collective action depends on comparing the advantages and expenses anticipated. Thus, rational and self-interested people will behave to attain their interests rather than group interests and have an incentive to free ride whenever an opportunity arises.

The standard assumption is that free riders will be easily found in small groups. Small-group participants are inclined to think that their contributions will bring a difference; thus, causing contributions from others (Olson 2012). However, group members' contributions in larger groups are hard to trace, so there are fewer data to check individual member behaviour (Hardin 1982). Therefore, an increase in group size will increase the costs of reaching internal agreements about coordinated strategies and monitoring members' participation in collective activities (Ostrom 2010).

The impact of group size on collective action stays controversial. Some studies could not find an essential connection between group size and free riding (e.g., Lipford 1985), while others (e.g., Agrawal and Goyal 1997) present a connection between group size and collective action. Agrawal (1997) argues that big organizations are inclined to have elevated conflict and cost tracking, while small organizations may have difficulty generating the funds required to participate in collective action efficiently. The issue with the free rider may also occur outside the group. For example, when individual farmers hesitate to join the bargaining farmers group but capture the advantages of the conditions of trade agreed (Ortmann and King 2007.).

Other institutional issues that farmers' groups usually encounter, especially traditional co-operatives, derive mainly from undefined property rights. These include the horizon, the portfolio issue, control, and influence cost-related problems (Ortmann and King 2007). Meinzen-Dick and Di Gregorio (2004) show that most of the problems and errors connected with group-based growth projects occur because of less attention being paid to knowing how collective action occurs and how it can be maintained. Therefore, it is essential to know where it is probable (or unlikely) that collective action will arise and continue.

Hellin et al. (2009), a better understanding of high-value markets could allow farmers to make informed decisions about when to collaborate and recognize when it is not valuable. In support, Kaganzi et al. (2009) argue that organizing the transaction expenses associated with market access would be comparatively small for farmers generating similar goods with no cost discount for performance.

2.7 Challenges faced by smallholder farmers in marketing.

Farmers' market participation is both a cause and a result of economic growth. It is a significant way of ensuring better income for rural people and enhancing food security. Smallholder farmers, markets, and enhanced market access are essential to attract agricultural and economic growth. Improved market access is essential in enhancing smallholder participation in the markets and their participation level (Fan and Brzeska 2016).

Smallholder farming, one of the world's primary economic occupations, is the primary source of income and jobs for 70% of the world's rural poor. Smallholder farmers contribute to food security, fair income distribution, and economic growth linkages (Poole 2017). Nevertheless, in terms of physical market access and access to market information, smallholder farmers face limitations. Farmers engaged in traditional food plants are usually dependent on informal markets because of the weak or absence of links with traditional markets. Smallholder farmers can considerably improve their incomes by increasing market sales percentage. Nonetheless, smallholder farmers' participation rate in the market remains low due to lack of access to market information and higher transaction costs (Poole 2017).

Most smallholder farmers are situated with poor transport and market infrastructure in remote areas, generating high transaction costs. They also lack reliable market information and information on potential exchange partners (Magesa et al. 2014). Smallholders are also generally

exposed to higher risk and transaction costs because of their small production surpluses. Their choice of products to be marketed mainly depends on marketing information, price generation, and distance from the market (Magesa et al. 2014).

Market participation has allowed smallholder farmers to diversify their commodities and bring their excess to neighbouring markets (Baloyi 2010). One disadvantage for smallholder farmers is that they lack marketing knowledge, resulting in most crops being marketed at their farm gate or on the local market with reduced costs. Limited access to secure markets is another significant issue facing smallholders for their products and inputs (Baloyi 2010).

Countries with the highest portion of smallholder farmers are recognized as low-income countries. In South Asia and Sub-Saharan Africa, more than 60% of the farm households have less than 1 ha of farmland, and more than 80% of the farm households have less than 2 ha of farmland (Lowder et al. 2016). Thus, it is necessary to increase the economic activities of smallholder farmers to raise competitiveness. South Africa, designated as a developing country by the UN and located in Sub-Saharan Africa, comprises smallholder farms (Baloyi 2010). 80% of the South African farms produce vegetables, fruit, nut, and grain products, with many small-scale farms that do not exceed 5 ha (DAFF 2012). Therefore, studying the effect of collective action on smallholder farmers' market participation in Msinga can provide useful implications for areas in similar circumstances and characteristics.

2.8 Determinants of smallholder farmers in market participation

Various elements are accepted to have an impact on farmers' market cooperation choice. Such factors run from social-economic elements, institutional factors, market factors, and external factors. Social-economic elements incorporate age, gender, off-farm salary, level of education, number of years farming, household size, land cultivated for farming, and production. Institutional components involve enrolment to a farmers' group, access to extension service, access to credit, land tenure, foundation, legally binding courses of action and strategies, and law. Market factors, such as access to market information, costs of yield, distance to the market, methods for transport, and other outer factors, common catastrophes that bring about loss of agricultural produce likewise decide smallholder farmers' market participation.

A study conducted by Apind et al. (2015) in rice marketing in the Ahero irrigation scheme identified these social-economic factors to be household size, gender, off-farm income, grading,

group marketing, source of market information, level of output, extension services access, and access to credit to influence the smallholder farmers' participation in the market significantly, and the extent of market participation. Awotide et al. (2013) found the gender of household head, access to improved seed, years of formal education, and average rice yield were those variables that are increasing the probability that a farmer would participate in the market.

The age of a household head ordinarily goes about as an intermediary for farming experience and, consequently, can fundamentally impact market participation (Amanor-Boadu et al. 2013). According to Awotide et al. (2013), the gender of the household head impacts the family decision, which fundamentally influences market participation. The female-headed families take part more in exchange for indigenous natural products (Mwema et al. 2013). A study conducted by Amanor-Boadu et al. (2013) contrasted with males, females have a lower likelihood of selling beans to brokers and cowpeas to buyers. However, they have a higher likelihood of offering to retailers. Then again, Sigei et al. (2014) expressed that female-headed family units are bound to be assets obliged, henceforth influencing marketable excess production that confines their cooperation in the market.

Household size is family work and the number of mouths to take care of. Education is a crucial feature in settling on educated choices and subsequently can impact market participation. In his investigation of the beans market in Zambia, Amanor-Boadu et al. (2013) found that education does not affect smallholder farmers' market participation. Ondieki et al. (2013) stated that the level of education is directly proportional to market participation, which means that the higher the level of education, the higher the likelihood of a smallholder farmer market participation.

Total farming land is a proxy measure of production scale, hence an essential factor in determining surplus production for the market. Mukundi et al. (2013) state that market participation is controlled by the asset base, where the size of landholding is an essential factor. The discoveries of Mathenge et al. (2010) and Martey et al. (2012) affirm that bigger farms have the potential for a family unit to build its marketable surplus, subsequently expanding market participation. Bigger farms are also prone to profit by scale economies, which convert into lower exchange costs and expanded capability to participate in the market. Farmers can utilize non-farm salaries to cushion family unit pay, and, in this manner, those with more pay from the farm may quit the market. Those with little non-farm income need to offer more to create a salary. An investigation on fresh

organic products farmers exposed that farmers with under 25% or less of their salary from cultivating were 21% more likely not to be interested in the market (Apind et al. 2015ndor).

The extent of smallholder farmers' market participation is affected by the market's distance (Kyaw 2018). The availability of transport can essentially decide interest participation about the distance to the marketplace, which can be credited to poor access to transport facilities due to high transaction costs. Therefore, both rural and peri-urban areas' transportation system needs to be upgraded to strengthen the delivery system and encourage smallholder farmers' market participation (Kyaw 2018). Amanor-Boadu et al. (2013) found that smallholder farmers' location mostly affects market participation compared with gender and education.

Farmers' group membership of a smallholder farmer is a social capital aspect that increases bargaining power and significantly impacts smallholder farmers' market participation (Kyaw 2018). Advancing collective action among smallholder farmers can help advance their economies of scale in information and yield markets and share market information amongst them (Ochieng 2018).

Smallholder farmers' access to market information such as product price and demand plays a crucial role in smallholder farmers' market participation. This market information is obtained directly or indirectly via a formal and informal institution such as extension officers or an academic institution like the Cedara Agricultural Training Institute. Omiti et al. (2009) stated that better market output and market information are critical incentives for improved sales production. Insufficient access to extension services is hindering market participation (Ndoro et al. 2013). Bardhan et al. (2012) explain that extension contact is one of the most critical policy variables, which favourably influences market participation intensity among smallholder farmers. An additional visit by an extension officer in South Africa has been found to increase the farmer's likelihood to sell his/her agricultural produce (Bahta and Bauer 2007). Jagwe et al. (2010) argue that policies aimed at encouraging access to market information, investment in infrastructure development, and collective action by farmers can reduce transaction costs and increase market participation.

Farmers' decision to sell their farm produce at a market outlet is influenced by the price they get from the outlet (Lupin and Rodriguez 2012). Convenience and partnership with the manufacturer may also play a significant role in this decision. A study conducted by Umberger (2010) revealed

that farmers' long-term relationship with their buyers, size, willingness to negotiate and cash payments are essential considerations for farmers when selecting a market outlet. Umberger et al. (2010) found that transport problems and market-related information accessibility are essential factors affecting marketing choice.

2.9 Impact of participation in collective marketing on household income and food security

There are two divergent views on the effect of market production on household food consumption; the first view suggests that market production positively affects household food security. It generates income that empowers the household to purchase various foods it does not produce (Timmer 1997). As income increases, households tend to adjust their food consumption pattern away from the cheap foods like cereals, tubers, and pulses towards balancing their diet by including nutritionally rich foods, especially proteins of animal origin such as meat, fish, milk, and other livestock products (Abdulai and Aubert 2004). Moreover, in areas where markets are functional, income from market production stabilizes household food consumption against seasonality (Timmer 1997).

A study conducted by Arouna (2018) in rice production indicates that participation in collective marketing increased rice farmers' income on average by USD 148/ha. Johnson and Berdegue (2004) observed that working together can help farmers negotiate better input and output rates. Farmers can negotiate better market input and output rates, thus improving their farm revenue (Arouna, 2018). Also, Alene et al. (2008), Jagwe et al. (2010), and other market scientists found that access to input and output markets reduces transaction expenses, thus enhancing farmers' sales margins.

Previous studies have primarily explored the links between collective action and household earnings. Mango et al. (2017), Arouna (2018) results show that marketing collectively improves smallholder farmers' bargaining power as vendors on the market. Therefore, they are likely to get higher rates collectively than people for their products (Mango et al. 2017). Increased household income allows the household to purchase a diversified mix of goods and services, including food, health care, and better housing, among others, or increase the current market basket. Also, through the income–food–consumption linkage, commercialization is assumed to increase household members' food intake, improving their nutritional and health status (Kennedy and Reardon 1994).

Market participation is not the only variable affecting household food security, amongst others. The explanatory variables consist of household characteristics that can capture transaction costs, farm characteristics, and agro-ecological risks. Household characteristics include household head age, education level, household size, and dummies for household off-farm activities. The age presents the family head's farming experiences, and then it can improve productivity that can allow farmers to generate a significant market surplus. The education level is an indicator of human capital, and then a high education level would improve farming productivity.

2.10 Conclusion

This chapter reviewed the literature on the impact of collective action on smallholder farmer market access and household food security. The study investigates whether having farmers group membership can contribute to lucrative market access for smallholder farmers. It is hypothesized that belonging to farmers groups increases access to market information and extension services, which allows a farmer to have information about prices of the products and information about potential buyers. It presented the details of the impact of market participation on household income and food security. There is a need to strengthen knowledge of improving food security by researching household food security determinants in rural areas. It hypothesized that household food security could be improved by smallholder farmers participating in the market to increase income among food-insecure households, particularly in rural areas. The following chapters present the findings of the research.

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CHAPTER 3: DETERMINANTS AND INTENSITY OF SMALLHOLDER FARMERS' PARTICIPATION IN COLLECTIVE ACTION

ABSTRACT

Collective action through farmers' group can be an essential strategy for smallholders to remain competitive in rapidly changing markets. Previous research has analyse the determinants of participation in farmers' group, equating participation with group membership. However, members' commitment can vary within groups, as marginal benefits and costs are not the same for all individuals. Low participation in collective activities may reduce the ability of groups to provide useful services to their members.

Randomly selected data collected from 243 smallholder farmers in Msinga Local Municipality in KwaZulu-Natal were used to identify the determinants and intensity of collective action participation. The logistic and ordered probit models results suggest that age, gender, education, household size, farm size, off-farm income, and extension services positively affect the decision and intensity of collective action participation.

Therefore, before forming farmers' groups, the government and NGOs should educate farmers through workshops, training, and seminars about farmer groups to help them understand the impact of collective action on their livelihoods.

Keywords: collective action, intensity, smallholder farmers, logistic, ordered probit

3.1 Introduction

Collective action by smallholder farmers through farmers' groups is a potential institutional solution for overcoming smallholder farmers' challenges. Challenges include lack of assets and restricted access to government support services (for example, extension, information, training), critical in reducing high transaction costs (Sinyolo and Mudhara 2018). Furthermore, collective action can overcome high transaction costs and other market failures such as poor infrastructure, inadequate information, and lack of access to credit and lucrative markets in developing countries (Fischer and Qaim 2014, Sinyolo and Mudhara 2018). Farmers' groups may also provide capacity-building tools, knowledge sharing, and creativity in rural settings (Fischer and Qaim 2014).

Agricultural cooperatives have a long history in Africa, having been promoted by colonial rulers, national governments, and development organizations with different aims in different contexts (Hussi et al. 1993). In response to more stringent standards of quality and food security and evolving procurement processes, funding for farmers' groups has recently gained popularity (Narrod et al. 2009; Vandeplas et al. 2013). Farmers' association has the following advantages: knowledge spreads quicker when farmers work together, members get more economic benefits when supporting each other, some work is done more quickly, and work becomes lighter, farmers 'skill sets are best used, benefiting others, and a group has more leverage to negotiate with input suppliers, banks, and other credit providers, and with buyers, and the members can get the services of organizations at the village and district level that individual can never get.

There have been some recent studies analysing similar problems. One strand of research has explored collective action for smallholders' income, technology adoption, and market access (Shiferaw and Muricho 2011). Some studies have explored farmers' perception of collective action (Gyau et al. 2012). Research was conducted on the collective action and intensity of involvement in irrigation water management (Muchara et al. 2014). Other studies also looked at the effect of collective action by smallholder farmers on food security. Collective action and rural poverty reduction were analysed in another literature strand (Sinyolo and Mudhara 2018). Several studies have examined the determinants and impacts of farmer collective action (Fischer and Qaim 2012). When expected benefits outweigh expected costs, a random utility system assumes that farmers

wish to become members. Utilities are modelled based on socio-economic characteristics, such as farm size, schooling, gender, or infrastructure conditions.

However, empirical evidence shows that farmers' groups are widespread in South Africa but are not always effective as they are designed to be, primarily because of weak internal leadership and member participation (Barrett 2008; Barham and Chitemi 2009). Understanding what drives smallholder farmers' involvement in collective action is critical for farmers' groups or cooperatives' sustainability and development in the long run. The organization relies heavily on the output of members to produce economies of scale in processing and marketing (Pocketbook 2015). Nominal engagement alone does not justify how intensively smallholders engage and contribute to their group. Farmers' groups are often not effective because anticipated benefits do not materialize, leading to the passive participation or departure of members and the breakup of groups (Fischer and Qaim 2012). Another aspect that can undermine the effectiveness of agricultural marketing cooperatives is when members do not sell their entire commodity to their cooperative but instead sell to local traders due to temporary cash restrictions, price shifts, and unequal intra-household gender ties.

This study assesses the determinants of the decision to participate and determinants of participation intensity in collective action initiatives in Msinga Local Municipality. Specifically, the study examines if the farmer is a member of farmers' group and the degree of collective action participation to assess individual commitment and contribution to shared goals.

3.2 Analytical framework

The study used a random utility theory (McFadden 1976). At the household level, the decision to participate in the farmers' groups is based on the random utility framework (McFadden 1976). The random utility theory assumes that a farmer, as a utility maximizer, would join a farmers' group if the expected utility from group membership U_i^M , is greater than that of non-membership U_i^N. That is, a farmer chooses group membership if the net utility, U_i^* i.e., $(U_i^M - U_i^N)$ is greater than zero. The unobserved net utility can be expressed as a function of observable elements in the following latent variable model:

$$U_i^* = \alpha x_i + \varepsilon_i,\ U_i = 1\ if\ U_i^* > 0 \qquad (3.1)$$

Where U_i is a binary indicator variable that equals 1 for smallholder farmer *i* in case of group membership and 0; otherwise, α is a vector of parameters to be estimated, x_i is a vector of household and farmer characteristics, and ε_i is an error term.

3.3 Methodology

3.3.1 Study area

The study was conducted at the Tugela Ferry and Mooi River located at Msinga Local Municipality in uMzinyathi District of KwaZulu-Natal Province in South Africa (Figure 1). Moreover, it is 45 kilometres away from Greytown and approximately 2 hours' drive from Pietermaritzburg. The Msinga Local Municipality has an average rainfall of 600 mm per annum and is a semi-arid area (Maziya et al. 2017). According to Statistics South Africa (StatSA) (2012), the total population of Msinga Local Municipality was 177,577, with 37,724 households in 2011.

Crop farming is practiced along the main rivers, i.e., the Tugela and Mooi Rivers. Farming contributes 18% of the income for the area. Approximately 30% of the municipal area to the north comprises commercial farmland. There are two dominant smallholder irrigation schemes in the Msinga Local Municipality, namely the Tugela Ferry Irrigation Scheme (TFIS) and Mooi River Irrigation Scheme (MRIS), which draw water from the Tugela and Mooi rivers, respectively. The TFIS covers 873 ha, while the MRIS covers 600 ha (Cousins 2013; Gomo et al. 2014). There are 1500 and 824 irrigators who participate in the TFIS and MRIS irrigation schemes, respectively.

3.3.2 Sampling and data collection tools

The data was collected in March 2020. Pretesting of the questionnaire was administered to ten smallholder farmers by trained and experienced enumerators before the primary survey. All the enumerators were native Zulu speakers and had a better understanding of the farming system. Pretesting of the questionnaire was done to ensure that farmers understand the questionnaire, and after that, the questionnaire was modified where required. Pretesting ensured that the questionnaire collected all the necessary data, and it assisted in improving the questionnaire translation to the local isiZulu language.

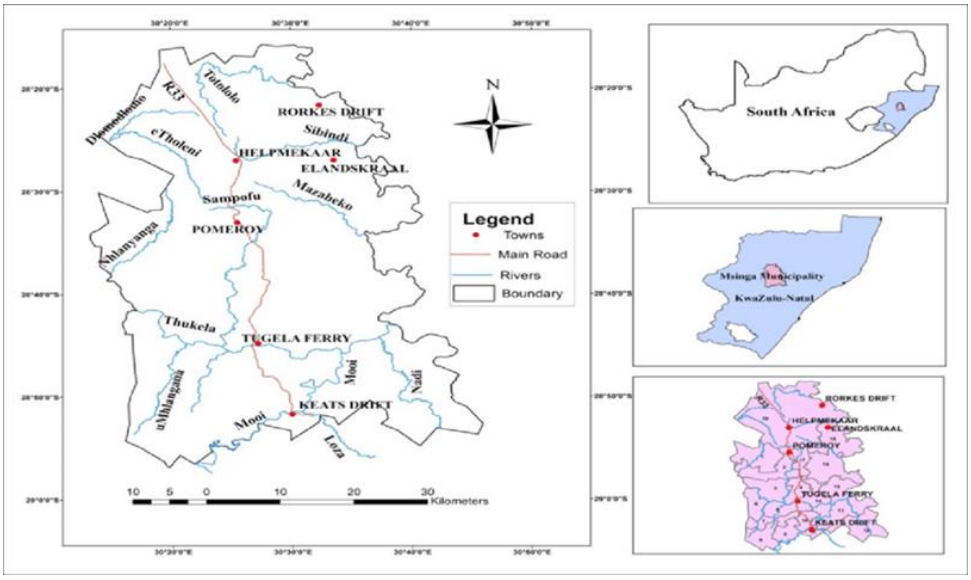

Figure 1: Location of the Tugela Ferry and Mooi River Irrigation Schemes in Msinga Local Municipality, South Africa (Source: Njoko and Mudhara 2017)

Smallholder farmers were randomly selected using a multi-stage technique. Firstly, one Local Municipality was chosen out of the four-Local Municipality in Umzinyathi District Municipality. Secondly, a total of 243 farmers out of approximately 2 324 smallholder farmers were selected. In the TFI scheme. The smallholder farmers' list was obtained from an extension officer working at the local Department of Agriculture located in Tugela Ferry Town. Furthermore, in the MRI scheme, the list was obtained from one of the enumerators who works at Lima Rural Development. Moreover, farmers were selected randomly from the list.

Out of the total sample size, 156 smallholder farmers were from TFIS and 87 from MRIS. The sampling was such that both TFIS and MRIS contribute 10% to the final sample, as Blanche et al. (2006) suggested. The sample was not based on gender; hence both male and female smallholder farmers had equal chances of being selected for this study.

3.3.3 Empirical models

The binary logistic model was used in this study for analysing the factors that influence group membership (which is used as a proxy to measure collective action) of smallholder farmers. The binary logistic model has advantages in that it is easier to compute and interpret than the probit model. Besides, it does not assume a linear relationship between the dependent variable and

independent variables. Since it requires that the independent variables be linearly related to the dependent variable's logit, heteroskedasticity is eliminated. Other studies analysing the determinants of collective action participation have used the binary logistic model (Gyau et al. 2016, Zeng et al. 2018)

This study assumes two possible outcomes "participating in collective action" or "non-participating in collective action." A binary equation is set up, which defines Y=1 for a situation where a farmer is a participant in collective action or Y=0 for a situation where is a non-participant is a collective action. The linear equation (3.2):

$$E(Yi) = ß_1X_1 + ß_2X_2 + \ldots + ßnXn \quad (3.2)$$

The above linear equation is not appropriate because the dependent variable (Yi), in this case, is not binary. Hence, for the outcome of the dependent variable (Yi) to take a binary value, a special function f (E (Yi), known as the logistic function, must be found. The special function is as follow:

$$f(E(Yi)) = \alpha + ß_1X_1 + ß_2X_2 + \ldots + ßnXn \quad (3.3)$$

Where outcome, Yi, takes the value of 1 with probability pi and the value of 0 with probability 1-pi. Therefore, the logistic regression model will be as follow:

$$\text{Logit}(Pi) = \ln(Pi / 1 - Pi) = ß_0 + ß_1X_1 + \ldots + ßnXn + Ut \quad (3.4)$$

Where:

$\ln(Pi / 1 - Pi)$ = logit for collective action participation decisions

Pi = participating in collective action

1-Pi = not participating in collective action

$ß_0$ = intercept

$ß_1$, ßn, = coefficient

X = independent variables

Ut = error term

Ordered probit regression was applied to assess participation intensity in smallholder farmers' collective action. Based on individual rationality, which is influenced by resource, socio-economic status, incentives, and institutional attributes (Table 3.1), respondents indicated that they either

participate or do not participate in collective activities. For those that participate, their level of participation varies. Respondents' observed preference to take collective responsibilities was regarded as a critical measure of participation intensity. The intensity of the involvement was measured by the number of group activities that each farmer performed. Farmers who decide to participate in groups may still not participate in all the activities (Fischer and Qaim 2014). To analyze the intensity of participation, the number of activities was grouped into three categories, such that 0 activities were considered no participation at all, 1-2 activities were considered low participation, while 3-5 activities were considered high participation. As such, the intensity of participation in collective action is an ordered variable and categorically measured as:

Category 0 = User not participating at all (No activities are done)

Category 1 = Not participating fully (1-2 activities done)

Category 2 = Fully participating (3-5 activities done)

According to Greene and Hensher (2010), the ordered probit model considers the dependent variable's order value, hence its adoption in this study. The intensity of collective action participation depends on certain measurable factors (Xi) and certain unobservable factors (εi). The ordered probit model was therefore estimated for the polychotomous dependent variable with three categories. Following Wooldridge (2010), the ordered probit model for Y (conditional on explanatory variables Xi) can be derived from a latent variable model as follows:

$$Y_i^* = \beta' X_i + \varepsilon i, \text{ where } i = 1\ldots\ldots\ldots n \quad (3.5)$$

Y* is unobserved, but what is observed are threshold values of Y (Wooldridge 2010), which in the present case would be:

$Y = 0$ if $Y^* \leq 0$

$Y = 1$ if $0 < Y^* \leq 1$

$Y = 2$ if $Y^* \geq 2$ (3.6)

The vector of independent parameter estimates is embedded in the coefficient vector β (Wooldridge 2010), consisting of demographic, institutional, and socio-economic factors (Table 3.1).

3.3.4 Dependent and independent variables

Farm group: A dummy variable used as a proxy to measure smallholder farmer collective action participation. A farmer who participates in the farmers' group is assigned 1 and 0, otherwise. The dependent variables used in the model were group participation (membership) and the intensity (Category 0 = User not participating at all or 1= not participating fully or 2= participating fully). The farmer's choice, whether to join the group or not, was estimated using binary logistic. The level of participation depends on the comparison of benefits and costs, hence on individual comparative advantage. The level of participation was modelled using ordered probit.

Age: Age is expected to positively affect farmers' group participation because as farmers get older, they form networks thus have more positive attitudes to group membership than younger farmers (Sinyolo and Mudhara 2018).

Gender: Gender also influences farmers' participation in collective action because group activities can be time-consuming, thereby lowering females' incentive to participate (Weinberger and Jütting 2001). Gender may influence participation intensity because of the traditional labour division and different food and cash crop production responsibilities. Gender is expected to have either a positive or negative effect on collective action.

Education: Education is likely to positively influence farmers' groups participation and intensity of participation because well-educated farmers are more likely to possess the skills and networks necessary to initiate and manage an association (Wuthnow 2002).

Household size: Household size accounts for family labour supply and the extent of household consumption (Alene et al. 2008, Mathenge et al. 2010). It is anticipated that large household sizes would positively affect group membership, as household sizes are significant for group meetings, market days, and agricultural products' transport.

Farm size: The land size in hectares is expected to negatively affect group membership because competitiveness for land resources among experienced enterprises decreases and increases in

production and marketable surplus as land-owned increases. This would discourage the need to engage in farmers' associations, as growing output would reduce production and marketing costs (Fischer and Qaim 2012, 2014).

Off-farm income: Off-farm income is expected to have a negative impact on farmers' group membership as it indicates the diversification of household's income (Fischer and Qaim 2012).

Extension services and credit access: Access to institutional support such as extension services and credit is associated with a farmer's high probability to join a farmers' group. Having access to extension services improves communities' awareness and understanding (Sinyolo and Mudhara 2018).

Perception of the effect of collective action on livelihood capitals (social, economic, physical, natural, and human capital)

The study also included an indicator of the farmers' perceived effect of collective action on their livelihoods. The fundamental perception variables of benefits associated with collective action were derived from the Collective Action Behaviour (CAB) model following Gyau et al. (2012). The variables were centered on the perceived effect on economic capital, which included how collective action improved their agricultural wages, labour income, access to banks, government subsidies, and credit access. Perceived effect on the capital social included perception of how collective action affected their relationship with relatives or neighbours, financial institutions, transporters, and other farmers' groups. Perceived effect on physical capital included how collective action participation affected access to transport, roads to the market, agricultural water infrastructure, and access to markets. Perceived effect on natural and human capital included how collective action improved land access (more plots), land access (security of land tenure), water availability, access to market information, water management skills, and access to extension service.

Table 3.1: Dependent and independent variables

Variables	Variables explanation	Variable type
Membership to a farmers' group	Whether a farmer belongs to a farmers' association or not	Dummy (1=Yes, 0= No)
Age	Number of years the respondent has lived	Continuous (number)
Gender	Whether a respondent is a male or female	Dummy (1=Male, 0= Female)
Education	Household head level of education	Categorical (1= No schooling, 2= Primary, 3= Secondary, 4= Tertiary)
Household size	Total number of permanent household members	Continuous (number)
Farm size	Size of the land in hectares	Continuous (ha)
Off-farm income	Total income from off farming activities in Rands	Continuous (Rands)
Extension Services	Access to extension services	Dummy (1=Yes, 0= No)
Credit Access	Access to credit	Dummy (1=Yes, 0= No)
Social Capital Perception	Perceived effect on social capital	Factor score
Economic Capital Perception	Perceived effect on economic/financial capital	Factor score
Physical Capital Perception	Perceived effect on physical capital	Factor score
Natural and Human Capital Perception	Perceived effect on natural and human capitals	Factor score

Principal Component Analysis

Principal Component Analysis was conducted to establish measures based on linear combinations of statement responses with identical patterns of variability to assess smallholder farmers' perception about the effect of collective action on natural, human, economic, social, and physical capital. Factors that had an eigenvalue of at least one were selected. Each observed variable

contributed 1 unit of variance to the total variance in the data set. Any factor that shows an eigenvalue greater than 1 presents a greater amount of variation than one variable had contributed.

On the other hand, variables with a factor loading less than 0.5 were dropped as factors with high factor loading (> 0.5) of items show convergent validity (Hair et al. 1998). To test the factor analysis's appropriateness for the scale, the Kaiser-Meyer-Olkin Measure of Sampling adequacy (KMO-MSA) was conducted. Any KMO greater than or equal to 0.5 was considered high and acceptable (Kaiser 1970; Dziuban and Shirkey 1974; Cerny and Kaiser 1977). This was followed by a reliability analysis based on Cronbach's alpha coefficients. The rule of thumb about the Cronbach's suggested by (George and Mallery 2003) shows that any alpha coefficient greater than or equal to 0.6 is acceptable. The factor scores generated from the factor analysis were then used in the logit regression as explanatory variables.

3.4 Results and discussions

In this section, descriptive statistics of the explanatory socio-economic variables, Principal Component Analysis, the logit regression, ordered probit results, and why farmers are not joining farmers group are presented.

3.4.1 Descriptive statistics

Table 3.2 and Table 3.3 shows the descriptive statistics of continuous and categorical variables used in the study. Table 3.2 presents the results from continuous variables, while Table 3.3 presents the results from categorical variables. T-test was done for the continuous variables, and a chi-square test was done for the categorical variables; these two tests were used to test whether the means of participants and non-participants in farmers' groups are statistically different from each other. The data collected from 243 smallholder farmers were analysed to portray the relevant demographic, social, economic, and asset endowment features of smallholder farmers. The data collected comprises of 90 (37%) farmers' group participants and 153 (62%) non-farmers' group participants. Descriptive analyses of both continuous and categorical variables indicated significant differences between the group members and non-group members regarding their demographics **(**age, gender, household size, and off-farm income).

This study revealed that smallholder farmers who are members of farmers' groups had an average age of 64.74 years, and non-farmers' group farmers had an average age of 48.56 years. Group memberships had a statistically significant impact of 1% on age. According to studies done by Muchara et al. (2014) and Sinyolo and Mudhara (2018) indicated that the average age for members was 56.88 years and for non-members was 58.55 years. Non-group members had fewer household members compared to farmers with group membership. The average household size was 5.48 for non-group members, and for farmers, with group members the average household size was 12.34.

Table 3.2: Continuous variables description

Variables	**Non-members (n=153)**		**Farmers group members (n=90)**		**t-test**
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**	
Age	48.56	9.85	64.74	7.85	***
Household size	5.48	2.14	12.34	3.29	***
Farming land owned	0.23	0.14	0.52	0.26	**n. s**
Off-farm income	20333.60	49626.90	48125.56	58109.34	***

Note: *, **, ***, means the coefficient is statistically significant at 10%, 5%, and 1% levels, and n.s means not significant

Female farmers play a dominant role in both group membership and non-membership. The majority (76.96%) of the households were female-headed, which supports Africa's widely encountered phenomenon that females practice more farming than men (Muchara et al. 2014). This study estimated that 66% of farmers who are non-members of farmers' groups had never attended school, and 63% of farmers with group membership in Msinga had never attended school.

There was no statistically significant difference in access to support services (extension and credit) between farmers' group members and non-members. The study revealed that 74% of group members had access to the extension service. The government's pressure to ensure that projects do not fail results in the skewed distribution of support to smallholder farmers.

Table 3.3: Categorical variables description

Variable	**Categories**	**Non-group members (n=153) (%)**	**Group members (n=90) (%)**	**P-value**
Gender	2=Female	80	71	*
	1= Male	20	29	
Education	1= No schooling	66	63	n. s
	2= Primary	18	21	
	3= Secondary	15	16	
	4= Tertiary	1	0	
Extension Service	0= No	74	26	n. s
	1= Yes	26	74	
Credit Access	0= No	72	74	n. s
	1= Yes	28	26	

Note: *= statistically significant at 10%; n.s. Not statistically significant

Table 3.4 shows reasons why smallholder farmers were not joining the farmers' group. This study found that 32.7% of smallholder farmers did not partake in collective action because they mainly did not trust the leaders. When elite opinions dominate, the rest of the members feel discriminated against. Approximately 27% had earlier joined the groups. However, they received poor services and left the group. Furthermore, 22.2% had no information about farmers' groups. About 9.2% and 8.5% of smallholder farmers did not have a joining fee and were not interested.

Table 3.4: Reasons for not joining the farmers' group.

Categories	Non-farmers group member (n=153) (%)
Not interested	8.5
No joining fee	9.2
Lack of information	22.2
Lack of trust	32.7
Was a member	27

Table 3.5 presents activities done in farmers' groups by smallholder farmers. The results indicated that key collective action activities farmers engaged in were group sales (21 %), group input purchase (57%), group training (24%), group borrowing (22%), and group transporting (18%). Group input purchases had a high percentage. It involved farmers buying agricultural inputs such as fertilizers, pesticides, and other agricultural inputs, which reduced buying input costs. Group training involved training on aspects of packaging, grading, marketing, and negotiation skills. Group borrowing involved farmers borrowing farming equipment such as tractors, tillage equipment, and donkeys for ploughing. Group sales involved farmers selling their agricultural produce together, and lastly, group transporting 18% of farmers indicated that they transported their produce together to the nearest market outlet.

Table 3.5: Farmers involvement in various aspects of collective action

Group activities	Number of farmers involved. (%)	Number of farmers not involved. (%)
Group sales	21	79
Group input purchase	57	43
Group training	24	76
Group borrowing	22	78
Group transporting	18	82

3.4.2 Principal Component Analysis

Table 3.6 presents perceptions of farmers on the effect of collective action on livelihood capital.

Table 3.6: Perceptions of the effect of collective action on livelihoods capitals

Factors and items	Factor Loading
Economic benefit (KMO=0.7576, Cronbach's alpha = 0.7355)	
Improve agricultural wages labour income,	0.7712
Improve access to banks,	0.8796
Improve government subsidies.	0.7303
Improve credit access	0.7406
Social benefits (KMO =0.7488, Cronbach's alpha = 0.7506)	
Improve relationships with relatives or neighbours.	0.5376
Improve network with financial institutions.	0.8188
Improve network with transporters.	0.8567
Improve network with other production groups (NGOs)	0.8261
Natural and Human benefits (KMO=0.7684 Cronbach's alpha=0.7563)	
Improve land access - more plots.	0.6863
Improve land access – security of land tenure.	0.8116
Improve water availability.	0.7867
Improve access to market information.	0.873
Improve water management skills.	0.5876
Improve access to extension service	0.6475
Physical benefits (KMO =0.7655 Cronbach's alpha =0.7974)	
Improve access to transport to the market,	0.7675
Improve roads to the market,	0.8614
Improve agricultural water infrastructure,	0.7771
Improve access to markets.	0.7508

Using Principal Component Analysis, four main variables were obtained, namely: Economic benefit made up of four variables (KMO=0.7576, Cronbach's alpha = 0.7355); Social benefits (KMO =0.7488, Cronbach's alpha = 0.7506), which is made up of four variables, Natural and Human benefits is made up of six variables (KMO=0.7684, Cronbach's alpha=0.7563). Physical benefits were made up of four variables (KMO =0.7655 Cronbach's alpha =0.7974) as presented in Table 3.6. These variables observed were derived from the Gyau et al. (2012) Collective Action Behaviour model (CAB model), which was based on an updated Technology Acceptance Model (TAM). In this model, the author suggested intrinsic motivators, economic benefits, and perceived ease of use as the reasons for joining collective action.

3.4.3 Regression Analysis

3.4.3.1 Factors affecting collective action participation.

Table 3.7 provides a parameter estimate for the logit regression model. The logit model was used to examine socio-economic factors that influence smallholder farmers to participate in the farmers' group. Out of 12 identified independent variables, seven independent variables had a statistically significant effect on collective action in Msinga Local Municipality. These variables were, i.e., age, gender, education, household size, farm size, off-farm income, and extension services. Other independent variables like credit access, social perception, economic perception, physical perception, natural and human capital perception were hypothesized to influence group membership. However, they had no significant effect on group membership.

Age had a positive significant ($p<0.01$) effect on group membership. The result implies that an increase in age increases smallholder farmers' likelihood to join the farmers' group. The positive effect of age on the likelihood of farmers' group membership may be because older farmers would have developed more contacts, trust, and social networks, thus having more positive attitudes to group membership than younger farmers. Gyau et al. (2016) and Sinyolo and Mudhara. (2018), also reported a positive relationship between age and group membership.

Gender is a vital household decision-making indicator in which, in a traditional setting, males make critical decisions in a household. The interests of male and female household heads are also reflected through gender. Gender had a negative and statistically significant ($p<0.05$) impact on

the decision to join the farmers' group, implying that female-headed households are more likely to join groups. The findings agree with Fischer and Qaim (2012) findings that gender is a central determinant of households' decision to join the farmers' groups. This argument can be due to the role of gender in deciding the specialization of labour supply within a household.

Table 3.7: Logit estimates for participation in collective action.

Variables	**Binary logistic regression**		
Group membership	**Odds Ratio**	**Std.Err.**	**P>z**
Age	1.360	0.126	**0.001*** **
Gender	-0.065	0.082	**0.029** **
Education	2.715	1.561	**0.082***
Household size	5.091	1.936	**0.001*** **
Farm size	5.979	5.409	**0.048** **
Off farm income	1.000	0.000	**0.043** **
Extension Services	0.800	0.102	**0.082***
Credit Access	0.726	0.859	0.787
Social Capital Perception	0.192	0.234	0.176
Economic Capital Perception	1.247	0.237	0.244
Physical Capital Perception	0.884	0.167	0.513
Natural and Human Capital Perception	1.046	0.167	0.780
_cons	0.000	0.000	**0.001*** **

Log likelihood=-20.797967 LR chi^2(12) =278.75 Prob > chi^2= 0.001 Pseudo R^2=0.8702

Note: *, **, ***, means the coefficient is statistically significant at 10%, 5% and 1% levels

Education had **a** positive and statistically significant (p<0.1) effect on farmers' group membership. An increase in formal education increases the likelihood of a farmer participating in

a farmers' group. Education level is a critical aspect in making objective judgments on the importance of participation in farmers' groups. A unit increase in education by one year increases the likelihood of participating in a group by 2.715. Educated household heads can understand the benefits of collective action because they are more likely to possess the skills and networks necessary to initiate and manage an association. These study results are aligned with Gyau et al. (2016), which indicated that education has a significant positive effect on smallholder avocado farmers' group membership in Kenya.

The coefficient for **household size** was positive and statistically significant ($p<0.01$). The results indicated that as household size increases, the household likelihood to join the farmers' group also increases. The results were aligned with Bernard and Spielman (2009) and Fischer and Qaim (2012); the results indicated that household size positively influences group membership. Presumably, larger households are more likely to participate in groups due to the availability of human resources. Furthermore, household sizes are significant for group meetings, market days, and transporting produce to the market.

Farm size: Farm size had a positive and statistically significant ($p<0.01$) effect on farmers' probability of being a group member. One additional ha of the land's size increases farmers' probability of becoming a farmers' group member by 5.979. The positive effect of smallholders' resource endowment on participation in farmers' groups aligns with previous findings of Wollni and Zeller (2007), Bernard and Spielman (2009), and Fischer and Qaim (2012). This is plausible because farmers with larger farms may be more inclined to participate in collective marketing because of the larger perceived gains from improved access to markets, related inputs, and extension services. Another reason might be that farmers possessing larger land size have more options to choose whether to participate in the farmers' group.

The coefficient for **off-farm income** was positive and statistically significant at 5%, implying that farmers with higher off-farm sales are more likely to join a group of farmers. This research contrasts with a study by Fischer and Qaim (2012), which found that farmers with high off-farm income were less likely to participate in group membership because they were occupied with off-

farm work. Farming is not their primary source of income. Households with special abilities other than farming were less likely to join the group of farmers.

Extension services were found to be positive and statistically significant at 10%. The results imply that access to support services, such as extension services, is correlated with an increased probability of group membership. If a farmer had access to extension services, they were most likely to have group membership. Extension services facilitate access to critical information on the benefits of participation in farmers' groups. The results were in line with previous literature, such as Meier zu Selhausen (2016) and Sinyolo and Mudhara (2018). Extension officers have been at the forefront of fostering group creation in South Africa; the government tends to work with farmers' groups. Extension officers are also likely to impact the farmers to meet to form groups.

3.4.3.2 Factors affecting the intensity of collective action participation.

Table 3.8 presents the parameter estimates and marginal effects of the ordered probit model. The results indicated that five out of 12 estimated coefficients were statistically significant. The goodness of fit model is given by Chi-square significance ($p<0.01$).

The results of the ordered probit model in Table 3.8 presents socio-economic factors influencing the intensity of participation of farmers in a group. The intensity was measured using the number of activities the farmer is involved in. The results indicated that age, household size, farm size, education, and economic perception had a statistically significant influence on participation intensity.

The marginal effect report shows that the **age** of a smallholder farmer had a negative and statistically significant ($p<0.01$) impact on participation intensity. The negative coefficient implies that older farmers participate in lesser group activities compared to younger group members. The results are aligned with the study done by Ayieko et al (2014), which found that age influences participation intensity. Younger members still have the energy to perform more activities than older farmers.

Household size had a positive and statistically significant ($p<0.01$) impact on the number of activities a member participates in. Group members with larger household sizes had a high participation level because family members divided activities amongst themselves. Fischer and Qaim (2014) also found that household size influences smallholder farmers' participation intensity in collective action.

Farm size had a positive, statistically significant impact on the intensity of participation at 10%. The results imply that as the size of farm size increases, the farmer was more likely to participate in more activities because they may be more inclined to participate in collective action because of the larger perceived gains from improved access to markets, inputs, and extension services. These results are aligned with Wollni and Fischer (2015), who found that members with larger farms were increasingly attracted to marketing a share of their coffee.

Education was found to have a positive, statistically significant ($p<0.1$) impact on participation intensity. This means that an increase in formal education increases the intensity of participation in farmers' groups. This study is aligned with Muchara et al. (2014), which found a positive correlation between education and participation in farmers' groups. Education level is a critical aspect in making objective judgments on the importance of participation in group activities (Muchara et al. 2014).

The marginal effect shows that economic benefits perception had a negative and statistically significant ($p<0.05$) impact on the intensity of participation in collective action. The results show that members who have perceived groups as a source of more economic benefits have a low intensity of group participation. These results are aligned with Gyau et al. (2016), who found that perception about economic benefits had a negative and statistically significant impact on participation intensity. This could have been caused by the group not meeting their expectations. There is no improvement in their agricultural wages, labor income, access to banks, government subsidies, and not improving farmers' access to credit.

Table 3.8: Intensity of collective action participation

Variables	**Ordered Probit**			**Marginal effects**		
Level of participation	**Coef.**	**Std. Err.**	**p>z**	**(dy/dx)**	**Std. Err.**	**p>z**
Age	0.061	0.012	**0.001*** **	-0.019	0.003	**0.001*** **
Gender	-0.353	0.217	0.104	0 .115	0.070	0.102
Education	0.000	0.000	**0.068***	0.000	0.000	**0.070***
Household size	0.241	0.031	**0.001*** **	-0.079	0.011	**0.001*** **
Farm size	0.295	0.1785	**0.096***	-0.096	0.058	**0.094***
Off farm income	0.107	0.132	0.421	-0.034	0.043	0.420
Extension Services	-0.315	0.244	0.196	0 .108	0.086	0.215
Credit Access	-0.096	0.232	0.679	0.031	0.073	0.674
Social Capital Perception	-0.018	0.021	0.374	0.006	0.006	0.372
Economic Capital Perception	0.066	0.032	**0.042** **	-0.021	0.010	**0.040** **
Physical Capital Perception	-0.034	0.037	0.361	0 .012	0.012	0.360
Natural and Human Capital Perception	-0.029	0.037	0.443	0 .009	0.012	0.443

/cut 15.130 1.051; cut2 6.017 1.07; /cut3 7.389 1.099.

Log likelihood=-144.8479 LR $X^2(12)$ =215.52 Prob > X^2=0.001*** Pseudo R^2=0.4266

Note: *, **, ***, means the coefficient is statistically significant at 10%, 5% and 1% levels

3.5 Conclusion

This paper investigated the factors influencing smallholder farmers' decision to participate in collective action and the intensity of participation among smallholder farmers in Msinga Local Municipality. The binary logistic model results indicated that age, gender, education, household

size, farm size, off-farm income, and extension services impacted the decision to participate in the farmers' group. Moreover, credit access and perceptions of the collective action on livelihoods assets have no significant impact on the decision to participate in collective action. The ordered probit model, which was used to model the intensity of participation, revealed that age, education, household size, farm size, and perception of the collective on economic capital significantly impact participation intensity.

Education plays a vital role in influencing smallholder farmers' decision to participate in collective action. Therefore, it is essential to educate farmers through seminars, training, and workshops about collective action benefits. Educational training should be conducted before and after the formation of the farmers' group. The progress of the farmers' group should be monitored and evaluated. Training should sensitize men and young people on collective action's key benefits since they are less likely to participate compared to female and older farmers.

It is recommended that the government and non-government organizations (NGO) that plans to intervene through farmers' groups to understand better farmers' perception of the collective action on economic benefits. Perception of economic capital affects the intensity of participation. Farmers have the expectation that needs to be met, such as access to credit, improved income, and government subsidies. If these expectations are not met, the farmer group is unlikely to succeed.

This study did not consider the impact of group characteristics (such as group size, number of group meetings attended, and group members' average age). Future studies should consider looking at group characteristics.

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CHAPTER 4: DETERMINANTS AND INTENSITY OF SMALLHOLDER FARMERS' MARKET PARTICIPATION: A CASE OF TUGELA AND MOOI RIVER IRRIGATION SCHEME

ABSTRACT

There are numerous constraints facing smallholder farmers that limit their access to markets and prevent them from taking advantage of the market opportunities. This research aimed to determine factors influencing smallholder farmers' market participation and the intensity of market participation in the Msinga Local Municipality.

Primary data was collected from 243 randomly selected smallholder farmers. The double hurdle model results revealed that the decision to participate in the market is positively influenced by farmers' group, market information access, training, income from livestock, and farm size. Distance to market had a negative effect on market participation. Farmers' group, market information access, and transaction cost significantly impacted the intensity of participation.

This study proposes that the South African government and policymakers need to establish and manage balanced policies for smallholder farmers effectively so that agricultural production can be induced, contributing to poverty reduction, food security, and economic growth.

Keywords: Smallholder farmers, market participation, intensity, double hurdle

4.1 Introduction

In Sub-Saharan Africa, access to the market play a vital role in improving agriculture-based economic growth by improving rural income (Mmbando et al. 2015). Farmers' market participation is both a cause and a result of economic growth. It is a significant way of ensuring better income for rural people and enhancing food security. Markets and enhanced market access are essential for smallholder farmers as they can attract agricultural and economic growth. Improved market access is essential in enhancing smallholder participation in the markets and their participation level (Achandi and Mujawamariya 2016).

Smallholder farming, one of the world's primary economic occupations, is the primary source of income and jobs for 70% of the world's rural poor. Smallholder farmers contribute to food security, fair income distribution, and economic growth linkages (Poole 2017). Nevertheless, in terms of physical market access and lack of market information, smallholder farmers face limitations. Farmers engaged in traditional food plants are usually dependent on informal markets because of the weak or absence of links with traditional markets. Smallholder farmers can improve their incomes considerably by increasing market sales percentage. However, smallholder farmers' market participation remains relatively low due to numerous obstacles that smallholder farmers face, such as linked poor market access, transaction costs, and poor infrastructure, amongst others (Poole 2017).

Most smallholder farmers are situated in remote areas with poor transport and market infrastructure and generating high transaction costs. They also lack reliable market information and information on potential buyers (Fan and Salas 2018). Smallholders are also generally exposed to higher risk and transaction costs because of their small production surpluses. Their choice of products to be marketed mainly depends on marketing information, price generation, and distance from the market (Fan and Salas 2018).

Economic liberalization has allowed smallholder farmers to diversify their commodities and bring their excess to neighbouring markets (Baloyi 2010). One disadvantage for smallholder farmers is that they lack marketing knowledge, resulting in most crops being marketed at their farm gate or on the local market with reduced rates. Limited access to specific markets is another significant issue facing smallholders for their products and inputs (Baloyi 2010).

Therefore, this chapter aimed to contribute to the literature on market participation by investigating factors influencing market participation and intensity of participation by smallholder farmers in Msinga Local Municipality in KwaZulu-Natal, using a double-hurdle econometric model. This chapter is divided into four sections. The first section discusses the research analytical framework. The second section discusses the methodology section, which includes the data, dependent and independent variables, and model specification. The third section includes results and discussion, and the last section is the conclusion and recommendations.

4.2 Analytical framework

The random utility framework considers a smallholder farmer's decision whether to participate in the market (McFadden 1974) and the theory of farm household decision-making under imperfect markets (De Janvry et al. 1991). The random utility framework suggests that when the expected utility or net benefit from participation is greater than in the case without participation, the smallholder farmer will decide to participate in the market. The theory of farm household decision-making under imperfect markets indicates that a household's market participation is mainly a function of market transaction costs. According to De Janvry et al. (1991), market failure is household-specific, not commodity-specific. When market gains are greater than the transaction costs, the household will participate in the market. When transaction costs are higher than market gain, the household will not participate in the market.

In developing countries, most market failures are caused by high transaction costs (Alene et al. 2008). In South Africa, smallholder farmers are in remote rural areas that are far away from traditional markets. Other causes of market failures are lack of market information, lack of access to extension services, lack of access to credit, and poor infrastructure. As explained in De Janvry et al. (1991) and other studies (Boughton et al. 2007; Alene et al. 2008), the household's market participation is influenced by its economic position and institutional environment. The model estimated in this study included proxies for transaction costs, asset endowment, and human capital.

4.3 Methodology

4.3.1 Data collection

See Section 3.2.1

4.3.2 Econometric specification: The Double Hurdle model

Cragg (1971) proposed the double-hurdle model to determine the factors affecting market participation and intensity of participation using the Software for Statistics and Data Science version 15 (STATA 15). The Tobit model might also have been considered an option to address the issue, but this model is very restrictive. Both the Yes/No responses and continuous aspects are assumed to be explained by the same set of explanatory variables (Greene 2008), an assumption that may not be true. The double-hurdle model relaxes this assumption (Yen 1993).

Various studies conducted in the past on market participation and intensity of participation revealed that the double-hurdle model is a better option than the Tobit model (e.g., Cragg 1971; Achandi and Mujawamariya 2016). It is assumed that farmers make two decisions regarding market participation. Firstly, a probit model is used to determine whether a farmer participates in the market or not. The truncated normal model was used for the level of market participation. The second stage decision for those who decide to participate in the market is to determine how much they sell to the market. The model permits separate stochastic processes for the Yes/No variable is explained by explanatory variables. The model can be defined as:

$$Z^{*}_{i1} = Xi'\alpha+\varepsilon_i \qquad (4.1)$$

Where:

Z^{*}_{i1} is a latent participation variable that takes the value of 1 if a household participates and 0; otherwise, x is a vector of observed parameters, and α is a vector of unobserved parameters; ε_i is an unobserved error term capturing all other factors.

The intensity of participation is indicated by:

$$Z^{*}_{i2} = W'i\beta+ v_i \qquad (4.2)$$

Where:

Z^{*}_{i2} is the amount of Market information access sold, W′i is a vector of covariates that explain this amount, β is a vector of unobserved parameters to be estimated, and v_i is a random variable indicating all other factors apart from W′i.

An individual will participate in marketing if $\varepsilon i > - (Xi'\alpha)$ with the probability of observing the individual participate in marketing given as $P(\varepsilon i > - (Xi'\alpha))$. The model gives room for possible

differences between factors that affect participation (εi, Xi′α) and factors that affect the intensity of participation (vi, W′iβ).

The interaction between the two decisions leads to the following estimation for the model:

$y_i^* = W'_i\beta + v_i$ if $y^* > 0$ and $Z_i^* > 0$, $y_i = 0$ otherwise.

4.3.3 Dependent and independent variables

4.3.3.1 Dependent variables

The dependent variable is the decision to participate in the market. The value of 1 was assigned if the household sold their produce during the 2019/2020 cropping season, or 0 otherwise. The supply equation's dependent variable is the natural log of the quantity of products sold during the 2019/2020 cropping season.

4.3.3.2 Independent variables

Location: the variables was included in the model to capture differences in the different locations' general economic and social conditions refer to infrastructure, remoteness, resource endowment, production potential, and farming conditions across the municipality (Jagwe et al. 2010). Location was expected to positively impact market participation because farmers who are near the market are most likely to sell their produce.

Age: The household head's age was used as a proxy measure of experience in producing and distributing. The age of the household head was recorded as a continuous variable. Kyaw et al. (2018) found that the householder's age had adversely affected the market's decision to engage. The householder's age was assumed to have an indefinite relationship with the probability of market participation and the quantity of products marketed by smallholder farmers.

Gender: Different results on the role of gender in market participation and the strength of participation have been presented in previous studies. Olwande and Mathenge (2011) have shown that the gender of a household head positively impacted milk participation**.**

Farmers' group: Membership of the farmers' group has been shown to increase households' market participation because it increases the production and marketing ability of farmers (Kyaw et al. 2018, Gani and Adeoti 2011). This study assumed that group membership positively

impacted both the likelihood of market participation and the quantity of products sold by smallholder farmers in Msinga Local Municipality.

Produce loss: This variable was expected to negatively impact the decision to participate in the market and intensity of participation because farmers would have little to no product to sell (Mukarumbwa ·2017).

Access to market information is essential because it enables farmers to make more appropriate decisions on which market to sell to and when to sell the commodity. Therefore, this study hypothesized that access to market information positively influenced farmers' decision to participate in the market (Kyaw et al. 2018).

Transaction costs: Transaction costs was proxied by the costs of transportation. Transaction costs were expected to have a negative and statistically significant in this study because high transaction costs deter small farmers' entry into the market. They impose added cost burdens on market entry activities (Randela et al. 2008; Zanello 2012; Okoye et al. 2016).

Training: This dummy variable was expected to positively affect market participation because trained farmers are more knowledgeable about the market (Maponya et al. 2016).

Household size: Previous research has shown household size as reflecting an indeterminate relationship with households' presence in the market and the intensity of market participation. Alene et al. (2008) and Kiprop et al. (2019) found that household size had a positive relationship with the quantity of products sold.

Extension service: Smallholder farmers who contact the extension services may better understand new technologies such as high-yielding varieties and other new farming practices, encouraging them to produce more and improve their livelihood. Osmani and Hossain (2015) found that access to extension training positively influenced the intensity of market participation among cereal producers in SSA. In this study, access to extension services was assumed to be positively related to the probability of market participation and the quantity of products sold among smallholder farmers in Msinga.

Table 4.1: Determinants of market participation and intensity of participation of smallholder farmers

Variables	Variables explanation	Measurement of the Variable
Participation (Y)	Market participants or non-market participant	0=No, 1=Yes
Produce sold (Y_i)	The volume of produce sold in the market	Continuous (bags)
Location	Location of the household head	0= Mooi River, 1= Tugela Ferry
Age	Age of the household head	Years
Gender	Gender of a household head	0= female, 1= male
Farmers group	Membership to farmers' group	0=No, 1=Yes
Produce loss	Produce loss due to drought, rain, insects, pest, or theft	0=No, 1=Yes
Market information access	The farmer has access to market information	0=No, 1=Yes
Transaction costs	Transportation costs	Continuous (Rands)
Access to training	Received agricultural training	0=No, 1=Yes
Household size	Total number household members	Continuous (number)
Extension service	Access to extension services	0=No, 1=Yes
Distance to market	Distance to the nearest market	0= less than 15 km, 1= greater than 15 km
Livestock income	Total income from livestock	Continuous (Rands)
Farm size	Size of the land	Continuous (ha)

Distance to market: The market distance was captured as a dummy variable measuring the distance between the farm and the market where the farmers sell their produce. Previous work (Lwezaura and Ngaruko 2013) noted that distance had a negative relationship with market participation. Makhura et al. (2001) presented that market distance influences both market participation and participation intensity.

Livestock income: Livestock is a significant shift in production because it improves the household's capacity to produce more and increases the chances of household involvement in the market (Dlamini and Huang 2019). In this analysis, an indeterminate association was hypothesized between livestock ownership and the likelihood of market participation, and the volume of products sold.

Farm size: Farm size is usually expected to have a positive relationship to market participation. Olwande and Mathenge (2011) argued that the farm-scale might indirectly affect market participation, as it is sometimes used as collateral for credit used to boost development.

4.4 Results and Discussion

This section discusses results obtained using t-test and chi-square test for descriptive results and double hurdle model for empirical results of the factors affecting market participation and intensity.

4.4.1 Descriptive results

The sample consisted of 150 market participants and 93 non-market participants. Tables 4.2 and 4.3 show the demographics and socioeconomic characteristics of the sampled households. Table 4.2 presents continuous variables and their means, while Table 4.3 presents categorical variables and their proportion. The t-test was done to investigate mean comparisons for continuous variables, while the χ^2 test was done to measure associations for categorical variables.

This study suggested that 62% of smallholder farmers participated in the market in the 2019/2020 farming season. Table 4.2 indicates that the average age of household heads who participated in the market was 57 years, while that of non-market participants was 49 years. A possible explanation is that more experienced farm households tend to have more personal contacts and social networking, permitting further trading opportunities. Matungul et al. (2001) and Makhura et al. (2001) found similar findings that some experience about the market helped farmers to overcome some fixed transaction costs in South Africa. Younger farmers are shifting more towards better-paying jobs than the agricultural sector and probably do not invest in getting a better understanding of how markets function. The household size was positive and statistically significant ($p<0.01$). Market participants were found to have bigger families with an average of 9

members family members, while non-market participants had an average 5 members. This difference indicated a high labour demand for farming.

Farm size had a positive and statistically significant difference ($p<0.01$) between market participants and non-participants. Table 4.2 shows that market participants had bigger size of the land than non-market participants. Whereas market participants had an average of 0.40 ha plot sizes per individual household, the non-market participants operated on average of 0.24 ha per household.

Table 4.2: Continuous variables

Variables	**Non-market participants (n=93)**		**Market participants (n=150)**		**P-value**
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**	
Age	49	10.41	57	12.11	****
Household size	5	3.08	9	4.20	***
Farm size(ha)	0.24	0.14	0.40	0.27	***
Livestock income (R)	1127	4039	2480	5794	**
Transaction costs (R)	3062	159	2023	204	***

Note: *, **, ***, means the coefficient is statistically significant at 10%, 5%, and 1% levels

Livestock income had a positive and statistically significant ($p<0.05$) difference between market participants and non-participants. The results indicated that market participants received more income from the livestock compared to non-market participants. Market participants received an average of R2 480 income from livestock compared to R1 127 that non-participants received. Non-market participants had an average transaction costs of R3062, and market participants had R2023. The difference is caused by market participants' proximity to the market. Therefore, the lower the distance travelled to the market, the lower the transaction costs.

Approximately 75% of smallholder farmers had received some level of agricultural training, while 25% did not receive agricultural training. The results also show that 68% of smallholder farmers participating in the market travelled shorter distances to the market, and 32% reside far away from

the market. The results indicated that 34% of non-market participants had access to market information, and 78% of market participants had access to market information.

Table 4.3: Categorical variables

Variable definition	**Categories**	**Non-Market (n=93)**	**Market participants (n=150)**	**P-value**
		%	%	
Location	0= Mooi River	44	30	**
	1= Tugela Ferry	56	70	
Gender	0= Female	81	75	n.s.
	1= Male	19	25	
Farmers' group	0= No	94	44	**
	1= Yes	6	66	
Produce loss	0= No	10	13	n. s
	1= Yes	90	87	
Extension service	0= No	57	50	n. s
	1= Yes	43	50	
Training	0= No	73	25	***
	1= Yes	27	75	
Distance to market	0= less than 15 km	35	68	***
	1= greater than 15 km	65	32	
Market information	0= No	66	22	***
	1= Yes	34	78	

Note: *, **, ***, means the coefficient is statistically significant at 10%, 5%, and 1% levels, and n.s means not significant

In terms of location, 70% of market participants were from Tugela Ferry; this is because farmers from Tugela Ferry were closer to the market than farmers from the Mooi River. Farmers' group membership positively impacts market participation, highlighting the importance of groups in enhancing market participation by smallholder farmers. Approximately 66% of farmers who had group membership participated in the market.

4.4.2 Regression results

Socioeconomic factors are hypothesized to affect the decision to participate in the output market. The intensity of participation was included in the double hurdle regression model. The results are presented in Table 4.4. Before estimating the selection model, it was checked for possible multicollinearity problems using the VIF (Variance Inflation Factor). The VIF was less than the critical value of 10 (Zainodin and Yap 2013), confirming that multicollinearity was not a problem. The correlation coefficient results showed that these coefficients are globally less than 0.5 for the sample, indicating weak correlations, which suggest that the variables are sufficiently independent to be modelled together without multicollinearity concerns.

From Table 4.4, it can be noticed that the likelihood ratio statistics as indicated by chi-square are highly significant ($p < 0.001$), suggesting that all the model parameters were jointly significant in explaining the dependent variable. The first hurdle results indicated that explanatory variables, i.e., farmers' group, market information, training, distance to market, income from livestock, and farm size, positively and statistically significantly influenced farmers' probability of participating in the market. The second hurdle results showed that farmers' group, market information, and transaction costs positively and significantly affected market participation intensity.

Farmers' group

Farmers' group had a positive and statistically significant impact at 5% on market participation and quantity of products sold, which means that farmers who had group membership were most likely to participate in the market. Group membership has played an essential role as an information exchange platform, sharing transaction costs, such as transport costs, allowing farmers to connect to buyers at a lower cost, thereby reducing the fixed transaction costs of participating in the market. The study results are aligned with previous studies Mmbando et al. (2015), which had similar findings. Farmers' group had a positive and statistically significant coefficient ($p<0.05$) for the intensity of participation, suggesting that the current farmers' group enhance market participation.

Table 4.4: Determinants of market participation

Variables	**First hurdle (Market participation)**			**Second hurdle (Total value of product sold)**		
	Coef.	**Std.Err.**	**P>z**	**Coef.**	**Std.Err.**	**P>z**
Location	0.372	0.288	0.197	0.052	0.134	0.698
Age	0.010	0.015	0.506	-0.007	0.007	0.3
Gender	-0.045	0.305	0.882	0.014	0.140	0.919
Farmer group	1.495	0.701	**0.033****	0.532	0.242	**0.028****
Produce loss	-0.147	0.418	0.725	-0.049	0.175	0.778
Market information	0.000	0.000	**0.001*****	0.000	0.000	**0.001*****
Transaction costs	-0.001	0.001	0.351	0.001	0.000	**0.031****
Training	0.892	0.529	**0.092***	0.002	0.205	0.991
Household size	0.050	0.059	0.4	0.011	0.024	0.642
Extension service	0.897	0.660	0.174	0.056	0.095	0.553
Distance to market	-1.27	0.585	**0.029****	-0.036	0.122	0.766
Livestock income	0.000	0.000	**0.061***	-0.000	0.000	0.468
Farm size	1.506	0.812	**0.064***	0.003	0.246	0.798
_cons	-2.797	1.333	**0.036****	6.686	0.563	**0.001*****

Log likelihood = -1222.103 LR chi2(13) = 389.81 Prob > chi2 = 0.0000 Pseudo R2= 0.1375

Note: *, **, ***, means the coefficient is statistically significant at 10%, 5% and 1% level

Market information access: The coefficient on access to market information showed a positive effect on a farmer's decision to participate in the market and the quantity of products sold in the market and significant at a 1% level. The positive outcome of market information implies that farmers who had access to market information were more likely to sell their products. This result implied that access to market information would help improve farmers' knowledge of the market and assist in planning on whether to sell in the market and the quantity to be sold to the market. This infers that access to market information will lead to increased productivity with a high marketable surplus. Kyaw et al. (2018) also found that market information positively affects a farmer's decision to participate in the market.

Training

The training was also found to impact the decision to participate in the market positively. Training had a positive coefficient ($p<0.1$), meaning that farmers who had access to agricultural training were most likely to sell their produce. The results imply that focused farmer training may increase the chances of households participating in the market. These findings are aligned with that of Maponya et al. (2016), which emphasized that well-trained smallholder farmers could sell more products in the market. A study by Cheteni and Mokhele (2019) stated that farmers' training improved their knowledge and understanding of livestock production and marketing.

Distance to market

The first hurdle's findings in Table 4.4 suggest that distance to the nearest market negatively influenced smallholder farmers' likelihood to participate in the output market ($p<0.05$). The negative sign means that as the nearest market's distance decreases, farmers were more likely to participate in the market. As the distance to the market decreases, the transportation cost decreases as well; this is an incentive to market participation. Eskola (2005) reported that the distance to the market was a significant factor that affected the farmers' market participation.

Livestock income

Livestock income had a positive and statistically significant ($p<0.1$) effect on deciding to participate in the market. The positive coefficient for livestock income implies that as income increases, the probability of farmers' orientation towards market participation increases. It follows that policies and programs promoting livestock ownership will automatically improve the household's opportunities to earn a livelihood (Blevins 2019).

Farm size

The land size had a statistically significant positive coefficient ($p<0.1$), suggesting a higher chance of a farmer participating in the market as the farm size increases. Farm size is a significant development factor that helps households generate a surplus for the market. Furthermore, households with larger farm sizes might partially allocate their land for food crop production and partially for cash crop production, giving them a better position to participate in the output market.

The outcome is consistent with many studies on market participation that highlighted the critical role of access to land plays in encouraging smallholder farmers to produce for the markets (e.g., Jagwe et al. 2010; Osmani and Hossain 2015).

Transaction costs

Transaction cost had a positive effect on market participation intensity and was statistically significant ($p<0.05$). The results seem counterintuitive and contradict our a priori expectation. From theory, transaction costs could be fixed or proportional. Transaction costs are fixed when the cost is invariant with production and proportional when it varies with the production level. Since only transportation cost was considered in estimating the transaction cost and it is proportional, the higher the quantity of products sold, the more the costs incurred. This study is aligned with Adeoti et al. (2014), which suggested that transaction costs positively impacted market participation intensity.

Contrarily to earlier expectations, variables location, age, gender, produce loss, transaction costs, household size, extension service were found to have no significant influence on the household's decision to participate in the market. The quantity of crops sold was expected to be affected by location, age, gender, produce loss, training, household size, extension service, distance to market, income from livestock, and farm size, but these factors did not impact market intensity participation.

4.5 Conclusion and recommendation

4.5.1 Conclusion

This paper examined the factors affecting smallholder farmers' market participation and its intensity using data collected from a randomly selected sample from Msinga Local Municipality, KwaZulu-Natal Province. The double-hurdle model was used to explain whether to participate in the market or not and determine the quantity of products sold.

Farmers who had received agricultural training and had access to market information were most likely to participate in the market because they were knowledgeable about the market; hence, agricultural training needs to be facilitated and market information needs to be distributed for smallholder farmers. Farmers living closer to the market were most likely to sell their products because the transportation cost decreases as well; this is an incentive to market participation.

Livestock income had a positive impact on market participation. Farmers who had a larger land size are likely to participate in the market because they have adequate land to produce a surplus for the market. Farmers with higher transaction costs had sold because only transportation costs were used. Therefore, the higher the total value of crops sold, the higher the transportation costs.

Farmers' group membership is positively correlated with market participation. Findings of the study indicate that outcomes support the assertions in the market literature that collective action can improve smallholder farmers' market participation. Farmers' groups provide a good platform for obtaining agricultural training and consequently lowering transaction costs.

4.5.2 Policy recommendation

In general, the integration of smallholder farmers in lucrative markets through collective action can transform the rural economy through increased incomes and, consequently, eradicate food insecurity. A clear policy that aims to support farmers' groups and promote smallholder farmers' collective action considering both the smallholder farmers' social and economic heterogeneity is required.

Access to market information for farmers needs to be improved, and this can be done by using the Short Message Service (SMS) platform. Market information such as prices could be communicated with farmers through SMS, and the information should be in the language that the farmers understand.

4.5.3 Recommendation for future study

Since the study centered on the role of collective action in market participation among smallholder farmers, physical infrastructures such as roads and water availability which could potentially impact market participation, were not explored in this study. Therefore, further research needs to be done on market participation which will include these factors. Market channels and sources of market information were not explored in this study. Therefore, an in-depth evaluation of the most promising market channels and sources of market information that would enhance market access and smallholder farmers' bargaining power is highly recommended.

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CHAPTER 5: IMPACT OF MARKET PARTICIPATION AND COLLECTIVE ACTION ON HOUSEHOLD FOOD SECURITY

ABSTRACT

Food insecurity is a global challenge. The reduction of hunger is one of the targets of the Sustainable Development Goals that is widely seen as a useful measure for evaluating the progress of a country in terms of the well-being of its people. Market access could help eradicate poverty and improve household food security, contributing to achieving Sustainable Development Goal 2: Zero Hunger.

Data were collected using a structured survey questionnaire from 243 randomly selected households in Msinga Local Municipality. The binary logistic regression result revealed that gender, age, education, social grant, credit access, market participation, farm size, total livestock unit, and food expenditure had a positive and statistically significant impact on household food security.

This paper's findings have crucial implications for the government and other development agencies for improving household food security status. Access to the market should be achieved in tandem with improved access to education. Furthermore, there should be increased awareness of the importance of education through the socialization of compulsory education, scholarship information through local community meetings.

Keywords: food security, binary logistic, smallholder farmers

5.1 Introduction

Globally, the smallholder farmers are estimated to be around 500 million and produce food for about 80% of the population, but they continue to be food insecure (Wickramasinghe et al. 2014). Wickramasinghe et al. (2014) also stated that those smallholder farmers are paradoxically the poorest and most food-insecure and suffer from malnutrition. Globally, an estimated 821 million people were undernourished in 2017, with most developing countries. Sub-Saharan Africa has the world's highest prevalence of undernourishment, projected to be 23.2% during the same year (FAO 2007). Statistics South Africa 2017 report reported the most-recent poverty statistics, which showed that despite a decline in poverty between 2006 and 2011, poverty levels had once again risen in 2015. In 2011 the poverty level was 53.2%; in 2015, approximately 30.4 million people (55.5%) of South African lived in poverty.

Megerssa et al. (2020) indicated that marketing should be more than just selling. Marketing entails setting financial targets, risk assessment, exploring pricing and presenting alternatives, looking for market opportunities, and managing one's pride. Besides, good marketing requires preparation, discipline in selling, access to useful potential buyer information, and a good understanding of pricing and delivery alternatives. It is impractical to expect anything to be priced at the market's peak. One of the key constraints facing smallholder farmers has also been a lack of reliable markets. Most smallholder farmers do not have financial and marketing skills and cannot comply with the quality requirements developed by markets for fresh produce and food processors.

Megerssa et al. (2020) reported that the agricultural sector is primarily subsistence, where most of the farm production is used for household consumption rather than market consumption. According to Megerssa et al. (2020), nearly 95% of the total land is cultivated by smallholder farmers and generates more than 90% of total agricultural production. From these, we can understand that one of the critical barriers faced by most smallholder farmers in the nation has also been a lack of reliable markets. This restriction of reliable and affordable market opportunities forced most smallholder farmers to be fewer market participants in the agricultural sector, especially in the crop market's participation, restricting their production to household consumption rather than marketing. The rest of the crop produced from household consumption is sold at low prices to traders. Such low involvement of smallholders in the crop market leaves them with little

income for a long time before the coming harvesting season, which also exposes them to unimproved food security and vicious life cycle style.

Farmers' market involvement is both a source of economic growth and a result of it. It is an effective vehicle for rural people to secure better incomes and enhance household food security. Smallholder farmers' markets and enhanced market access are significant as they can attract agricultural and economic growth. Smallholder farming's importance in the fight against rural poverty and food insecurity in Sub-Saharan Africa has been primarily recognized (Weaver 2008; Mabuza et al. 2016). Smallholder farming's importance in the fight against rural poverty and food insecurity in Sub-Saharan Africa has been paramount in growing smallholder market participation and the scale of their participation. There is increasing awareness that if smallholder agriculture breaks out of the subsistence trap and becomes more entrepreneurial and market-driven, it will contribute more to rural livelihoods.

The smallholder's market participation has long been promoted to enhance farmers' productivity, income, food security, and poverty (Barrett 2008; Sibhatu et al. 2015; Radchenko and Corral 2018). Nevertheless, there is no definitive proof of its effect on food security and nutrition. On the one hand, studies have shown that the marketing of agricultural produce is successful in enhancing food security and nutrition (Seng 2016). Studies such as Carletto et al. (2017), on the other hand, have found no evidence that market participation has a positive impact on smallholder farmers' nutritional status. Other studies such as Kehinde and Kehinde (2020) found a positive relationship between group membership and food security, and others found no contribution of collective to ensuring food security and poverty reduction because of heterogeneous m membership, leadership, passive membership , lack of trust and equality of dividend irrespective of the participation level (Dongfeng 2012). This chapter contributes to the market participation debate by analyzing the effect of market participation and collective action on households' food security.

5.2. Analytical framework

According to the standard agricultural household model, farmers' household allocates consumption expenditure by increasing the maximizing utility subject to income constraints. Household income is determined by agricultural produce returns that depend on farmers' productivity and ability to generate a marketable surplus, which is the primary condition for market participation. Then, the market entrance would determine the household expenditure on necessary goods. This study

hypothesizes that participation in markets exerts positive effects on household food security in terms of HDDs by augmenting household food consumption. It makes production more efficient and increases household earnings. To assess the effects of market entry on household food security, a commonly used model in the literature on effect evaluation is specified as follows:

$$Y = \beta X + \gamma I * + \varepsilon \quad (5.1)$$

Y is the household's HDDs per capita, X is a vector of household and farm characteristics, and other factors expected to affect the consumption. $I *$ is a dummy for market participation, and then γ is the coefficient capturing the effect of market participation on household food security.

5.3 Methodology

5.3.1 Data

Household Dietary Diversity Score (HDDS) questionnaire was used as a guide to capturing the farmers' household dietary diversity as a proxy measure of food security (Swindale and Bilinsky 2006). Finding detailed information on farmers' household food security or individual dietary consumption can be expensive, thus time-consuming. A higher level of technical skills may be required for data collection and analysis (Swindale and Bilinsky 2006). Dietary diversity is a qualitative measure of food consumption that reflects household access to various foods and is also a proxy for nutrient adequacy of individuals' diets. The dietary diversity questionnaire presents a rapid, user-friendly, and easily administered low-cost assessment tool (Swindale and Bilinsky 2006).

Some 243 randomly selected participants in Msinga Local Municipality were asked to remember all food items/goods eaten in the previous 24 hours before the interview. A scale of 12 food groups has been used to determine the participants' dietary diversity (Taruvinga et al. 2013). The participants' dietary diversity scores were calculated using information obtained from a 24-hour dietary recall (FAO 2007). A single point was allocated to each of the food groups eaten in the 24hr period, allocating each person a maximum total dietary diversity score of 12 points if his / her responses were "yes" for all food groups. Figure 5.1 demonstrates Household dietary Diversity food groups.

After collecting data from 243 smallholder farmers participants, the food items were grouped into food groups. There is no clear international cut-off of high or low HDDS levels, but an average HDDS was computed per this paper's overall sample group. The average HDD score was 3.5. Households that went above the average level of HDDs were treated as food secure, and those that went below the average level of HDDs were treated as food insecure. The HDDS is a widely used instrument and is promoted by the FAO and USAID as a food access proxy. The HDDS was therefore used in this paper to act as a proxy for household food security status.

Table 5.1: Household dietary diversity food groups

Food Groups
1. Any bread, rice noodles, biscuits, or any other foods made from millet, sorghum, maize meal, rice, wheat?
2. Any potatoes, yams, manioc, cassava, or any other foods made from roots or tubers?
3. Any vegetables? (Pumpkin, carrot, squash, or sweet potato that are orange)
4. Any fruits?
5. Any beef, pork, lamb, goat, wild rabbit game, chicken, duck, other birds, liver, kidney, or heart?
6. Any eggs?
7. Any fresh or dried fish or shellfish?
8. Any foods made from beans, peas, lentils, or nuts?
9. Any cheese, yogurt, milk, or other milk products?
10. Any foods made with oil, fat, or butter?
11. Any sugar or honey?
12. Any other foods, such as condiments, coffee, tea?

Source: Kennedy et al. (2010)

5.3.2 Empirical model

The empirical binary logistic regression method is suitable for the modelling of dichotomous dependent variables. For this paper, the HDDS refers to the household food security status, where

households were graded as food secure (assigned numeric value 1) and food insecure (assigned a numeric value 0). The binary logistic regression model then provides a basis for detecting the probability of a household being food secure or otherwise (food insecure). Various studies, such as the work of (Arene and Anyaeji 2010, Maharjan and Joshi 2011, Mango et al. 2014, Maziya et al. 2017), have studied determinants of household food security. Equation (1) depicts the definition for binary logistic regression modelling:

$$Z_i = \mathcal{P}\mu + \Sigma(\beta_i x k_i) \quad (5.2)$$

Where X_i presents a set of parameters that specify the food security status of the household. Z_i is the probability that the household is food secure or not, a dichotomous dependent variable (coded with 1 if food secure, 0 food insecure). β_0 presents the intercept model, and β_1 to β_i presents the explanatory variables' coefficients, X_1 to X_{ki}.

$$Pi = \frac{e^{zi}}{1+e^{zi}} \quad (5.3)$$

P*i* denotes the likelihood that the household's food security status will be food secure and $(1-P_i)$ the likelihood that the household will be food insecure. The odds (Y = 1 versus Y = 0) define the proportion of the likelihood of a household being food secure (P_i) to the likelihood of being food insecure ($1-P_i$); that is, odds = $P_i/(1-P_i)$. Using the natural logarithm, the prediction is portrayed in Equation (3):

$$Li = \text{In}\left(\frac{Pi}{1-Pi}\right) = Zi \quad (5.4)$$

whereby the value of:

$$Pi = \left(\frac{1}{1+e^{-Zi}}\right) \quad (5.5)$$

Z*i* is also denoted as the logarithm of the odds ratio in relation to a household being food secure as portrayed in the regression Equation (5):

$$Zi = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \ldots \beta n Xn + ui \quad (5.6)$$

Zi presents the household food security status (assigned a numeric value 1 if food secure and 0 if otherwise), β0 is the vector of unknown parameters (intercept), and μi denotes the error term.

5.3.3 Dependent and independent variables

5.3.3.1 Dependent variable

HDDs was used as a proxy to measure household food security. The average score of 3.5 of the total HDD was used; the farmer was assigned 1 if their score was above the average score and 0 if below the average score. 1 means the farmer is food secure and 0; otherwise.

5.3.3.2 Independent variables

Gender: The de facto headship of the household head was captured in this study. Female household heads have a higher dependency, which is likely to hinder their households from allocating labour to off-farm or other income-generating activities (Maziya et al. 2017). The expected outcome could be either negative or positive.

Age: The expected outcome could be either negative or positive. Younger heads of households have the energy to work in different jobs; older heads of households can be food secure as they can get remittances and pension (Maziya et al. 2017).

Education: Level of education was expected to have positive impact. Educated household heads are more likely to be food secure; they have potential access to opportunities. The education level that a household head attained could lead to the possible advantages of modernized agriculture utilizing technological inputs, hence improving agricultural productivity and food availability (Maziya et al. 2017).

Marital Status: Households with married spouses can be food secure. They help each other with household necessities, married head of households dominates in the survey, the female may be engaged in agricultural activities, the male may be more involved in income-generating activities (Maziya et al. 2017).

Market participation: Market participation was expected to have a significant positive impact on household food security because participating in the market improves household income. Manda et al. (2020) found that selling cowpea to rural and urban traders significantly increased household income, food expenditure, and food security.

Farm size: In this study, farm size is expected to affect households' food security status positively. According to Najafi (2003), food production can be increased extensively by expanding areas under cultivation. Therefore, landholding size is expected to play a significant positive role in influencing households' food security.

Remittances, farm income, off-farm income, and social grant: To cover all expenses, one income alone is not enough. Households receiving remittances, farm and off-farm income, and social grants are less likely to follow unhealthy coping habits such as consuming less nutritious food because of lack of money and are less likely to be concerned about meeting household food requirements. The number of people receiving social grants has significantly increased from 15.7 million in 2013 to almost 17.9 million in 2018 in South Africa (Government 2019). These factors are anticipated to positively affect their households' food security status because they have sufficient money to buy food (Waidler and Devereux ·2019).

Credit access: Access to credit is households' ability to obtain credit in cash and kind for either consumption or to support agricultural production (Kuwornu et al. 2018). Credit obtained for consumption purposes increases the consumption basket of households (Babatunde et al. 2007). On the other hand, when obtained on time, production credit increases the chances of farming households acquiring productive resources (pesticides, seeds, fertilizers, and machinery hire), boosting productivity, and improving household food security.

Farmer group: Farmers' group improves the consumption of food of its members by increasing farming production (Nugusse et al. 2013). This variable was expected to affect food security status positively.

Total Livestock Unit: Total livestock unit owned has a positive effect on household food security. The total number of livestock enables a household to be food secure through the income earned or by direct consumption (Maziya et al. 2017).

Food expenditure: The rationale is that households that spend a high proportion of their total food expenditure are more vulnerable than households that spend a lower proportion (Waidler and Devereux 2019). This is because households that spend a large share of their income on food are more vulnerable to changes in food prices and changes in income. Expected to have negative outcome.

Own transport: Ownership of a vehicle is expected to have a positive impact on household food security. Households without cars necessarily spend more time and money to travel to grocery stores. Higher costs may cut the size of meals, increasing food insecurity (Baek 2016).

Table 5.2: Variables included in the regression model.

Variables	**Variables explanation**	**Measurements**
Household Diet Diversity Score	Household is food insecure or food secure	0= Food insecure 1= Food secure
Gender	Gender of the household head	0= female, 1= male
Age	Age of the household head in years	Continuous (number)
Education	Level of the household head education	1=No schooling,2= Primary, 3= Secondary, 4= Tertiary
Marital Status	Marital status of the household head	0= unmarried 1=married
Market participation	If the farmer participated in the market	0=No, 1= Yes
Farm size	Size of the land in hectares	Continuous (ha)
Off-farm income	Income from off-farm sources per year	Continuous (Rands)
Social grant	Annual total social grant income	Continuous (Rands)
Credit access	If has access to credit	0=No, 1= Yes
Farmers' group	If a farmer belongs to any farmers association	0=No, 1= Yes
Remittances	If a farmer receives income from private transfers or gift	Continuous (Rands)
Farm income	Income from on-farm activities per year	Continuous (Rands)
Total Livestock Unit	Total number of livestock	
Food expenditure	Money spent on food items monthly	Continuous (Rands)
Own transport	If a household head owns a vehicle	0=No, 1= Yes

5.4 Results and discussions

5.4.1 Descriptive statistics

Table 5.3 presents t-test results for the continuous variables. The study indicated that 42% and 58% of the sample households were food secure and food insecure, respectively. The t-test results show that the average age of food insecure farmers was 51 years, whereas, for food secure farmers, it was 58 years. This study revealed a statistically significant difference between household food security and age at 1%. The mean age differences imply that as the number of years of age of the household head increases, so do the chances of their household being food secure.

This study revealed that farmers with a larger farm size with an average of 0.412 ha were food secure than those with 0.291 ha plots per food insecure individual. This is because farmers with larger farming land can produce more crops for consumption and selling.

Off-farm income was statistically significant at 1%. This implies that households who were food secure get an average of R33781 and they can buy more food, and food insecure get an average of R28306.

Social grants had a significant ($p<0.01$) impact on household food security status. The t-test indicated that recipients of social grants who are food insecure received an average of R27139. Food secure households received R21670 of social grants annually. Table 5.3 shows that food-insecure households received farm income of R11205 yearly and food secure households received R15206 yearly.

There was statistically significant ($p<0.01$) between total livestock owned and food security status. Smallholder farmers that were food insecure had an average of 8.721 of total livestock unit, and food secure smallholder farmers had an average of 20.456 of total livestock unit. In discussion with the farmers, they indicated that they sell their livestock, which generates more income to buy more food.

Every month a food-secure household spent R1537 on food items, and food-insecure households spent R1120.

Table 5.3: T-test results for household food security determinants

Variables	Food insecure (n=140)		Food secure (n=103)		
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**	**t-test**
Age	51	11.645	58	11.368	***
Farm size (ha)	0.291	0.193	0.412	0.282	**
Off-farm income (R)	28306	66667.304	3378	31166.332	***
Social grant (R)	27139	20807.804	21670	19768.022	***
Farm income (R)	11205	10566.525	15491	11741.541	***
Total livestock unit	8.721	10.987	20.456	16.413	***
Food expenditure (R)	1120.357	547.719	1537.378	910.793	***

Note: ***, ** and * means significant at 1%, 5%and 10% levels of significance, respectively

Eight variables were analysed in this section against household food security status, i.e., gender, farmers' group, marital status, market participation, credit access, access to transport, extension access, and education. Of the eight variables, three were statistically significant (farmers group, market participation, and credit access).

The farmers' group was statistically significant at 1%, which means that belonging to the farmers' group played a significant role in household food security status. The results show that 76% of smallholder farmers who did not belong in a farmers' group were food insecure, and 24% were food secure. The results show that 73% of farmers who had group membership were food secure, and 27% are food insecure.

The Chi-square test was performed based on household participation and non-participation in the output market. The results revealed that market participants had a statistically significant difference ($p<0.01$) between food secure and food insecure smallholder farmers. Market participation plays a significant role in a farmer's food security status. The results in indicated that 77% and 23% of smallholder farmers who did not participate in the market were food insecure and food secure, respectively. About 45 % and 55 % of farmers who participated in the market were food insecure and food secure, respectively.

Credit access was significant at 5%; approximately 67% of food insecure households had access to credit than the 33% of food secure households who had access. These results imply

that food-insecure households did not have enough money to buy adequate, safe, and nutritious food because they use the money to pay back the credit.

Table 5.4: Association between food security and socio-economic parameters:

Variable definition	**Categories**	**Food insecure (n=140) (%)**	**food secure (n=103 (%))**	**X^2 Sign. Level**
Gender	0= Female	56	44	n.s
	1= Male	62.5	37.5	
Farmers' group	0= No	76	24	***
	1=Yes	27	73	
Marital Status	0= Unmarried	61	39	n.s
	1= Married	54	46	
Market participation	0= No	77	23	***
	1=Yes	45	55	
Credit access	0= No	54	46	**
	1=Yes	67	33	
Access to transport	0= No	50	50	n.s
	1=Yes	36	64	
Remittances	0= No	56	54	n.s
	1=Yes	64	36	
Education	1= No schooling	59	41	n.s
	2= Primary	52	48	
	3= Secondary	54	46	
	4= Tertiary	0	1	

Note: ***, ** and * means significant at 1%, 5% and 10% levels of significance, respectively. ns= not statistically significant.

5.4.2 Regression results

Table 5.5 provides the parameter estimates for the binary logistic model. The logistic model assessed market participation and collective action on household food security in Msinga Local Municipality.

The severity of multicollinearity between the independent variables was tested using Variance Inflation Factor (VIF), where values less than 10 are acceptable. The results show that multicollinearity was not a problem as all VIF values were below 10. The overall measure of goodness of fit model is given by the chi-square significance ($p<0.001$). The variation in independent household food security contribution is explained by selected 15 explanatory variables in Table 5.5. Among the 15 variables considered in the model, nine had a significant impact on household food security. The nine variables were gender, age, education, social grant, credit access, market participation, farm size, total livestock unit, food expenditure.

Gender: A household head's gender had a negative and statistically significant influence on household food security ($p< 0.05$). This is suggesting that households headed by females were more food secure than households headed by males. This happens because some males move in search of jobs to urban areas, and their existence in rural areas means they are unemployed. On the other hand, married female-headed households are more likely to have their male counterparts generating money in cities and obtain remittances that can be used to buy food (Maziya et al. 2017).

Age: In determining household food security status, age is a significant factor. Economic model indicates that age (odd ratio = 1.178, $p = 0.005$) was statistically significant. The odd ratio is positive, meaning that the higher the age, the more the household's probability to be food secure. Results indicated that household food security differed significantly among various age groups. Households with older households' heads were more likely to be food secure, and households with younger heads were more likely to be food insecure. The household gains more agricultural experience and becomes more averse to risk and diversifies its production. The findings are consistent with previous research by Gebre (2012) and Mango et al. (2014); both studies indicated that older heads of households appear to be food secure.

Education: The odd ratio for education was positive and statistically significant ($p<0.05$), which implies that the higher the household head's education level, the more likely it to be food secure. Education plays a crucial role in reducing food insecurity in that the extent of it will positively enhance the household head's income-earning potential. This outcome correlates with the theoretical evidence that higher education levels help the farmers

understand the potential benefits of agricultural modernization and labour quality improvement (Asogwa et al. 2012).

Table 5.5: Determinants of the household food security status of households

Food Security	**Odds Ratio**	**Std. Err.**	**P>z**	**VIF**
Gender	-17.125	20.178	**0.016****	1.31
Age	1.178	0.069	**0.005*****	1.91
Education	0.346	0.184	**0.046****	1.09
Marital Status	3.203	2.521	0.139	1.15
Remittances	2.753	2.465	0.258	1.32
Farm income	14.706	39.474	0.317	1.61
Off-farm income	1.000	0.000	0.298	2.06
Social grant	0.999	0.000	**0.057***	1.2
Farmer group	0.269	0.264	0.182	1.19
Credit access	0.006	0.015	**0.028****	3.59
Market participation	0.149	0.169	**0.094***	1.16
Farm size	0.999	0.000	**0.058***	1.41
Total Livestock Unit	1.111	0.058	**0.042****	1.58
Food expenditure	1.007	0.002	**0.001*****	1.72
Own transport	0.286	0.279	0.199	1.18
_cons	0.001	0.001	**0.001*****	

Log likelihood = -27.743794 Prob > chi^2= 0.001 Pseudo R^2 = 0.5445 LR $chi^2(15)$ = 66.32

Note: *, **, ***, means the coefficient is statistically significant at 10%, 5% and 1% levels

Social grant: The logistic model demonstrated that social grant was significant in explaining household food security. Social grant was positive and statistically significant at 10%. The result showed that an increase in social grants contribute to the probability of being food secure. In this study, the increase in social grants could be caused by having a larger household size and the older person receiving an old-age pension. The larger the household size, the more people get a social grant in the form of child support and disability grant. This implies that grants can be used for buying food. This study's results are consistent with the

expected initial results, consistent with Maziya et al. (2017), which stated that social grants minimize food insecurity in smallholder households by increasing access to food through purchases. Social grants are a central component of the government's efforts to alleviate poverty and addressing hunger.

Market participation: Market participation had a positive and statistically significant coefficient ($p<0.1$). This shows that farmers who participated in the market were more likely to be food secure. These findings are consistent with other studies Seng (2016) and Manda et al. (2020), which showed that market participation improves household food security. There are two significant ways by which market participation can influence household food security. One is through a rise in agricultural production followed by more marketable surpluses and incomes (Stifel and Minten 2017).

Credit access had a positive and statistically significant ($p<0.05$) impact on household food security. This means that household who had access to credit were more likely to be food secure. Access to credit is households' ability to obtain credit in cash for either consumption or to support agricultural production (Kuwornu et al. 2018). Credit obtained for consumption purposes increases the consumption basket of households (Babatunde et al. 2007). On the other hand, when obtained on time, production credit increases the chances of farming households acquiring production resources (input, fertilizers, pesticides, and machinery), boosting productivity, and improving household food security.

Farm size: The logistic model results indicated that the households with larger farm sizes were most likely to be food secure. The size of the farm was significant at 10%. A possible explanation is that households with a larger farm size had a better chance of producing more, diversifying the crop they harvest, and providing larger crop residues. This outcome is consistent with the research results conducted by Aidoo et al. (2013) in Ghana.

Total Livestock Unit: The total number of livestock units owned had a positive and statistically significant ($p<0.05$) relationship with household food security. This implies that the possibility of a household being food secure increases as the total livestock units owned by a household increase. The unit increase in total livestock holdings will increase food security by 1.111. The increase in livestock ownership presents a higher level of household wealth and income that enables local people to be food secure, either through income earned

through the selling of livestock or, to a lesser degree, through direct consumption. The study was consistent with other studies Maziya et al. (2017).

Food expenditure: The total amount of money spent on food monthly had a positive and statistically significant ($p<0.01$) impact on household food security status. The study's results imply that households that spent more money on food were most likely to be food secure. This study is aligned with Jacobs (2009) and Ngongi and Urassa (2014), who reported that food secure households spend more on food.

Contrary to earlier expectations, the farmers' group had no significant impact on household food security. This could be caused by because of heterogeneous membership, leadership, passive membership, lack of trust and equality of dividend irrespective of the participation level. Therefore, this study rejects the hypothesis that collective action has significant contribution in ensuring food security.

5.5 Conclusion and recommendations

5.5.1 Conclusion

This paper examined the impact of market participation and collective action on rural farm households' food security in Msinga Local Municipality. HDDs was used as a proxy to measure household food security status; HDDs average was used to indicate household food security status. If a household HDD score was below the average, the value of 1 was assigned to them and considered food secure, 0 for households who had HDD score below the average and considered food insecure. The binary logistic model was used to analyze data. The study found that market participation can enhance household food security. Market participation increased the likelihood of being food secure by the odd ratio of 0.149.

While farming remains important for rural households, especially for female heads, opportunities for income diversification are crucial. Livestock-rearing is such an example as this study shows that livestock ownership can potentially contribute to household food security.

5.5.2 Policy recommendations

This paper's findings have crucial implications for the government and other development agencies for improving household food security status in rural Msinga Local Municipality. Access to the market should be achieved in tandem with improved access to education.

Furthermore, there should be increased awareness of the importance of education through the socialization of compulsory education, scholarship information, etc. through local community meetings.

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CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Overview of the study

Smallholder farmers lack access to the formal market because they live in remote rural areas, resulting in higher transaction costs. Other factors that hinder smallholder farmers' market participation are inadequate infrastructures (roads, communication), lack of access to market information or institutions. A long-distance to the market is common in the subsector, leading to high transaction cost, coordination failure, and pervasive market imperfections. Collective actions address smallholder farmers' market failures. Collective action is significant for smallholder farmers in developing countries to sustainably access markets and increases their marketing performance. Improving smallholder farmers' market performance can contribute tremendously toward poverty reduction reducing food insecurity incidence among vulnerable groups in rural areas. There is low participation in collective action by smallholder farmers.

The study's overall objective was to examine the effects of collective action on market participation and food security among smallholder irrigation farmers in the Msinga Local Municipality. Firstly, the study sought to investigate the determinants and intensity of participation in collective action. Secondly, the study investigated the determinants and intensity of smallholder farmers' market participation. Lastly, the study investigated the impact of market participation and collective action on household food security.

The study used a questionnaire survey of 243 households for data collection, 156 households from the Tugela Ferry Irrigation Scheme and 87 households from the Mooi River Irrigation Scheme generated using a random sample technique. Data analysis involved both descriptive and econometric techniques. Descriptive statistics made use of t-tests and χ^2 tests, while econometric analysis made use of the binary logistic model, double hurdle model, PCA, and the ordered probit model.

Based on the empirical results, this chapter discusses the study's main conclusions. Several policy proposals are made in the chapter. Finally, it presents the remaining knowledge gaps and areas of future research.

6.2 Conclusion

Chapter 3 investigated determinants and intensity of participation in collective action. Farmers' group membership was used as a proxy to measure collective action, and the intensity of participation was measured using the number of activities the farmer is involved in. The factors influencing the decision to participate in the farmers' group were analysed using binary logistic, and the intensity of participation was modelled using ordered probit. The empirical chapter found that older and female farmers were more likely to take farmers' group membership. Educated farmers participated in the farmers' group because they know the benefits of joining the farmer groups. Farmers with larger household sizes were more likely to take farmer group membership because they can divide activities such as attending meetings, market days, and agricultural products' transporting amongst family members.

Farmers with larger farm sizes may be more inclined to participate in collective marketing because of the larger perceived gains from improved access to markets, related inputs, and extension services. Off-farm income was expected to have a negative impact on membership because farmers with high off-farm income are less likely to participate in group membership because they are occupied with off-farm work, and farming is not their primary source of income. However, in this study, off-farm income positively impacted farmers' group participation meaning that farmers who participate in off-farm activities are more likely to join farmer groups. Farmers who had access to institutional support such as extension services were more likely to join farmer groups. Such motivation positively influences farmers to join groups by giving them knowledge about the benefits of collective action. Smallholder farmers' intensity of participation in collective action is influenced by age, household size, farming land owned, off-farm income, and perception about economic capital benefits.

The study also concludes that there is a low level of farmers' group participation mainly because of the lack of trust. Farmers do not have adequate information about the farmers' group, and they do not have a joining fee. Some farmers were members of the group before, but their expectations were not met, then left.

Chapter 4 looked at determinants and intensity of market participation. The double hurdle model was used for modelling factors affecting the decision to participate in the market and intensity of participation. Farmers with group membership were most likely to participate in

the market because groups are an essential information exchange platform; sharing transaction costs, such as transport costs, allows farmers to connect to buyers at a lower cost and reduce the fixed transaction costs. Total production output has a positive significant on the decision to participate in the market or not because households who have greater production have more surpluses they can sell. Farmers who have received agricultural training participated in the market because they are knowledgeable about the market.

Livestock income was expected to negatively influence the farmers' decision to participate in the market because farmers with a high degree of participation in the livestock market may be less efficient in enhancing their crop productivity. The size of land owned influenced farmers' participation in the market because it helps households generate a surplus for the market. Distance to market negatively affected market participation, meaning that farmers residing near the market will be more likely to sell their produce. Farmers' group, total production output, and transaction costs significantly impacted market participation intensity. Lastly, smallholder farmers do not have access to more profitable formal marketing channels but sell their produce to bakkie traders and their neighbours.

The empirical chapter investigating the impact of market participation on household food security found that households that participate in the market are less food secure than non-participating households. The results from this study confirm the potential roles in enhancing market participation that would improve household food security. Market participation is not the only factor influencing household food security status. Female farmers were more likely to be food secure than their counterparts because men migrate searching for jobs in urban areas. Those who reside in rural areas are unemployed as there are no job opportunities. Those in cities send money to their families back home, which is used to buy food. Older people were found to be food secure compared to young ones because they have gained more agricultural experience and become more averse to risk and diversifies their production.

Education plays a crucial role in reducing food insecurity as it positively enhances the household head's income-earning potential. Social grants minimize food insecurity in smallholder households by increasing access to purchased food. The households that have access to credit were more likely to be food secure. Access to credit is households' ability to obtain credit in cash for either consumption or to support agricultural production.

Households with a larger farm size were more likely to be food secure because they had a better chance of producing more, diversifying the crop they harvest, and providing larger crop residues. The increase in livestock ownership presents a higher level of household wealth and income that enables farmers to be food-secure, either through income from livestock sales or, to a lesser degree, through direct consumption. Households who spend more money on food are food secure because they can buy enough food.

6.3 Policy recommendation

Collective action organizations, such as farmer groups, play an essential role in influencing market participation. Therefore, appropriate policies are required to strengthen farmer groups' development and existence, which can act as a platform for information exchange, improved bargaining power and negotiation skills, and enhance trust between farmers and buyers.

Education plays an essential role in influencing farmers' decisions to participate in collective action. It is crucial that before and after the formation of groups, the government and NGOs educate farmers through workshops, training, and seminars about farmers' groups to ensure that they understand the impact of collective action on their livelihoods. Training should sensitize men and young people on collective action's key benefits since they are less likely to participate compared to female and older farmers.

It is recommended that the government and non-government organizations planning to intervene through farmers' groups to understand better farmers' perception of the collective action on economic benefits. Perception of economic capital affects the intensity of participation. Farmers have the expectation that needs to be met, such as access to credit, improved income, and government subsidies. If these expectations are not met, the farmers' group is unlikely to succeed.

In general, the integration of smallholder farmers in lucrative markets through collective action can transform the rural economy through increased incomes and, consequently, eradicate food insecurity. Policymakers need to develop a clear policy that supports farmer groups and promotes smallholder farmers' collective action considering both the smallholder farmers' social and economic heterogeneity.

6.4 Areas for future research

The study has provided baseline information on the impact of collective action on smallholder farmers' market access and household food security in the Msinga local municipality. It has been identified that collective action can help improve market access and hence household food security. This study did not consider the impact of group characteristics (such as group size, number of group meetings attended, the average age of group members) and a position hold by a farmer in a group on collective action. Future studies should consider looking at group characteristics.

APPENDICES

APPENDIX 1

Ethics Approval Letter

31 January 2020

Miss Thobani Cele (215042163)
School of Agri Earth & Env Sc
Pietermaritzburg Campus

Dear Miss Cele,

Protocol reference number: HSSREC/00001000/2020
Project title: Effects of Collective Action on Market Access and Food Security among Smallholder Farmers in Msinga Local Municipality Degree: Masters

Approval Notification — Expedited Application

This letter serves to notify you that your application received on 28 January 2020 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 until 31 January 2021.
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.

HSSREC is registered with the South African National Research Ethics Council (REC-040414-040).

Yours sincerely,

[redacted]

Dr Shamila Naidoo (Chair)

APPENDIX 2

Consent form

INFORMED CONSENT FORM

Dear Participant,

My name is Thobani Cele. I am currently doing Master of Agriculture in Food Security at the University of KwaZulu-Natal, Pietermaritzburg Campus, South Africa.

The title of my research is the **Effects of Collective Action on Market Participation and Food Security Among Smallholder Farmers in Msinga Local Municipality**. The aim(s) of the study is to analyze the level and determinants of smallholder farmers' in market participation, and to determine the determinants of participation and intensity of participation in collective action. Lastly to measure the impact of market participation on household food security. I am interested in interviewing you to share your experiences and observations on the subject matter.

Please note that:

- The information that you provide will be used for scholarly research only.
- Your participation is entirely voluntary. You have a choice to participate, not to participate or stop participating in the research. You will not be penalized for taking such an action.
- Your views in this interview will be presented anonymously. Neither your name nor identity will be disclosed in any form in the study.
- The interview will take about 30 to 45 minutes.
- The record as well as other items associated with the interview will be held in a password-protected file accessible only to myself and my supervisors. After a period of 5 years, in line with the rules of the university, it will be disposed by shredding and burning.
- If you agree to participate please sign the declaration attached to this statement (a separate sheet will be provided for signatures)

I can be contacted at: School of Agricultural, Earth and Environmental Sciences, University

of KwaZulu-Natal, Pietermaritzburg Campus, Scottsville,

Email: **Thobanivpa@gmail.com** Cell: [redacted]

My supervisor is Prof Maxwell Mudhara who is located at the School of Agricultural, Earth and Environmental Sciences in the African Centre of Food Security Department. Pietermaritzburg campus of the University of KwaZulu- Natal.

Contact details: Email: **Mudhara@ukzn.ac.za** Tel: **033 260 5673/5518**

You may also contact the Research office at: -

Prem Mohun - SAO: HSSREC

Email: **BREC@ukzn.ac.za** Tel: (031) 260 4557

Email: **HSSREC@ukzn.ac.za**

Thank you for your contribution to this research.

DECLARATION

I……*(full names of participant*) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire.

I understand the intention of the research. I hereby agree to participate.

I consent / do not consent to have this interview recorded (if applicable)

SIGNATURE OF PARTICIPANT DATE

……

APPENDIX 3

Questionnaire

Questionnaire on the effects of collective action on market access and food security among smallholder farmers in Msinga Local Municipality

Date: ----------Name of Enumerator: ----------
District: ----------Ward: ----------Village: ----------

Contact no.: ----------

A: Household Characteristics

1. Name of the household head----------

2. Marital Status---------- 0= Unmarried 1= Married

3. Are you the household head? If not, what is your relationship to the head?

Position	Frequency	Tick Appropriate
Household head	1	
Spouse of head	2	
Brother	3	
Sister	4	
Son	5	
Daughter	6	
Other(specify) …….	7	

4. Status of the farmer in household head:

Status	Frequency	Tick Appropriate
Female head (single/widowed)	1	
Female head (husband away)	2	
Male head	3	
Child headed household	4	

5. What is the age of the farmer (in years)? ……

6. What is the highest educational level attained by the farmer?

1= No Education 2=primary education 3= secondary education 4= tertiary education 5= other (SPECIFY)…….

7. The total number of permanent household members (members stayed on the farm continuously for the last four or more months……

B. ASSETS

8. Which of the following crops do you grow?

Crop	**For sale**	**For consumption**	**Other (specify)**
Potatoes			
Tomatoes			
Beans			
Cabbage			
Garlic			
Maize			
Spinach			
Onion			
Other (Specify)			

9. What livestock do you own?

Livestock type	**Unit**	**Sold (Rands)**
Cattle		
Goats		
Sheep		
Pigs		
Chickens		

Other (specify)	
Total	

10**.** How many plots of agricultural land do you own in the irrigation scheme? ----------

INCOME SOURCES AND EXPENDITURE INFORMATION

11. Please indicate the amount spent per month on:

i. Food items R……. ii.

12. What were the sources of your household income in the last 12 months? (Indicate approximately how much each source contributed and how often)

Source of household income		**Amount per given time (R)**	**How often? (e.g. monthly)**	**Number of times in the past 12 months**	**Total amount**
Remittances					
Agricultural activities	Irrigation farming				
	Dryland farming				
	Livestock production				
	Hiring out farming Equipment				
Arts and craft					
Permanent employment					
Temporary/casual employment					
Hawking/petty trading					
Welfare grants	Disability				
	Child grant				

	Old-age pension				
Other (specify)					

13. Do you own a vehicle?

14. Do you have access to credit? 1= Yes, 0=No

C. Collective Action

15. Are you a member of any of the following groups?

Group	**Membership (Yes=1; No=0)**	**Function**
Cooperative		
Farmer group		
Producer association		
Other (specify)		

16. If No, why are you not a member of any group(s)? ----------

17. What are the group's activities? ----------

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18. Farmers belief in collective action

Beliefs	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
Farmers must stick together to get things done even if they must give up some of their individual freedom					
A group of farmers can usually make better marketing decisions than an individual farmer					

Members receive benefits from doing business as a cooperative or collective					
It is only through agricultural farming group that farmers can assume an appropriate role in the marketplace					
Membership has improved your market access					
The sharing of tasks in farmers' groups is fair					
You will remain the member of a farmers' group for a long period of time in future					

PERCEPTIONS

19. What benefits do you obtain from being involved in your Farmers' group(s)?

Benefits	**Strongly disagree**	**disagree**	**neutral**	**agree**	**Strongly agree**
FINANCIAL CAPITAL					
Farmers' group improves agricultural wages labour income					
Farmers' group improves household income					
Farmers' group improves access to banks					
Farmers' group improves government subsidies					
Farmers' group improves credit access					
PHYSICAL CAPITAL					
Farmers' groups improve access to transport to the market					
Farmers' groups improve roads to the market					

Farmers' groups improve agricultural water infrastructure					
Farmers' groups improve access to markets					
HUMAN CAPITAL					
Farmers' groups improve extension services					
Farmers' groups improve water management					
Farmers' group improves marketing skills					
NATURAL CAPITAL					
Farmers' group improves land access - more plots					
Farmers' group improves land access – security of land tenure					
Farmers' group improves water availability					
SOCIAL CAPITAL					
Farmers' group improves relationship with relatives or neighbours					
Farmers' group improves network with financial institutions					
Farmers' group improves network with transporters					
Farmers' group improves network with other production group (NGOs)					

MARKET PARTICIPATION

20. Do you normally sell your agricultural produce? 0=N0 1= YES

If YES, which produces do you sell?

Agricultural produce	**Tick**
Potatoes	
Tomatoes	
Beans	
Cabbage	
Garlic	
Maize	
Spinach	
Onions	
Other (specify)	

21. How much did you sell, each year, for the past 3 years (kg)?

Agricultural produce	**2019/2020**
Potatoes	
Tomatoes	
Beans	
Cabbage	
Garlic	
Maize	
Spinach	
Onions	
Other (specify)	

22. Do you transport produce to the market as a farmers' group or individually?

23. Do you ever experience agricultural produce loss? 0= NO 1=YES

23(a) If yes, what causes agricultural produce loss?

1= drought 2= rotten 3=eaten by birds/insects 4= damaged when transporting them to the market

23(b) If yes, how would you rate the amount of produce lost?

0= Significant amount 1= insignificant amount

24. Do you have access to market information (*eg, market prices, when to grow, where to sell)*? 0= No 1= Yes

25. Do you have access to extension services? 0= NO 1=YES

26. How far is the market? (km)

27. How much do you pay for transport? 1= Yes, 0=No

28. Have you received any agricultural training? 1= Yes, 0=No

What types of foods that you or anyone else in your household ate in the last 24 hours?

Question number	**Examples**	**YES=1** **NO=0**
1	Any bread, rice noodles, biscuits, or any other foods made from millet, sorghum, maize, rice, wheat?	
2	Any potatoes, yams, manioc, cassava or any other foods made from roots or tubers?	
3	Any vegetables? (Pumpkin, carrot, squash, or sweet potato that are orange)	
4	Any fruits?	
5	Any beef, pork, lamb, goat, rabbit wild game, chicken, duck, or other birds, liver, kidney, heart, or other organ meats?	
6	Any eggs?	
7	Any fresh or dried fish or shellfish?	
8	Any foods made from beans, peas, lentils, or nuts?	
9	Any cheese, yogurt, milk or other milk products?	
10	Any foods made with oil, fat, or butter?	

11	Any sugar or honey?	
12	Any other foods, such as condiments, coffee, tea?	