

**INFLUENCE OF SENSE OF COMMUNITY ON QUALITY SEED POTATO  
ADOPTION AMONG SMALLHOLDER FARMERS IN MOLO SUB COUNTY,  
NAKURU COUNTY, KENYA**

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**A Thesis Submitted to the Graduate School in Partial Fulfilment of the Requirements for  
the Master of Science Degree in Community Studies and Extension of Egerton University**

**Egerton University**

**OCTOBER, 2024**

## DECLARATION AND RECOMMENDATION

### Declaration

I declare that this thesis is my original work and has not been presented in this University or any other for the award of a degree.

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### Recommendation

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## **DEDICATION**

I dedicate this thesis to my parents; Paul Wambua and Beatrice Syombua and my three siblings who believed in my abilities and encouraged me to pursue my academic dream.

## **ACKNOWLEDGEMENTS**

I am extremely grateful as I stand at the culmination of my master's program, to the MasterCard Foundation, the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM). I extend my sincere gratitude to Transforming African Agricultural Universities to meaningfully contribute to Africa's growth and Development (TAGDev) Program for their unwavering commitment to funding my entire master's program at Egerton University and for sponsoring this research. This thesis reflects not only my personal commitment but also the invaluable help, guidance and support of individuals and institutions that have played a significant role in shaping my academic research.

I am very grateful to the faculty members and staff at the Department of Applied Community Development Studies, Egerton University. Their guidance and expertise have been instrumental in my academic development and research endeavors. Their guidance has been invaluable in honing my skills and deepening my understanding of community development. Special thanks to the smallholder farmers in Molo Sub County who actualized my research by providing needed information for this study. I am indebted to my thesis supervisors, Prof. Dolphine Odero-Wanga and Dr. Milcah Mulu-Mutuku for their patience, insights and unceasing support. Their constructive comments and scholarly guidance have been invaluable in improving my research abilities.

Finally, I would like to thank my family and friends for their unwavering encouragement and understanding throughout my course work and research. Their belief in me has always been a source of inspiration, and I am truly grateful for their presence in my life.

## ABSTRACT

Globally, potato production has been declining over the past 50 years. The use of poor quality seed potato has contributed to the decline, especially among smallholder farmers in developing countries. In Kenya, despite government efforts to improve quality seed potato availability and access, adoption remains a challenge. This study therefore sought to explore the influence of Sense of Community (SOC) on quality seed potato adoption among smallholder farmers in Molo Sub County. This is because SOC has been found to influence community development in different contexts. The objectives included, to characterize SOC, to explore the influence of SOC components on quality seed potato adoption, to examine the influence of SOC variation by gender on quality seed potato adoption and to examine the influence of SOC variation by age on quality seed potato adoption among smallholder farmers in Molo Sub County. Theory of SOC and Theory of Planned Behavior (TPB) guided this research. Correlational research design was used in this study. Data was collected from a population of 6,000 smallholder potato farmers in the four wards of Molo Sub County. A total of 152 respondents were sampled using a multilevel sampling procedure. Semi-structured questionnaire was used to collect data from individual respondents and a Focus Group Discussion (FGD) guide was used to collect qualitative data from 12 knowledgeable farmers. A pilot study was conducted in Njoro Sub County to pretest the questionnaire, and it was found to be reliable with a Cronbach's Alpha reliability coefficient of  $\alpha = .803$ . Descriptive statistics, factor analysis, Kruskal-Wallis H test, and logistic regression analysis were used in data analysis using Statistical Package for Social Sciences (SPSS) software. Data from FGD was analyzed thematically and incorporated in the discussions. Factor analysis extracted four SOC components namely; shared emotional connection, integration and fulfillment of needs, membership and influence. Kruskal-Wallis H test revealed that SOC varied significantly by age, ( $p = .009$ ). Logistic regression determined that SOC components had influence on quality seed potato adoption, especially the membership component ( $p = 0.012$ ). Gender differences in SOC with regards to quality seed potato adoption was more significant among male ( $p = .022$ ) than female farmers. SOC variation by age had no influence on quality seed potato adoption. Therefore, extension workers promoting quality seed potato adoption should prioritize strengthening group identity and fostering a sense of belonging among farmers considering group-specific needs and challenges.

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## LIST OF ACRONYMS AND ABBREVIATIONS

<b>ADC</b>	Agricultural Development Corporation
<b>FAO</b>	Food and Agriculture Organization
<b>FAOSTAT</b>	Food and Agriculture Organization Statistics
<b>FGD</b>	Focus Group Discussion
<b>KALRO</b>	Kenya Agricultural and Livestock Research Organization
<b>KEPHIS</b>	Kenya Plant Health Inspectorate Service
<b>KIPPRA</b>	Kenya Institute for Public Policy Research and Analysis
<b>KMO</b>	Kaiser-Meyer-Olkin, Measure of Sampling Adequacy
<b>MoALF</b>	Ministry of Agriculture, Livestock, and Fisheries
<b>NACOSTI</b>	National Commission for Science, Technology, and Innovation
<b>SCI</b>	Sense of community Index
<b>SOC</b>	Sense of community
<b>TPB</b>	Theory of Planned Behavior
<b>TRA</b>	Theory of Reasoned Action
<b>WEIRD</b>	Western, educated, industrialized, rich and democratic

# CHAPTER ONE

## INTRODUCTION

### 1.1. Background to the Study

Potato (*Solanum tuberosum L.*), is one of the important food crops in the world that has a potential for ensuring food security. Due to its weight and the limited storability of its ware tubers, potato was once and continue to be a crop grown locally for local consumption in many developing nations (Haverkort & Struik, 2015). The potato is one of the global crops with most diverse distribution pattern (Haverkort et al., 2013) and is grown among smallholder families that are characterized by high levels of poverty, inequality, hunger, and malnutrition. Therefore, potato can be an effective crop for enabling smallholder families to attain food security.

Potato is the world's fourth largest food crop in terms of production after maize, rice, and wheat thus the largest non-cereal food crop cultivated in the world (Food and Agriculture Organization Statistics [FAOSTAT], 2020). It provides more calories per cultivated area than any other crop and can easily be used as a substitute for cereals for food consumption with one out of eight people in the world eating it often (Jansky et al., 2019). The comparatively short maturity period, nutritious characteristics, adaptability to various climate conditions, employment and income opportunities that characterize potato, make it a resilient crop that can secure vulnerable livelihoods under the effects of climate change and changing market environments (Devaux et al., 2020).

Despite its importance, over the past 50 years (1973-2023) potato production globally has declined by 72% (Wasilewska-Nascimento et al., 2023). Potato yield in Kenya has also significantly declined over the years. In 2018, it was recorded at 8.6 tons per hectare, a considerable drop from 21.2 tons per hectare in 2008. By 2022, the yield had stagnated at seven tons per hectare, which is far below the potential of 40 tons per hectare (Kenya Institute for Public Policy Research and Analysis [KIPPRA], 2022). In Molo, specifically, the average yield of potato between the years 2016 to 2020 was 9.8 tons per acre, against the country's potential of 40 tons per acre (National Potato Council of Kenya [NPCK], 2021). Studies show that the potato industry in Kenya is plagued by endemic pests and diseases that are seed-borne, such as nematodes, late blight, and bacterial

wilt (Thomas-Sharma et al., 2017). Although the low yields cannot be attributed solely to the use of poor-quality seeds, it remains a significant contributing factor.

The Kenyan Government has put in place efforts to produce, multiply and distribute modern, high-yielding seed potato through bilateral agreements with the French, Dutch, and British governments in collaboration with International Potato Center, German Corporation for International Cooperation, United States Agency for International Development and other private partners at affordable prices. However, the uptake of quality seeds among smallholder farmers remains low. Globally, over 50% of potato farmers do not renew their seed potato tubers, and those that do, they renew after seven to eight planting seasons (Gildemacher et al., 2009). Only 6% of the 800,000 smallholder potato farmers in Kenya use quality seed potato, with the majority relying on farmer-saved seeds (KIPPRA, 2022). In Kenya, smallholder farmers cultivate less than two hectares and agriculture is rain-fed, produce low volumes and depend on family labor (Ochola, 2017).

Research has documented socioeconomic factors that influence smallholder farmers' choice of seed potato. Use of poor-quality seed potato has been attributed to farmers' low level of education, inadequate resource endowment and limited access to credit, long distance from the source of quality seed potato and household food insecurity (Amwine et al., 2019). Interventions have also been developed based on these ideas. The potential for building blocks of community, such as SOC, has not been critically examined. Building blocks of a community lie in diverse individuals who come together, forming a network that fosters a sense of belonging and solidarity (Perkins et al., 2015). The research identifies key building blocks of a community to be a SOC; shared identity, purpose, objectives, interests and behavior. These aspects form the basis for the community existence and functioning.

Adoption takes place among community members, and SOC has proved to contribute positively on other community development sectors, such as health and education. For instance, Terry et al. (2018) in a study to investigate the influence of SOC on psychological and mental wellbeing showed that SOC contributed to decreased psychological distress and improved mental functioning among individuals with serious mental illness. In the context of large non-profit health organizations, Nowell and Boyd (2017) found a likewise consistent pattern, strong SOC contributed to employee health and wellbeing. Likewise, in a study by Faircloth and others, sense

of belonging contributed to motivation and success among students of Black-American and Latin descent (Faircloth et al., 2005).

McMillan and Chavis (1986) defined SOC as a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together. SOC is built on a foundation of feeling included as a member of a community, having a voice and influence within the community, experiencing a sense of integration and fulfillment of one's needs, and sharing an emotional bond with others. This therefore suggests that SOC reinforces individual's commitment to the wellbeing of the group.

SOC has been characterized in terms of four components: membership, influence, integration and fulfillment of needs and shared emotional connection (McMillan & Chavis, 1986). Membership is the feeling of belonging or being part of a group or community. Membership involves having a sense of identification with others, sharing common interests, and feeling accepted by the group. Influence refers to the ability to have a say in the decisions that affect the community. It involves feeling that one's opinions and actions can make a difference, and that one has some control over the group's direction. Integration and fulfillment of needs refers to the extent to which the community provides its members with the resources they need to meet their individual needs, such as emotional support, material resources, or opportunities for personal growth. Shared emotional connection component refers to the shared emotional experiences that bind members of the community together. It involves feeling a sense of trust, caring, and commitment to the group, and experiencing a sense of shared history, values, and traditions.

These components are interrelated and may also vary significantly between gender and age and may influence how individuals of different age groups and gender perceive SOC and how the choices they make are affected by it (Chavis et al., 2008).

The assessment of SOC has employed the four components, which have been determined to be significant for communities that are successful and have people who consistently contribute to personal and community development (Chavis et al., 2008). Using the four components, a series of statements have been derived to establish the SOC scale. Respondents are asked to score on a predetermined range of values, which enables a quantitative assessment of the strength of community ties and the identification of factors that contribute to SOC.

Sense of belonging and SOC differ significantly and may be perceived differently by different communities and ethnic groups (Faircloth & Hamm, 2005). Further, research on SOC has been conducted among Western, Educated, Industrialized, Rich and Democratic (WEIRD) nations (Henrich et al., 2010). Similarly, since the collapse of the only cash crop in Molo Sub County, pyrethrum, back in the 1990s, potato has been a leading crop produced by farmers in Molo Sub County (Ministry of Agriculture, Livestock, and Fisheries [MoALF], 2019). Also, after the 2007 post-election violence in Kenya, community dynamics in Molo Sub County have been disrupted. The violence caused displacement and migration, weakening established social networks and kinship ties. Fear and security concerns further isolate people, challenging efforts to promote unity and shared responsibility. In addition, Molo Sub County has had quality seed production facility, Agricultural Development Corporation (ADC). Yet, smallholder farmers in Molo Sub County still utilize poor quality seed potato. Therefore, there's need to characterize and contextualize SOC in Africa, especially among smallholder farmers in Kenya, where majority of the population still live in poverty (Moss, 2019), and explore community building blocks, such as SOC, in Molo Sub County and how they may influence quality seed potato adoption.

## **1.2. Statement of the Problem**

Farmers in Molo Sub County, like many other parts of Kenya, continue to rely on informal seed systems, using farm-saved seed and unregulated markets, which often lead to the propagation and spread of diseases and pests. This has resulted in reduced yields of potato in Molo Sub County, and in Kenya at large. The Government of Kenya in partnership with other development partners, have invested in efforts to improve quality seed potato availability and access in Molo Sub County through certified seeds production, multiplication and distribution under the Kenya Plant Health Inspectorate Service (KEPHIS). However, farmers in Molo Sub County are not utilizing the quality seed potato fully. This is despite Molo Sub County being a host of Molo ADC and Agrico East Africa Limited that are certified by KEPHIS to multiply and distribute quality seed potato. Interventions to increase access to, and adoption of quality seed potato have been designed and developed based on socioeconomic factors with limited focus on building blocks of a community, such as SOC. SOC has been found to contribute positively in different community development areas, such as education and health, although literature has information from WEIRD nations and limited evidence from developing African countries. Therefore, there is a need for comprehensive

research to go beyond the socioeconomic factor that influence quality seed potato adoption to explore in details the influence of specific building blocks of a community, such as SOC in the context of African smallholder farmers, which may influence how farming technologies are accepted and utilized by farmers.

### **1.3.Purpose of the Study**

The purpose of the study was to explore the influence of SOC on quality seed potato adoption among smallholder farmers. The study sought to provide an understanding on how SOC components are perceived and understood between different age groups and gender and how these aspects influence quality seed potato adoption among smallholder farmers in Molo Sub County, Nakuru County, Kenya.

### **1.4.Objectives of the Study**

The following were the objectives of this study;

- i. To characterize SOC components among smallholder farmers in Molo Sub County.
- ii. To explore the influence of SOC components on quality seed potato adoption among smallholder farmers in Molo Sub County.
- iii. To examine the influence of SOC variation by gender on quality seed potato adoption among smallholder farmers in Molo Sub County.
- iv. To examine the influence of SOC variation by age on quality seed potato adoption among smallholder farmers in Molo Sub County.

### **1.5. Research Question and Hypotheses of the Study**

This section highlights the research question and hypotheses of the study.

#### **1.5.1. Research Question**

- What are the characteristics of SOC components among smallholder farmers in Molo Sub County?

### **1.5.2. Research Hypotheses**

H0<sub>1</sub>. SOC components have no statistically significant influence on quality seed potato adoption among smallholder farmers in Molo Sub County.

H0<sub>2</sub>. SOC variation by gender has no statistically significant influence on quality seed potato adoption among smallholder farmers in Molo Sub County.

H0<sub>3</sub>. SOC variation by age has no statistically significant influence of on quality seed potato adoption among smallholder farmers in Molo Sub County.

### **1.6. Significance of the Study**

This study may be useful to policy makers and extension service providers in Kenya and in the region in developing strategies for improving quality seed potato adoption by enhancing client targeting efforts and in designing farmer-specific intervention. The study can also be of great value to researchers in the field of community development. This is because results from the study provide valuable insights into how SOC is perceived and understood in the African context, in this case, among smallholder farmers in Molo Sub County.

### **1.7. The Scope of the Study**

The study was conducted in Molo Sub County in Nakuru, Kenya. Molo is along the Mau Forest which runs on the Mau Escarpment. The study population was majorly smallholder potato farmers in Molo Sub County. These are farmers who operate on average of two hectares of land, whose agricultural farming is rain-fed, produce relatively low volume and also depend on family labor for the farming activities. Farmers that own land and those leasing were considered. The study also involved representatives from quality seed potato producers and distributors (Molo ADC and Agrico East Africa Limited) as well as extension service providers in Molo to provide information on adoption behaviors of smallholder farmers. The study focused on characterizing SOC and establishing how SOC and SOC variation by gender and age may influence quality seed potato adoption among smallholder farmers in Molo Sub County. Studying SOC variation was limited to variation by age and gender only.

### **1.8. Assumptions of the Study**

- i. The respondents were motivated to give information required by the researcher.
- ii. Smallholder farmers in Molo Sub County had sufficient awareness of quality seed potato benefits at the time of the study.

### **1.9. Limitations of the Study**

The research was conducted in Molo Sub County among smallholder potato farmers using a small sample of farmers. Therefore, the results from the study may not be generalizable to all smallholder farmers in Kenya or Africa. The research was also a survey conducted at a particular point in time, and therefore may not have captured details on lived experiences that may be valuable in informing SOC and quality seed potato adoption patterns.

### 1.10. Definition of Terms

**Accessibility** refers to the ease with which a product or service can be obtained and used (Hasan et al., 2017). In the context of this study, accessibility refers to the ability of smallholder farmers to obtain and use quality seed potato for planting.

**Adoption** describes a systematic approach to implementing technology so that all appropriate target population utilize it to its potential. It refers to a process by which farmers accept, learn and begin to use technologies or innovations in their agricultural practice (Dearing, 2013). In this context, it refers to the acceptance and use of quality seed potato in potato production. Definitions of adoption vary significantly across fields of study (Doss, 2006). In defining adoption, Doss notes that we may sometimes be interested in farmers' histories of technology use. Therefore, in this study, farmers who have been using quality seed potato for at least two seasons in the last three planting seasons and are willing to continue using quality seed potato are described as adopters.

**Availability** refers to the presence of a product (Kriksunov et al., 2011). In the context of this study, availability refers to the extent in which pest and disease-free; and high-yielding seed potato is produced and present to be acquired by farmers for planting.

**Characterization** refers to the process of describing and analyzing the essential qualities, attributes, or properties of a particular subject of study (Moya & Goenechea, 2022). Therefore, SOC characterization involves the process of describing and understanding the key features that contribute to the development of SOC among group or community members. In this context, SOC characterization entails establishing SOC components as understood and perceived individuals as well as establishing potential disparities of SOC across gender and age among smallholder farmers in Molo Sub County.

**Gender** is a complex social construct influenced by cultural, historical, and institutional factors, shaping individuals' self-perception, social interactions, and access to resources. It encompasses not only biological differences but also the ways in which individuals understand and perform their gender identity (Connell, 2005). Gender defines individual roles in the society and the ability to perform tasks. The society and community expects a person to behave in a particular way for different gender identities and may affect how people of different gender identities interact and form relationships. In this study, gender constitute the individual's internal preferred gender

identity measured through the male and female binary as well as through an open option to accommodate people with non-binary gender identities.

**Quality seed potato** refers to potato tuber that is free from pest and diseases and is capable of producing a healthy and productive potato plant (Food and Agriculture Organization [FAO], 2008). Quality seed potato can be certified by KEPHIS or produced locally under careful monitoring by trained officers from the ministry of agriculture (Atieno et al., 2023). In the context of this study, quality seed potato encompasses seed potato from the Molo ADC or other government certified distributors and farm-level grown seed potato with expert monitoring by a certified extension worker.

**Sense of community** refers to the feeling of belonging, attachment and connection that individuals experience as members of a group or a community. It is characterized by feelings of trust, mutual respect, feelings of mattering and shared emotional connection. SOC is a psychological construct that a member of community has a sense of responsibility and commitment to individual and community well-being (McMillan & Chavis, 1986). McMillan and Chavis notes that SOC is a dynamic psychological concept and may vary greatly based on gender and age of individuals. In this study, SOC entail the degree of connectedness that smallholder farmers in Molo Sub County feel, as determined by a value from the SOC scale.

**Sense of community components** refers to the different building blocks that contribute to the development and experience of a SOC. Each component represents a distinct aspect of community that, when combined, contribute to the overall sense of belonging, connection, and identification with a group or community. SOC components include; membership, influence, integration and fulfillment of needs and shared emotional connection (McMillan & Chavis, 1986). In this study, these four components are used to measure SOC using a scale adapted from the SOC Index (SCI) established by Chavis.

**Sense of community variation** describes the differences that can exist across people or groups in terms of how they perceive their sense of identity, attachment and belonging to a community (Kissinger et al., 2009). The degree to which people feel connected to one another and to the community at large is reflected in their subjective and emotional experience of their SOC (McMillan & Chavis, 1986). In this study, SOC variation encompasses the differences that exist in how different age groups and people with different gender identities experience SOC.

**Smallholder farmers** refers to farmers who own or operate on small plots of land, usually less than two hectares, and rely majorly on family labor to produce crops and livestock for subsistence or commercial purposes (FAOSTAT, 2020). Smallholder farmers rely on rain-fed agriculture and have limited access to farming resources, such as credit, extension services and technology which make their productivity and profitability low (Kamara et al., 2019). Despite the fact that smallholder farmer's productivity is low, it doesn't mean that their production potential cannot be achieved. In this study, smallholder farmers encompass farmers who farm on less than two hectares and rely majorly on family and friends to provide labor in the farm.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1. Introduction**

This chapter provides a review of existing literature in an attempt to provide an understanding of potato production and quality seed potato adoption. The chapter also describes SOC and the different components of SOC. The chapter includes information from paper publications and books found online with relevant information on SOC, potato production, seed potato systems and farmers' seed potato adoption behaviors. Theoretical framework that guides the study is also discussed. The conceptual framework is also included in this chapter.

#### **2.2. Potato Production Overview**

In Africa, five major crops contribute more than 45% of total crop production value, with maize being the single most important staple crop. Rice is an important staple in Eastern and Western Africa, and other important staples include potatoes in Eastern and Central Africa, cassava in Western and Eastern Africa and plantains Eastern and Central Africa (World Bank, 2020).

The potato is the largest non-cereal food crop grown in the world and ranks fourth in terms of production behind maize, rice, and wheat (FAOSTAT, 2020). Amidst increasing population pressure, with hungry people increasing every day, potato is a crop that has a potential for ensuring world's food security (Devaux et al., 2020). This is because it provides more calories per cultivated area than any other crop. One in eight persons worldwide consumes potatoes frequently, making them an easy alternative to cereals for food intake (Jansky et al., 2019). Also, due to the bulkiness and limited storability of the seed and the tubers, potatoes have been historically grown primarily for local consumption in many developing nations (Haverkort & Struik, 2015). Due to its widespread distribution and cultivation in regions with high rates of hunger, malnutrition, poverty, and inequality, potato is one of the world's most diverse crops (Haverkort et al., 2013). As such, potato can be a useful crop for helping smallholder families achieve food security and escape poverty. Potato has comparatively short maturity period, nutritious characteristics and can adapt to various climate conditions, and therefore has a potential for providing employment and income to farmers (Devaux et al., 2020).

### **2.3.Potato Production in Kenya**

Potato was first introduced in Kenya in the 19th Century by British East African Trading Company to be grown by white settlers (Harris, 1976). Today, it is second important food crop in Kenya after maize, and plays a major role in national food and nutrition security (Muthoni & Nyamongo, 2009). In Kenya, potato is mainly grown in slopes of Mt. Kenya, the Mau escarpment, the Nandi escarpment, Cherangany hills and the slopes of Mount Elgon. Potato is also cultivated in Kericho, Kisii and isolated patches in the Taita hills (Kirumba et al., 2004).

Smallholder farmers account for the majority of potato production in Kenya, with an estimated 800,000 households involved in potato farming (Rael et al., 2016). Smallholder farmers in Africa can be categorize depending on; the agro-ecological zones they operate in; their socio-economic status in terms of capital invested and size of land owned; or annual revenue generated from farming activities (Ochola, 2017). In Kenya, smallholders are those farmers who farm land smaller than two hectares (FAOSTAT, 2020). Smallholder farming is often rain-fed. The farmers depend predominantly on family labor and they produce relatively small food volumes on small plots of land. Shangi, Sherekea, Dutch Robijn, Kenya Karibu, Kenya Mpya, Asante, Desiree, Kenya Mavuno, Kenya Sifa and Tigoni are common seed potato varieties utilized in Nakuru (Rael et al., 2016).

In Kenya, potato yields have been declining at a rate of 11 % per year (FAOSTAT, 2020). This decline is attributed to adverse weather conditions, declining soil fertility, use of low yielding varieties and poor-quality seed potatoes (Kaguongo et al., 2012). Past studies draw a direct link between use of poor-quality seed potato and the low yields obtained by potato farmers in sub-Saharan Africa. These studies argue that the low yield results from the accumulation of seed-borne diseases, especially bacterial, fungal, and viral diseases, which have been associated with severe degeneration in seed quality globally (Thomas-Sharma et al., 2017). To address the problem of poor-quality seed potato usage, the Kenyan government, international bodies and other private partners have invested in technologies to improve seed potato quality through quality seed production, multiplication and distribution, yet the quality seed potato has not been adopted fully by farmers (Kaguongo et al., 2012).

## **2.4. Quality Seed Potato Adoption in Kenya**

From formal experts, that is, from the view of government organizations and seed potato regulating bodies, quality seed potato encompasses production and distribution regulations of the tuber, yielding potential of the batch, disease resistance and physiological crop growth and developmental characteristics (International Potato Center [CIP], 2020). Conventionally, however, quality seed potatoes can be defined on the basis of productivity, certified or locally produced under careful monitoring by experts (Atieno et al., 2023). Productivity refers to the ability of seed potatoes to produce a high yield of healthy and uniform tubers. Certified seed potatoes are produced under strict guidelines set by the government or seed certification agencies. Consequently, seed potato can be produced by farmers under supervision of trained personnel from the government and seed certifying bodies with an aim of ensuring farmers have access to high-yielding and disease-free seed potato within their budget (MoALF, 2019).

Adoption describes a systematic approach to implementing technology so that all appropriate target population utilize it to its potential (Kangogo et al., 2021). According to Bach et al. (2022), the technology adoption lifecycle is a sociological model that explains how new innovations are adopted or accepted by specific adopter groups. These groups include innovators, early adopters, early majority, late majority, and laggards. Quality seed potato adoption requires farmers to learn about and utilize seed potato that has high yielding potential and is free from pests and diseases. Different farmers use different seed potatoes that are considered formal and of high quality or informal, where farmers utilize poor quality seed potato in their farming.

In Kenya, potato growers often select the smaller potatoes from their own harvest to be used as seed in the next season (Taiy et al., 2017). Seeds from external sources are mostly exchanged within regional boundaries under various modalities like family, farmer to farmer, markets, or biodiversity and seed fairs. Approximately 90% of Kenya's potato production is dependent on landrace seed varieties, which farmers get from the previous harvests, neighbors, or from the open-air markets (Taiy et al., 2017). This has been attributed to a number of factors that are evident in various studies in Kenya. Some include person's level of education, resource access and ownership such as access to finance and credit, distance from the source of quality seed potato and household food insecurity (Amwine et al., 2019). In this case, higher level of education attained, endowment

to more resources, short distance to the source of the quality seed potato positively correlates with quality seed potato adoption.

## **2.5. Common Seed Potato Systems in Kenya**

Broadly defining a seed system, it consists of interrelated set of components including breeding, management, replacement and distribution of seed (Thiele, 1999). Kenya seed potato industry consists of three systems: Formal, semi-formal and informal (Kaguongo et al., 2013). According to Kaguongo et al. (2013) formal seed system, or the certified seed system is characterized by official rules and guidelines from the Kenyan government. The basic seed is passed on to seed multipliers for bulking and distribution. The certified seed bulking farmers, farmer groups and private companies operate under one parastatal, the Agricultural Development Corporation (ADC).

Growers in the semi-formal system produce two different types of products: clean seed and positively selected seed. Clean seed comprises seed multiplied at the farm level which originates from certified seed. Production practices follow recommendations from farmer training conducted by Kenya Agricultural and Livestock Research Organization (KALRO), Ministry of Agriculture, Deutsche German Agency for Internal Cooperation and Training of Trainers. Most guidelines used in production of certified seed are also used in clean seed production. Positively selected seed are seed potatoes produced from farmer seed through a process of selecting the best-looking plants during vegetative growth by farmers trained on seed selection and management. Although the process of production lacks the stringent procedure and inspection by Ministry of Agriculture, it offers an opportunity for farmers to control diseases and improve their yields (Devaux et al., 2020).

Farmer seed system, or the informal seed system comprises of seed potatoes obtained from own and neighbor farms and is mainly of very poor quality. In this system, no guidelines are followed and no systematic seed selection is done. This type of seed suffers from pest and disease (especially bacterial wilt and viral diseases) accumulation leading to low yields. It also contributes greatly to the spreading of diseases and low potato yield (Sadik et al., 2018). In this study, the formal and semi-formal seed systems are considered high quality seed potato.

In Kenya, only 2% of the 800,000 smallholder potato farmers in Kenya use certified seeds. About 95% use farmer-saved seeds, and 4% use clean seeds. This is despite bilateral agreements between

the Government of Kenya and the French, Dutch, and British governments to avail modern, high-yielding seed potato varieties in Kenya (KIPPRA, 2022). Most of research work on factors that influence quality seed potato adoption has documented socioeconomic factors that influence smallholder farmer's choice of seed potato, and have majorly concentrated on the conventional experts' opinions on these socioeconomic elements (Thomas-Sharma et al., 2015). However, quality seed potato adoption among smallholder farmers remains low as stated earlier. This study therefore attempts to explore beyond the socioeconomic aspects of farmers that influence adoption, to target the building blocks of community that create the environment where adoption takes place, in this case, SOC.

## **2.6. The Concept of Sense of Community**

SOC cannot be understood clearly without first understanding the concept of community. The term community has been in use in the English language since the 14th century. It comes from Latin term, *communitas*, from the base word *communis*, and has the meaning of common or shared by many (Soanes & Stevenson, 2004). This may encompass human existence as well as other environmental aspects that surround human life. Specifically, referring to human communities, the term community may refer to a group or society of people, living under the same laws and regulations, having common rights and privileges, or common interests or common identity (Soanes & Stevenson, 2004). Having a common interest or goal is a key element in any group of people and it structures the interactions within the group, or with others outside the group. Different authors have given the term community different meanings. Hillery (1955) discovered no less than 94 distinct definitions. To date, this number has increased in line with the continually changing nature of society and the numerous new forms of community, such as online communities, which have emerged. Despite the term's variability in use, the importance of the general meaning of sharing and unity prevails. Politicians use the language of community to capture votes, urban planners promote the development of SOC as a cure to many social challenges, including crime. Extension agents use groups of people to promote their agendas in extension work and to encourage people to adopt new technologies in rural and urban settings (Colombo et al., 2001).

Communities can be understood in various ways, with key distinctions being geographical or territorial communities, which refer to neighborhoods, and relational communities, which focus on the quality and nature of human relationships (Bryer et al., 2019).

The different definitions referring to community have come about due to the changing nature of the structure of the family and society in general (Tumiel-Berhalter & Kahn, 2023). Therefore, it is not uncommon to encounter the phrase that community is dynamic. As society becomes more differentiated in regards to individual roles, the collective consciousness decline. This means that the focus shifts to individualism and as opposed collectivism, in the process of development.

The word community, henceforth includes humans and their environment, and the feelings of inclusion and belonging to a particular community gives birth to a psychological notion of SOC. SOC was first defined by Sarason (1974), where he noted the basic characteristics of SOC as the perception of similarity with others, an acknowledged interdependence with others, a willingness to maintain this interdependence by giving to or doing for others what one expects from them, the feeling that one is part of a larger dependable and stable structure. This concept of SOC was further refined by McMillan and Chavis (1986), and described SOC as a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together.

Nowell and Boyd (2014, 2017) highlighted that the traditional concept of SOC as defined by McMillan and Chavis (1986) has been drawn primarily from needs-based theories that characterize community as a potential resource for meeting key psychological and physiological needs of the individual. Nowell and Boyd (2014, 2017) expanded this understanding of SOC by arguing that SOC may be related not solely to an expectation of physiological and psychological benefit for the individual but also to a sense of responsibility for the well-being of the community.

## **2.7. Sense of Community Components**

McMillan and Chavis (1986) describe SOC in terms of four components; membership, influence, integration and fulfilment of needs, and shared emotional connection. The SOC components provided a framework, the SOC Index, which has been modified and refined to measure SOC in different contexts.

### **2.7.1. Membership**

Membership refers to the extent to which individuals feel a sense of belonging and connection to a particular community. According to McMillan and Chavis (1986), membership involves both an individual's perception of their own membership in the community, as well as their understanding of the boundaries and characteristics of the community itself. McMillan and Chavis (1986) further suggests that when individuals feel a strong sense of belonging to a community, they are more likely to share information and resources with their peers. This is an important aspect of membership which can facilitate the adoption of new technologies. This is particularly important for smallholder farmers, who often rely on their social networks for information and support. Also, when an individual has a strong SOC, he/she has greater emotional connection to the community. Smallholder farmers who feel connected to others in their community may be more likely to adopt new technologies, as they may be more likely to share information about the benefits of the technology and to collaborate with others in its implementation.

### **2.7.2. Influence**

Influence is also an important aspect of SOC, which refers to the degree to which individuals within a community are able to affect the decisions and actions of the group as a whole (McMillan & Chavis, 1986). Influence can take many different forms within a community. For example, individuals may feel that they have influence over the decisions made by community leaders, or they may feel that they have influence over the attitudes and behaviors of their peers.

The relationship between the degree to which individuals feel that they have a say in the decision-making processes of the community and adoption of technologies among smallholder farmers can be significant. Individuals who feel that they have a voice in the decision-making processes of their communities, they are more likely to adopt new technologies. This is because they feel more empowered and invested in the decision-making process, which leads to greater ownership and commitment to the technology (Greenhalgh et al., 2017).

Conversely, when farmers feel excluded from decision-making processes, they may be less likely to adopt new technologies (Greenhalgh et al., 2017). This is because they may feel that the technology is being imposed on them, rather than being something they have chosen to use. One reason why farmers may be less likely to adopt new technologies when they feel excluded from

decision-making processes is that they may feel that their knowledge and expertise are not being valued. Farmers are often intimately familiar with the local conditions and have a deep understanding of the challenges and opportunities in their particular context. When they are not included in decision-making processes, they may feel that their insights are not being taken into account, which can erode their motivation to try new things.

### **2.7.3. Integration and Fulfillment of Needs**

Integration refers to the degree to which individuals feel connected to their community. It includes a sense of shared values, norms, and beliefs that create a common culture (McMillan & Chavis, 1986). When individuals feel integrated into their community, they are more likely to participate in community events, contribute to community projects, and support community initiatives. This, in turn, creates a sense of shared purpose and meaning, and strengthens the SOC.

Fulfillment of needs refers to the degree to which individuals feel that their needs are met within the community. Needs can be physical, emotional, social, or psychological (McMillan & Chavis, 1986). When individuals feel that their needs are met within the community, they are more likely to feel satisfied and fulfilled. This, in turn, promotes their well-being and increases their sense of attachment to the community.

Integration and fulfillment of needs are interrelated, as the extent to which individuals feel integrated into their community can affect their sense of fulfillment of needs. For instance, if individuals do not feel connected to their community, they may be less likely to seek out resources and support within the community, which can affect their ability to have their needs met (Yahan & Nicholas, 2019). Conversely, if individuals feel connected to their community, they are more likely to seek out resources and support within the community, which can enhance their sense of fulfillment of needs (Cramm & Nieboer, 2015).

### **2.7.4. Shared Emotional Connection**

Shared emotional connection is an important aspect of a SOC. McMillan and Chavis (1986) defined shared emotional connection as the feelings of attachment, belonging, and shared identity that people experience when they are part of a group or community. Emotional connections within a community can provide a sense of trust and security, which may be important factors in the decision to adopt new technologies (Paolo et al., 2022). Individuals who have strong shared

emotional connection within their community may be more likely to trust the recommendations of others and to be open to new ideas and practices. This means that the degree to which individuals feel they belong to a particular community may provide smallholder farmers with confidence which can encourage them to take risks and experiment with new technologies. This is especially relevant in contexts where the adoption of new technologies may involve significant changes to traditional farming practices.

## **2.8.Sense of Community and Community Development**

SOC has been traditionally conceived of and measured by most researchers as an individual-level as well as group or community level construct, and has been termed as an important aspect of community development (Fisher & Sonn, 1999; Perkins et al., 2015; Sarason, 1974). From these studies, the researchers have developed and tested different measurement scales of SOC adapting them to different fields of study.

The concept of SOC has been explored in the fields of medicine, psychology, business, education and community participation and has proved to have immense contribution to positive outcomes in those fields (Terry et al., 2018). This concept is in line with McMillan and Chavis (1986) ideology that a key characteristic of successful communities, successful meaning active, engaged communities where members contribute on a regular basis, is SOC.

Terry et al. (2018) show that SOC contributed positively to the living experiences of people with mental health challenges and accounted for decreased psychological distress and improved mental functioning among individuals with serious mental illness. A study by Albanesi et al. (2007) to investigate the relationship between SOC, civic engagement and social well-being in a sample of Italian adolescents suggests that SOC predicts social well-being and explains some of the association between civic engagement and social well-being. To investigate the relationship between SOC and level of participation in tourism activities in Iran, Aref et al. (2010) found that SOC can have a catalytic effect on development of tourism industry through enhancement of local participation. Gabriele (2022) examined association between SOC and support for local farmers' market, and the study found out that SOC was associated with willingness to pay more than a small extra price for local food. Yahan and Nicholas (2019) assessed the intersection between green events and SOC at Liverpool's Lark Lane Farmers Market and found that sense of belonging has impacts on the local community willingness to engage in green events aimed at environmental

sustainability. Bess et al. (2002) suggests that SOC is essential in enhancing education outcomes of people in the community. SOC has also been reciprocally linked with participation in various contexts such as local organizations and politics (Colombo et al., 2001).

Although SOC has been extensively studied and measured, most of this research has been conducted in WEIRD nations. Measurement scales like the SCI have also been developed and applied primarily to uncover insights about SOC within these WEIRD countries (Hughey & Speer, 2002.) These standardized scales are developed from the SOC theory, which uses the four components of SOC. There is limited research work on SOC in the context of African communities, more so among the smallholder farmers, and the four components may be understood or perceived differently compared to the WEIRD communities. Among smallholder farmers, SOC could influence adoption of technologies and innovations since adoption requires group learning and practice through community participation for effective diffusion of the innovations in the community. However, there is limited research work that has examined the influence specific components of SOC or SOC in general on farmer behavior, such as adoption of farming technologies. Therefore, there is need for extensive research on SOC in the African context, especially among smallholder farmers and how it may influence adoption of farming technologies, such as quality seed potato adoption.

## **2.9. Sense of Community Variation by Gender and Age**

Chavis et al. (2008) also show that SOC may vary across different age groups and gender. Age and gender are prioritized because they are widely recognized as influential factors in shaping individuals' experiences and social interactions. They have consistently been shown to have significant impacts on various aspects of individuals' lives, including their social roles, responsibilities, and expectations within communities (Tomioka et al., 2017). Various factors such as life experiences, societal expectations, and personal circumstances contribute to these variations. Kissinger et al. (2009) and Ross et al. (2019) show that the variation of SOC by gender and age respectively contribute to different life experiences among groups and individuals in the community.

### **2.9.1. Sense of Community Variation by Gender**

Research by Kissinger et al. (2009) show that men and women demonstrate variances in their connections to community and sense of belonging. Lardier et al. (2020) note that women may experience SOC differently than men, and they are also more likely to feel empowered as a result of a network of interconnected interactions; therefore, women tend to have a higher sense of belonging and stronger connections to their communities. Although this statement may have been true according to Lardier et al. (2020), it may not be universally true for all women or all communities. Research shows that social and psychological behaviors can vary greatly based on individual personalities, cultural backgrounds, and societal contexts (Ali, 2019). These gender disparities can significantly impact individual's SOC and consequently, influence the level of participation in community development. Traditional gender norms can perpetuate unequal power dynamics, limiting opportunities for women and non-binary individuals to fully engage in community activities and decision-making processes. Therefore, there is a need to explore SOC variation by gender and influence of the variation on quality seed potato adoption among smallholder farmers.

### **2.9.2. Sense of Community Variation by Age**

Notably, a study by Ross et al. (2019) show that older adults have a stronger SOC. However, Maulana et al. (2021) suggests that a person's SOC develops during their formative years (childhood and adolescence) and stabilizes around the time they reach middle age through socialization, identity formation and the establishment of social networks. This development is influenced by community involvement and engagement during early life. By the time individuals reach middle age, their SOC stabilizes as they settle into social roles, establish deeper connections with community members, and experience life events that reinforce their community bonds. While this trajectory may be common, individual experiences and personality traits can lead to diverse and dynamic community engagement throughout a person's life. Therefore, there is need to explore SOC variation by age and possible influence of this variation on quality seed potato adoption.

## **2.10. Theoretical Framework**

This section describes two theories that guide this study. The theories constitute the theory of SOC that guides the study of SOC and theory planned behavior (TPB) that guide the study of influence of SOC on quality seed potato adoption among smallholder farmers in Molo Sub County.

### **2.10.1. Theory of Sense of Community**

Sarason (1974) was the first to describe the theory of SOC. This idea was developed to explain how people feel when they believe they are a part of a larger community that is interdependent on them. McMillan and Chavis (1986) further refined theory of SOC. McMillan and Chavis suggested that SOC, which was define as a feeling that members have of belonging; members feel that they matter to one another and the group, can be known by assessing membership, influence, integration and fulfillment of needs and shared emotional connection, which are the main components of SOC as discussed earlier. Membership refers the feelings of belonging to a community. Influence refers to the degree that one feels has a voice and impact to the broader community. Integration and fulfillment of needs refer to a sense of belonging to a network that shares values, exchanges resources, and satisfies needs. Shared emotional connections refers to feelings of attachment and shared identity.

This theoretical framework has been used in this study to assess SOC. Unfortunately, the theory does not give a basis for measuring how SOC influence community members' behavior, which is a key component of farmer technologies adoption. Adoption involves change of attitudes and behavior. To complement the theory of SOC, TPB will be used to guide the process of exploring influence of SOC on adoption of farming technologies, and in this context, quality seed potato adoption among smallholder farmers in Molo Sub County.

### **2.10.2. Theory of Planned Behavior**

TPB is a well-established theoretical framework that has been widely used in the study of human behavior, including the adoption of new technologies (Pourmand et al., 2020). Ajzen initially proposed TPB (Ajzen, 2005). This was an extension of the theory of reasoned action (TRA) (Heilbroner et al., 1980).

TPB is a social cognitive theory that posits that human behavior is influenced by three main factors: attitudes towards the behavior, subjective norms, and perceived behavioral control. SOC, which

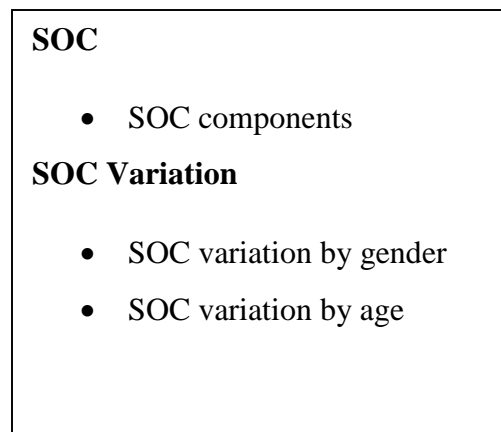
refers to an individual's feelings of belonging and connection to a particular community or group, can influence each of these three factors. For example, a strong SOC may lead to more positive attitudes towards the adoption of new farming technologies, as individuals feel a sense of collective responsibility to improve agricultural practices within their community. Additionally, a strong SOC may also lead to the formation of more positive subjective norms, as individuals may feel that their peers also value the adoption of new technologies. Also, a strong SOC may increase perceived behavioral control, as individuals may feel more empowered to adopt new technologies with the support of their community.

According to TPB, an individual's attitudes towards a behavior, the subjective norms that they perceive from their social environment, and their perceived ability to carry out the behavior all interact to shape how they adopt a particular behavior, and subsequently, the individual's actual behavior. Therefore, influence of SOC on quality seed potato adoption can be explored by applying TPB.

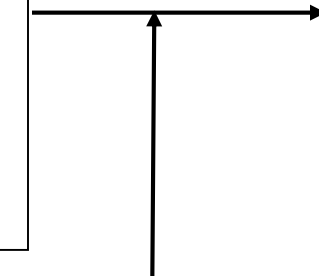
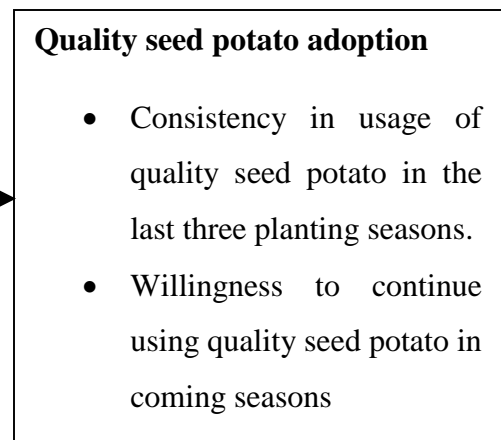
### **2.11. Conceptual Framework**

The conceptual framework shows the independent, dependent and moderating variables in this study and their hypothesized interaction. On one hand, SOC and SOC variation constitute the independent variables in this study. SOC was assessed through SOC components. SOC variation was assessed through variation by age and gender. On the other hand, quality seed potato adoption was the dependent variable. Indicators of quality seed potato adoption were explored through the consistency of using quality seed potato in the last three planting seasons and willingness to continue using quality seed potato. The moderating variables were education level, land ownership and level of income. Moderating variables were incorporated in the study as a control to show whether SOC actually had influence on quality seed potato adoption as hypothesized. Figure 1 provides the conceptual framework.

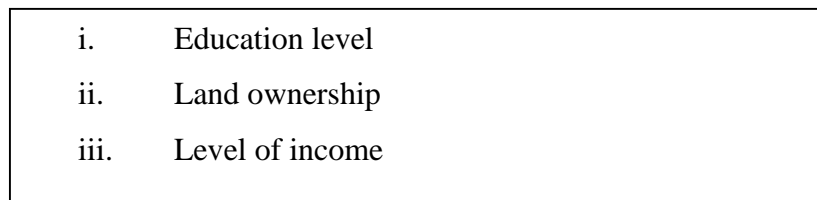
**Independent Variable**



**Dependent Variable**



**Moderating Variables**



**Figure 1:** Conceptual Framework; Influence of SOC on Quality Seed Potato Adoption

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1. Introduction**

This chapter describes the procedure that was followed during the research process. Research design, study area, study population, sample size and sampling procedure sections are discussed. Data collection instruments, data collection procedure and data analysis processes are also described.

#### **3.2. Research Design**

The research adopted a correlational research design. This research design enables the researcher to investigate relationships between an independent and a dependent variable without manipulation of the study variables (Curtis et al., 2016). Correlational design is also predictive and gives insights into possible relationships between variables. Mixed-methods research approach was used to collect both qualitative and quantitative data. Mixed-methods research draws from the strengths of qualitative and quantitative data collection methods. It allows for a holistic information gathering, where information on attitudes, beliefs and behaviors can be gathered as well as facts with figures (Regnault et al., 2018). Specifically, a cross-sectional survey was conducted to collect information from the sample population at a particular point in time without manipulation of the study cases. This method involves collecting data from a sample of participants to gain insights into their attitudes, beliefs, behaviors, or experiences (Curtis et al., 2016). A cross-sectional survey allows for collection of qualitative and quantitative data that can be analyzed using descriptive and inferential statistics to describe the population as well as establish relationships (Brenner, 2020).

Further, a FGD was conducted with a smaller group of farmers. FGD is a qualitative data collection approach where a specific group of individuals engage in a detailed discussion about a particular topic or issue (Nyumba et al., 2018). The authors suggest that FGD aims at gathering insights into participants' attitudes, perceptions, knowledge, experiences and practices. FGD are valuable for gathering knowledge within communities, which would be challenging to acquire through individual interviews alone (Barbour, 2014).

### **3.3. Study Area**

The study was conducted in Molo Sub County, Nakuru. Molo Sub County is located in Nakuru County, Kenya and sits in an area of approximately 483.2 KM<sup>2</sup> with a population of 156,732 as per the 2019 census. It has four wards namely; Turi, Molo, Elburgon and Mariashoni. The study area is located in the Mau Escarpment and it is characterized by deep fertile soils. It has a warm summer climate with low average temperature of 18.6°C, and typically receives about 117.68 millimeters of precipitation per year. Molo Sub County has 219.77 rainy days which is 60.21% of the time, annually. These parameters make potato growing in Molo Sub County a vibrant agricultural activity. Potato farming is one of the main economic activities Molo Sub County, with farmers growing both for subsistence and commercial purposes since the collapse of pyrethrum farming in the '90s. However, the use of poor-quality seed potato has been a major challenge in Molo Sub County leading to low yields and poor-quality potatoes despite being a host of Molo ADC, which enhances access to quality seed potato to farmers.

### **3.4. The Study Population**

A study population is a complete set of individuals, cases or objects with common observable characteristics. In this research, the study population was mainly smallholder potato farmers in Molo Sub County. Although there is no precise documentation of total smallholder potato farmers in Molo Sub County, the research targeted 6,000 smallholder potato farmers. Chepkoech et al. (2022) notes that there are about 6,000 smallholder farmers that operate on less than five acres of land and depend on family and friends to provide labor in the production of potatoes. This population therefore fits the description of smallholder potato farmers, and therefore, the target population was also used as the accessible population from which the sample of study was drawn. The results are also generalized to the 6,000 smallholder potato farmers.

### **3.5. Sampling Procedure and Sample Size**

To ensure selection of a representative sample from all the wards of Molo Sub County, the research adopted a multistage sampling method. Molo Sub County was selected purposely because it is a potato producer region in Kenya. Proportionate stratified sampling was used, where the four wards were used to distribute the sample proportionately as shown in Table 1.

**Table 1:** Distribution of Smallholder Potato Farmers in Molo Sub County

Ward	Number of potato farmers	Proportion (%)	Sample size
Elburgon	1,000	16.67	25
Mariashoni	2,500	41.67	63
Molo	500	8.33	13
Turi	2,000	33.33	51
Total	6,000	100	152

The sample size was calculated based on potato farmers' distribution in Molo Sub County. Afterwards, convenience sampling was used to get the individual respondents within the wards. Specifically, accidental convenience sampling was used to recruit respondents in the study, where those who were available at their homesteads and farms during the period of data collection and willing to participate were included in the survey. However, caution was taken so as not to sample respondents from just one village in the wards by mapping out the distribution of farmers in the entire ward before sampling begun.

The appropriate sample size for the survey was established using the Nassiuma (2000) sample size formula, which is given by;

$$n = \frac{NC^2}{C^2 + (N-1)e^2}$$

Where;

n is the required sample size

N is the population size, which is 6,000

C is the Coefficient of variation

e is the Standard error value.

The formula asserts that for most survey researches the coefficient of variation is  $\leq 30$  and the standard error margin value is  $\leq 5\%$ . Therefore, a coefficient variation of 25% and 2% margin error was used. The 25% variation coefficient and 2% margin error falls within the stipulated limits and were used so as to ensure low variability in the sample and minimize the degree of error.

$$n = \frac{6,000(0.25)^2}{(0.25)^2 + (6000 - 1) 0.022}$$

$$n = \frac{6,000 (0.0625)}{0.0625 + (5999) 0.0004}$$

$$n = \frac{375}{2.4621} = 152.3$$

Therefore, the sample size for the survey was 152 respondents.

For the FGD, purposive sampling method was used to select 12 farmers. This involved selecting smallholder potato farmers who were knowledgeable and experienced in potato production and who could provide in-depth insights into quality seed potato adoption in Molo Sub County. The total number of participants for this study was 164 smallholder farmers. The FGD participants were drawn from the four wards. Referrals from smallholder farmers were used to access these individual farmers. The FGD participants were convened at a venue in Elburgon for the discussions.

### **3.6. Data Collection Instruments**

Printed, semi-structured questionnaires containing close-ended and open-ended questions were used to collect quantitative data and qualitative data that was supplemented by data from FGD. The questionnaires were self-administered and only researcher-administered to respondents who could not read or write. The questionnaires are preferred where a large number of respondents is

expected (Krosnick, 2017). Questionnaires are easy to administer and also easy to analyze the data that it yields, as information is systematically collected. A semi-structured questionnaire helps in focusing the research towards attaining the intended objectives, but at the same time allowing room for the respondent to freely give their ideas and opinions from their own perspective.

The questionnaire contained sections for collecting information on general demographics, socioeconomic characteristic, quality seed potato adoption behaviors of the farmers as well as a section to assess SOC among the smallholder farmers. To assess SOC, the questionnaire contained a scale adapted from SOC Index 2 (SCI-2) developed by Chavis based on the theory of SOC by McMillan and Chavis (1986). The SCI-2 is available online with permission granted to use or restructure the tool to suit populations of interest. The tool has been tested and proved to be reliable with a coefficient alpha score of 0.94 among the Western populations (America). It has 24 scoring items on a scale of 1-4. For this study, these items were restructured to suit the context of smallholder farmers in Molo Sub County and it contained 20 scoring items on a scale of 1-5.

A FGD guide was used during FGD. This ensured that discussions stayed focused on issues of interest. The guide had sections to collect information on general demographics of the farmers, SOC perceptions and perceived influence of SOC on quality seed potato adoption among smallholder farmers in Molo Sub County.

### **3.7. Validity**

Validity is the extent to which a research instrument measures what it is intended to measure. Prior to conducting the survey, the research instruments were developed guided by the objectives of the study. The instruments were then presented to the Department of Applied Community Development Studies for experts' review to ensure that the instruments collected data in accordance to the research objectives.

### **3.8. Reliability**

Reliability is referred to as the degree to which an instrument yields consistent responses over time. The researcher, before embarking on data collection, did a pilot study to test the reliability of the questionnaire at the 0.7 cut-off coefficient score (Cronbach's alpha) for social sciences. The pilot study was carried out at Njoro Sub County, Nakuru County. Njoro Sub County was selected for the pilot study to avoid selecting farmers who might be involved in the actual study sample. In

Njoro Sub County, potato is one of the major crops produced in the area by smallholder farmers, and quality seed potato adoption is a challenge (Amwine et al., 2019). Njoro Sub County is a cosmopolitan sub county, and it mirrors well the population in Molo Sub County, which also has different ethnic groups coexisting. For a pilot study in social sciences, it has been suggested that a sample of between 30-36 cases is ideal (Lewis et al., 2021). Also, the Cronbach's alpha, which was used to estimate the reliability of the questionnaire, requires at least a sample of 30 cases. Therefore, in this study, a sample of 32 respondents was obtained from two wards in Njoro Sub County, that is, Njoro and Mauche, using a convenience sampling procedure. These two wards were selected because of their vibrant potato growing activity. Accidental sampling was used to obtain respondents who were available in their homesteads at the time of visit and willing to participate in the pilot study. The Cronbach's alpha was used to estimate the reliability of the questionnaire given by the formula;

$$\alpha = K.c / [v + (K - 1) c] \text{ Where;}$$

K is the number of items in the test tool

c is mean inter-item covariance among the items

v is overall mean variance

After the pilot study, the questionnaire produced a Cronbach Alpha reliability coefficient of  $\alpha = .771$ , at the cut-off point of .70 for social statistics with 46 items of the questionnaire. To increase the reliability of the questionnaire, 12 items that proved to lower the reliability of the questionnaire were deleted, and the reliability of the questionnaire increased, and produced a Cronbach Alpha reliability coefficient of  $\alpha = .803$  at the cut-off point of .70 for social statistics with 34 items.

During the pilot study, the FGD guide was also pretested to make sure that the questions generated useful and relevant information for this study. Seven knowledgeable farmers were purposively sampled from Njoro Sub County through referrals to have them participate in the FGD. The questions in the FGD guide yielded relevant information on SOC and quality seed potato adoption.

### **3.9. Data Collection Procedure**

Before beginning data collection, the researcher sought clearance by the Egerton University Ethical Committee through the Graduate School. Also, the researcher acquired an introduction letter from the Board of Post-Graduate Studies of Egerton University to facilitate application of research license from the National Commission for Science, Technology, and Innovation (NACOSTI). The permit and the approval letter were presented to the Nakuru County Education Office for authorization. Afterwards, a reconnaissance study was conducted in Molo Sub County to map out the smallholder potato farmers. With the aid of community leaders, farmers were notified about the research. Appointments with respondents were also made at this point. During the actual data collection process, the researcher conducted home/farm visits to meet smallholder farmers for the survey and FGD. Informed consent from all the participants was sought prior to data collection. Questionnaires were then availed to the respondents to provide the information required. With the help of translators, the questionnaire items were translated to local languages for proper understanding by the respondents who were not able to comprehend the English language. FGD was facilitated by the researcher in a round table discussion with the farmers. The researcher took short notes during the FGD. The discussion was also recorded (audio record) with permission from the participants.

### **3.10. Data Analysis Procedure**

Collected data went through a number of closely related operations which are data cleaning, establishment of categories and coding. The data was then analyzed using descriptive and inferential statistics. With the aid of SPSS, descriptive statistics was used to provide insights on the population of study in form of percentages, charts and tables. Factor analysis was used to establish the components of SOC that are there among smallholder farmers in Molo Sub County. Kruskal-Wallis H test was used to explore SOC variations between different age groups and gender. The Kruskal-Wallis H test is the alternative for one-way ANOVA, and is suitable with ranked or ordinal data sets where the parametric assumptions of normality and equal variance may have been violated (Johnson, 2022). Logistic regression was used to determine the influence of SOC components and SOC variation by age and gender in Molo Sub County on quality seed potato adoption. Data from FGD was analyzed thematically to identify common themes and patterns. This information was incorporated in the discussion of the results.

**Table 2:** Summary of Data Analysis Procedure

<b>Objective</b>	<b>Independent variable</b>	<b>Dependent variable</b>	<b>Statistical procedure</b>
To characterize SOC components among smallholder farmers in Molo Sub County	-	-	Descriptive statistics Factor analysis Kruskal-Wallis H test
To explore the influence of SOC components on quality seed potato adoption among smallholder farmers in Molo Sub County	SOC components	Quality seed potato adoption	Logistic regression Descriptive statistics Thematic analysis
To examine the influence of SOC variation by gender on a quality seed potato adoption among smallholder farmers in Molo Sub County	SOC variation by gender	Quality seed potato adoption	Logistic regression Descriptive statistics Thematic analysis
To examine the influence of SOC variation by age on quality seed potato adoption among smallholder farmers in Molo Sub County	SOC variation by age	Quality seed potato adoption	Logistic regression Descriptive statistics Thematic analysis

### **3.11. Ethical Considerations**

The researcher did a self-introduction to the participants and informed them the purpose of the study. Informed consent was sought prior to engaging the respondents in the research. The respondents were informed that participation in the study was voluntary. Anonymity was ensured by not including respondents' names or any personal identification information in the questionnaire. The participants were assured that confidentiality for the data collected will be upheld and the data will be used for academic purposes and informing policies in potato production sector. The respondents were given the chance to withdraw from the research if they felt uncomfortable and that there were no consequences for withdrawing from the research. Also, during the research, all cultural and religious matters as well as individual preferences were handled with utmost respect.

## **CHAPTER FOUR**

### **RESULTS AND DISCUSSIONS**

#### **4.1 Introduction**

This chapter provides the findings of the study conducted in Molo Sub County among smallholder farmers. The study was conducted to establish the influence of sense of community (SOC) on quality seed potato adoption. The specific objectives of the study were; to characterize SOC components among smallholder farmers in Molo Sub County, to explore the influence of SOC components on quality seed potato adoption among smallholder farmers in Molo Sub County, to examine the influence of SOC variation by gender on quality seed potato adoption among smallholder farmers in Molo Sub County and to examine the influence of SOC variation by age on quality seed potato adoption among smallholder farmers in Molo Sub County.

The study was conducted in Molo Sub County. Data was collected from the four administrative wards of Molo Sub County namely; Turi, Molo, Elburgon and Mariashoni. Stratified proportionate sampling was used to acquire individual respondents in Molo Sub County. Mixed methods approach- using focus group discussion (FGD) and a survey- was used to gather both qualitative and quantitative data from a population of 6,000 smallholder potato farmers. In the survey, 152 respondents were involved. Data was collected from the respondents using a semi-structured, self-administered questionnaire. The FGD was conducted with 12 participants who were purposively sampled from the four wards of Molo Sub County. Purposive sampling was to ensure that selected participants had the knowledge and expertise in potato value chain and could provide relevant information on SOC and quality seed potato adoption.

Data collected with questionnaires were cleaned and coded to facilitate further analysis. SPSS software was used to aid in analysis. Descriptive statistics was used to summarize data. Factor analysis, Kruskal Wallis test as well as logistic regression analysis were used to establish relationships among relevant variables according to the objectives of the study. Information from the FGD was analyzed thematically and was incorporated in the discussions. Results are presented in text, tables and charts.

## 4.2. Profile of the Respondents

During the study, data on the demographic characteristics of the respondents was collected. This data is important for profiling the respondents to which the results are based on. The demographics included data on ward of residence, age range, gender, highest level of education attended, average size of land farmed on, source of labor on the farm, average household income, potato farming experience as well as membership to community groups/ organizations.

### 4.2.1 Ward of Residence of the Respondent

A survey was conducted in the four wards of Molo Sub County; Molo, Turi, Mariashoni and Elburgon. The smallholder farmers were sampled from the individual wards using a proportionate sampling procedure dependent on the total number of smallholder farmers in the ward. Table 3 gives a summary of the distribution of the respondents in the four wards.

**Table 3:** Distribution of Respondents in their Wards of Residence

Ward	Frequency	Percentage
Molo	13	8.6
Turi	51	33.6
Mariashoni	60	39.5
Elburgon	28	18.4
Total	152	100.0

From the results, the respondents were well-distributed in the four wards according to the target in the population of study description. Mariashoni had the highest number of respondents than any other ward constituting of 39.5% (n=60) of the total respondents. 33.6% (n=51) and 18.4% (n=28) of the smallholder farmers were from Turi and Elburgon respectively. Molo ward had the least number of respondents as compared to other wards in Molo Sub County constituting of 8.6% of the total respondents. Molo is, by large, a commercial center and a town with less agricultural practices as compared to the rest of the wards of Molo Sub County, and therefore the difference in respondents' distribution (Chepkoech, 2022).

#### 4.2.2. Age and Gender Distribution of the Respondents

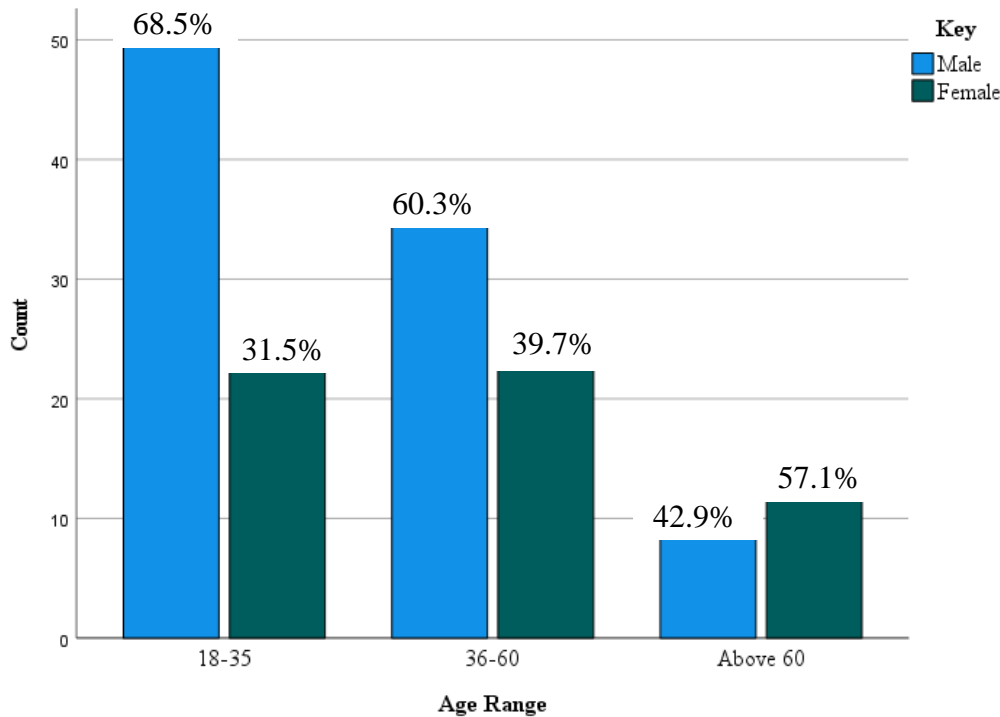
The study sought to determine age and gender distribution of the respondent in Molo Sub County. The age of the respondents was classified in three groups; 18-35 years, to represent the youth, 36-60 to represent the middle-aged farmers and above 60 years to represent farmers with advanced age. The gender categories were male and female. Table 4 presents a crosstabulation summarizing the age distribution of the smallholder farmers by gender.

**Table 4:** Age Distribution of Respondents

Age groups	Male	Female	Total	% of the total
18-35	50	23	73	48.0%
36-60	35	23	58	38.2%
Above 60	9	12	21	13.8%
Total	94	58	152	100%

Generally, the survey results shows that a majority of the smallholder farmers were aged between 18-60 years represented by a cumulative percentage of 86.2% (n= 131). Findings from this study are contrary to the view of small-scale agriculture in literature, where smallholder farmers are commonly categorized as predominantly composed of elderly individuals aged over 60 years (Kalele et al., 2021). However, Osinowo and Tolorunju (2019) noted in their research that people working in agricultural production were in their prime years of life. This is consistent with the results of this survey, where almost half (48%) of the respondents were youth farmers. This can be explained by the fact that youth entrepreneurship in agriculture has grown out of the need to find an alternative sustainable solution to poverty and unemployment among rural youth in Kenya (Ouko et al., 2022).

Comparing the figures, there were notable gender disparities among the different age groups as shown in figure 2.

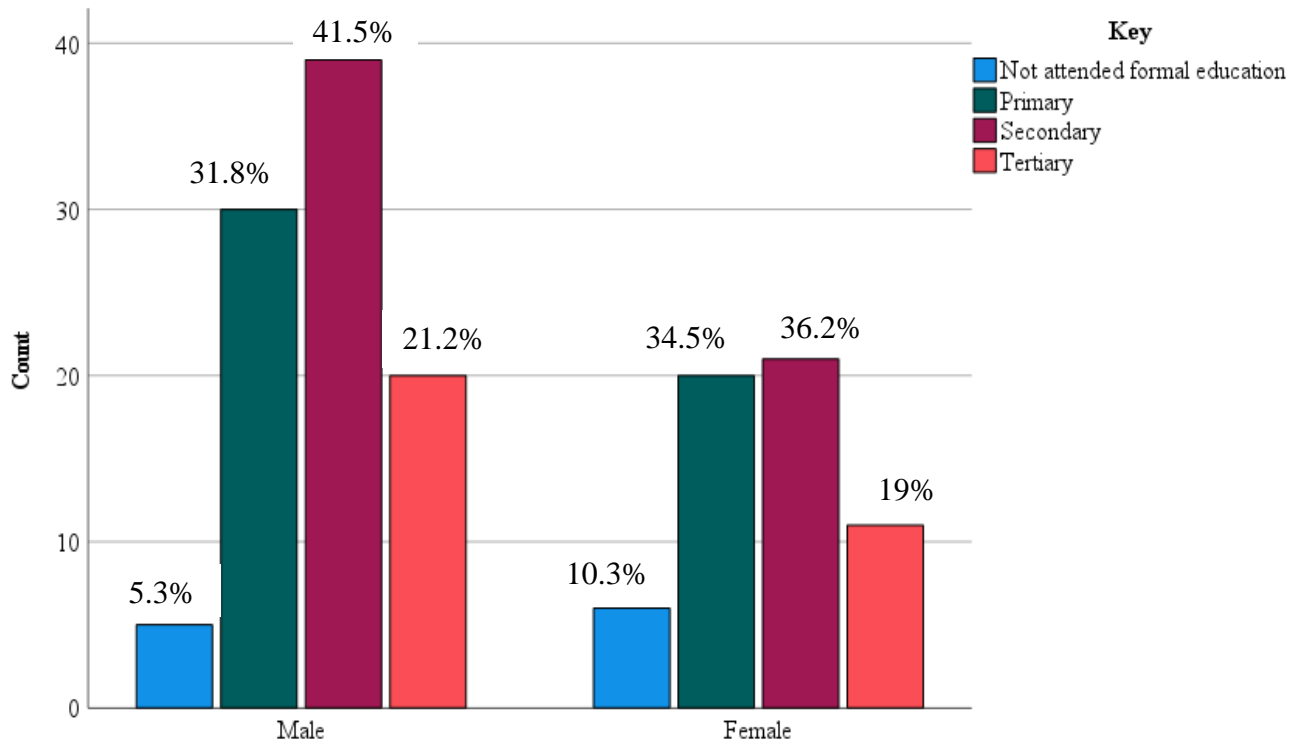


**Figure 2:** Gender Disparities among Age Groups

Among the youth farmers, the majority (68.5%) were male while the rest (31.5%) were female. Similarly, among the middle-aged farmers, majority (60.3%) were male while the rest (39.7%) were female. These results indicate that there were more men (61.8%) than women (38.2%) in the survey despite there being more women (57.1%) than men (42.9%) among the elderly farmers. This trend can be explained by the prevailing male dominance in the field of cash crop farming, where females frequently assume supporting roles (Ventura-Dias, 2022). It has been noted that among smallholder farmers in most rural areas, women predominantly focus on crops that are considered food crops whereas men are more involved in production of crops considered cash crops (Hill & Vigneri, 2014). In the case of this study, potato income was termed as the main source of livelihood in the household. A farmer noted in the FGD that most of the smallholder farmers depend on potato farming entirely for income. This therefore, may explain why there were more male farmers than female. This therefore imply that male farmers may tend to adopt quality seed potato to increase on production and profits.

### 4.2.3. Education Level Attained by the Respondents

The study sought to investigate the highest education level attained by respondents in the Molo Sub County. The level of education was categorized in four levels; those that did not attend formal education, those who attended primary education, secondary and tertiary as shown in figure 3.



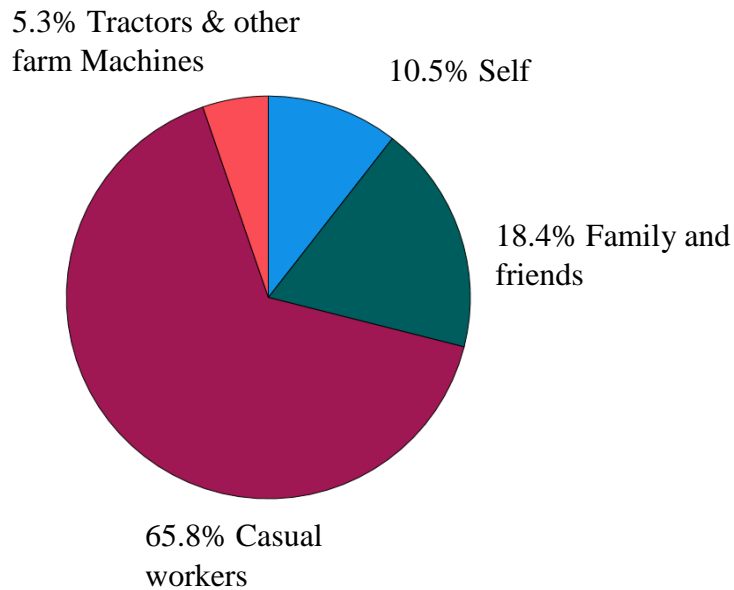
**Figure 3:** Education Level Attained by the Respondents

From the results, a noteworthy variability is evident across educational levels and genders. Among male participants, the majority (41.5%) had attained secondary-level education, followed by those with primary education (31.8%). Among the female participants, majority (36.2%) had attained secondary education followed by those that had attained primary education (34.5%). Notably, among the male respondents 5.3% had not attained formal education. Likewise, among the female participants, 10.3% had not attained formal education. Additionally, 20.4% of the total respondents (n=31) had pursued tertiary-level education, with the percentage among the male participants being higher (21.2%) than among the female participants (19%). Education level is termed as a

significant predictor of adoption (Taiy et al., 2017), and therefore these variations may lead to differences in quality seed potato adoption among the smallholder farmers in Molo Sub County.

#### 4.2.4. Main Source of Farm Labour among the Respondents

Respondents were asked on their main sources of labour on the farm. Four major categories were established, and the descriptive statistics are presented in figure 4.



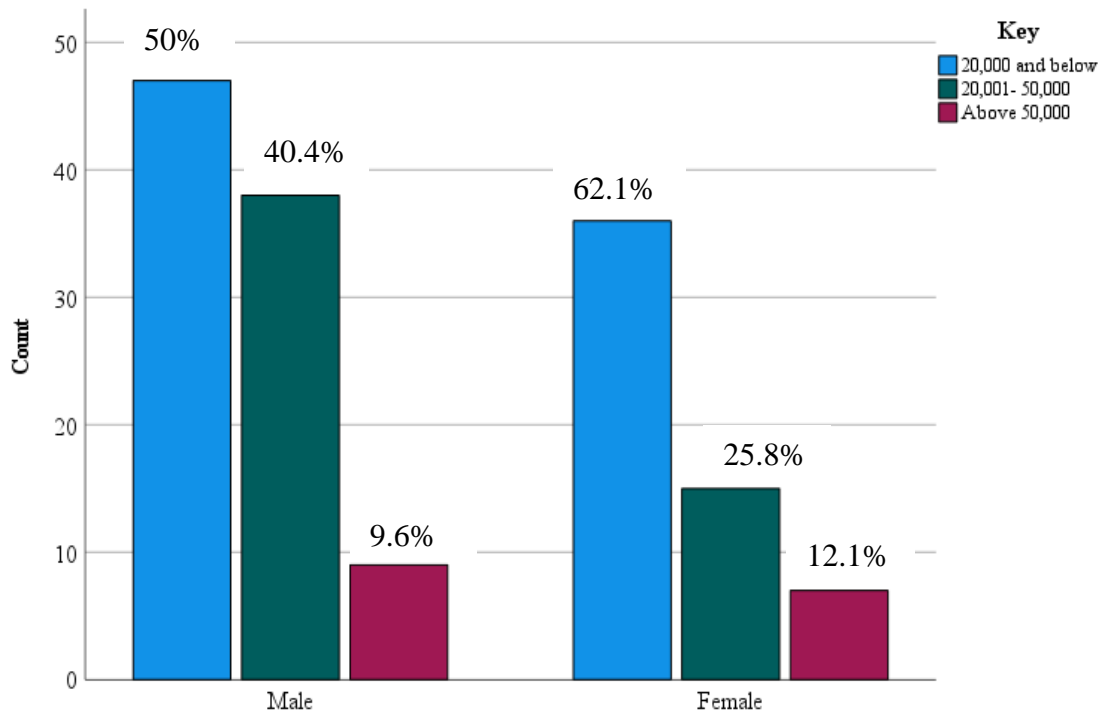
**Figure 4:** Main Source of Labour on the Farms of the Respondents

A majority of the respondents (65.8%) hired casual workers for labour on the farm. Only 5.3% of the total participants used tractors and other farm machines to work on the farms. 18.4% acquired labour from family and friends and 10.5% of the respondents worked on their farms themselves. These results are in contrary with FAOSTAT (2020), that indicate smallholder farmers rely heavily on family labour for farm operations. The results from this study show a significant shift from reliance on family labor on the farm, where more casual workers are being used to provide labour in potato production among smallholder farmers. This shift may have impact on the SOC and social cohesion. In the FGD, farmers noted that traditionally friends and family would provide labor in the farm without necessarily being paid for it, and this enhanced community cohesion.

Today the focus is on monetary compensation and community members may not be so much concerned with the welfare of other smallholder farmers.

#### 4.2.5. Average Household Income per Month of the Respondents

An examination of earnings from smallholder potato farmers in Molo Sub County per month revealed a diverse distribution of income levels within the farmers. Figure 5 summarizes the findings.



**Figure 5:** Household Income per Month of the Respondents

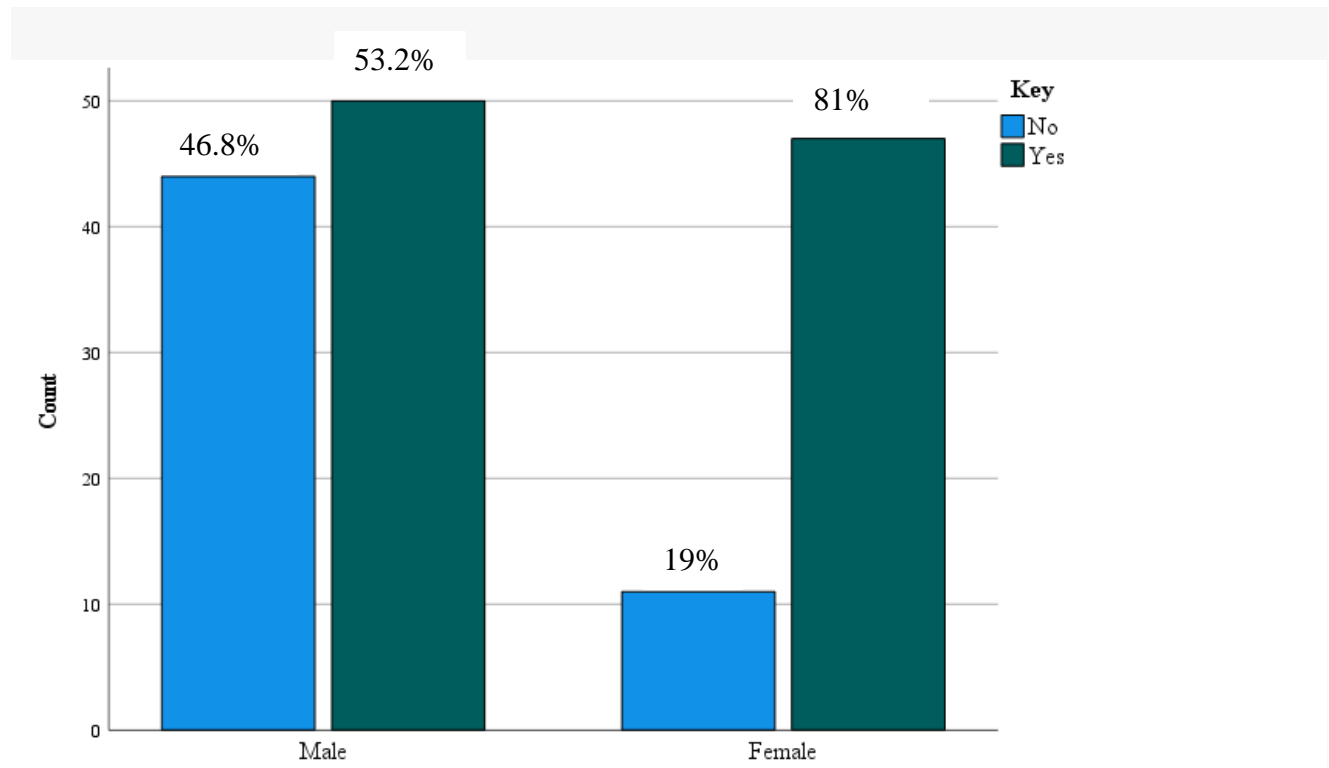
There were slightly smaller differences in income earned by farmers between men and women. Among the males and females, the percentage of female farmers who earned 20,000 Kenyan shillings or less was more (62.1%) compare to that of male farmers (50%). Among those who earned more than 50,000, there was a notable smaller margin between men and women, with the percentage of women being slightly more (12.1%) than that of the male (9.6%). These findings are in line with findings by Giller et al. (2021) who suggest that there are income disparities among smallholder potato farmers, with the majority operating at relatively lower income levels (Giller et al., 2021).

The income was estimated from potato proceeds and other economic activities in the households, such as formal and non-formal employment and business activities. Potato income was termed as the greatest contributor of the household income among the smallholder farmers. This can be explained by the changing dynamics in potato production, to being treated as both cash and food crop rather than how it has been traditionally classified as a food crop (Kwambai et al., 2022).

Level of income can significantly influence quality seed potato adoption among smallholder farmers (Okello et al., 2016). A higher income level provides farmers with the financial capacity to invest in the purchase of quality seed potatoes. Low-income farmers may face financial constraints that limit their ability to invest in quality seed potato. For this study, based on the average level of income, farmers may be able to afford quality seed potato. Therefore, the results imply that low quality seed potato adoption may be caused by other factors other than level of income.

#### **4.2.6. Membership to Community Groups/ Organizations**

The study sought to determine participants' membership to community groups/ organizations. Participants were asked if they belonged to any community groups or organizations, and the results revealed a distinction in group/ organization membership among the participants. A comparison bar graph was used to summarize the information from the respondents, as shown in figure 6.



**Figure 6:** Membership to Community Groups/ Organizations

The results show that 63.8% of the total respondents reported membership to community groups/ organizations with 36.2% indicating no affiliation. These results indicated a significant gender-based variability, where 53.2% among male respondents, reported belonging to community groups/organizations. Conversely, among female respondents, 81% reported belonging to community groups. This is in line with literature findings that suggests women are more involved in community groups than men as observed in various settings such as local community organizations and religious groups (Ziersch et al., 2011). This phenomenon may be due to the fact that traditionally, women have played key roles in community building and social support networks (Naud et al., 2019).

Participants in this study joined groups/organizations for varied reasons. Table 5 presents the frequencies and percentages of the reasons for belonging to community groups among respondents in Molo Sub County.

**Table 5:** Main Reasons for Belonging to Community Groups/ Organizations

<b>Reason</b>	<b>Frequency</b>	<b>Percentage</b>
To create social connections	16	16.7
Financial benefits	71	72.9
For community welfare	8	8.3
To access information	2	2.1
Total	97	100

Numerous research investigations have demonstrated a connection between group identification, which involves feeling a sense of belonging to one's social group and a shared bond with fellow group members, and elevated life satisfaction (Wakefield et al., 2016). From this study, what participants said to be the reasons for belonging to community groups/ organizations were varied. However, the dominant reason among the respondents was to gain financial benefits, constituting 72.9% of the respondents who belonged to community groups/ organizations.

Respondents in this study belonged to different groups. The groups of membership by smallholder farmers in Molo Sub County are shown in Table 6.

**Table 6:** Community Groups/Organizations of Membership by Respondents

<b>Community group/organization</b>	<b>Frequency</b>	<b>Percentage</b>
Local community organizations (merry-go-round and table banking)	58	59.8
Community welfare	41	42.3
Community based organization	31	32.3
Church groups	29	30.2
Farmer cooperative society	17	17.5
School groups	3	3.1
Farmer training and learning groups	2	2.1

Among the 97 participants who belonged to community groups, 55.7% belonged to more than one group. However, the number of those who belonged to local community organizations, (merry-go-round and table banking groups) was the highest, constituting 59.8% of the total respondents who belonged to community groups. Local community groups/organizations are most popular within

low-income earners because of their ease of formation and the immediate benefits gained from the organizations/groups (Molyneux et al., 2007). Farmer cooperative society and farmer training and learning groups had low levels of membership constituting 17.5% and 2.1% of those that belonged to community groups/ organizations respectively. A reason for this phenomenon could be that most of the farmer groups are established for temporary initiatives (such as a crop trial or fertilizer distribution) by national agencies or development organizations, and typically do not possess crucial components that guaranteed their long-term existence (Rwelamira & Gunn, 2014).

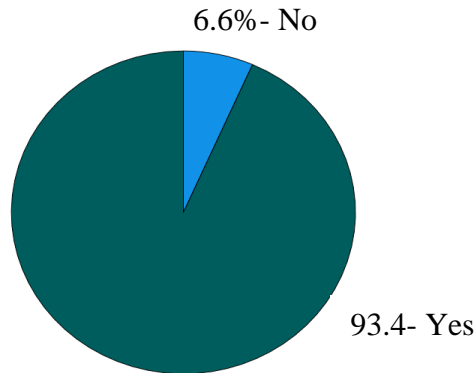
Those that did not belong to any community groups/ organizations (36.2% of the total respondents) gave a number of reasons for not joining groups/ organizations as shown in Table 7.

**Table 7:** Main Reasons for not Joining Community Groups/ Organizations

<b>Reason</b>	<b>Frequency</b>	<b>Percent</b>
Prefer to be independent	27	49.1
Time constraints	13	23.6
Not aware of any group	4	7.3
Prefer not to say	8	14.5
On progress	3	4.5
Total	55	100.0

The results show that the most common reason for not joining community groups/ organizations cited by respondents in this study was a preference for independence (49.1%). Time constraints (23.6%) also emerged as a significant barrier to joining community groups/ organizations. A smaller percentage of respondents (7.3%) reported not being aware of suitable groups while 5.5% were in the progress of joining a group. A notable portion (14.5%) chose not to disclose their specific reasons for not joining groups. Turner (2018) acknowledges that community groups/ organizations play a vital role in fostering development by facilitating collective action, sharing knowledge, and addressing local issues, but not everyone chooses to join such groups for various reasons. According to Turner (2018), some individuals may opt not to participate in community groups/ organizations due to time constraints, lack of interest, or a preference for individual endeavors, a phenomenon similar to the findings of this study.

Further, the results show that respondents received help from neighbors and other community members as shown in figure 7.



**Figure 7:** Participants who Receive Help from Community Members/ Neighbours

Despite the fact that 36.3% of the respondents did not belong to any community groups/ organizations, 93.4 % of the total respondents admitted that they had community members or neighbors that they could ask for help when they needed assistance. Only 6.6 % of the total respondents did not have community members or neighbors that they could ask help from, as shown in figure 3.

The help that the farmers received from the community members/ neighbours varied from food, loans, money for personal needs (harambee), seed potato and other assistance, such as farm labour as shown in the Table 8.

**Table 8: Kind of Help Received from Community Members/ Neighbours**

Kind of help	Frequency	Percentage
Money for personal need (Harambee)	92	64.8
Seed potato	67	47.2
Loans	54	38.0
Food	18	12.7
Any other help (including farm labour)	12	8.5

Although the highest percentage of help which members received from their neighbors and community members was majorly on money for personal needs (harambee) 64.8%, a significant

percentage of the respondents (47.2%) received seed potato from neighbors and community members. These results are in line with those by Okello et al. (2016) who found out that smallholder farmers share and exchange seed potato amongst themselves in the community.

### 4.3. Characteristics of SOC Components among Smallholder Farmers in Molo Sub County

Objective one (i) of the study sought to characterize SOC components among smallholder farmers in Molo Sub County. In this section, SOC components are established from the SOC index using factor analysis. SOC variation by age and gender is also explored as part of SOC characterization using the Kruskal Wallis test.

#### 4.3.1. SOC Components among Smallholder Farmers in Molo Sub County

To establish SOC components, exploratory factor analysis was found to be suitable for this purpose. This is because exploratory factor analysis simplifies varied connections among a group of measured variables by revealing shared dimensions or factors that tie together variables, enabling the identification of meaningful patterns within the variable (Tavakol & Wetzel, 2020).

Preliminary assessment was conducted to determine if the data was suitable for factor analysis using Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett’s Test of Sphericity as shown in Table 9.

**Table 9:** Factor Analysis KMO and Bartlett’s Test

<b>Kaiser-Meyer-Olkin Measure of Sampling Adequacy.</b>		<b>.898</b>
Bartlett’s Test of Sphericity	Approx. Chi-Square	1789.207
	df	190
	Sig.	.000

The KMO value revealed high suitability at .898, indicating that the dataset is well-suited for factor analysis. Additionally, Bartlett’s Test of Sphericity resulted in a significant outcome ( $\chi^2 = 1789.207$ ,  $df = 190$ ,  $p < .001$ ), confirming significant correlations among observed variables. These combined findings affirm that the dataset is appropriate for factor analysis. This is because a KMO value  $> 0.5$  is acceptable for sample sizes between 100 and 200, and a Bartlett’s Test of Sphericity value  $< 0.05$  indicates that a factor analysis is suitable for the data set (Shrestha, 2021).

In order to determine items in the SOC index that loaded together, the Kaiser’s criterion was used to determine the initial unrotated factors to be extracted as shown in table 10.

**Table 10:** Eigenvalues and Total Variance Explained by Different Components

<b>Component</b>	<b>% of Variance</b>	<b>Cumulative %</b>	<b>Total</b>
1	44.092	44.092	8.818
2	8.269	52.362	1.654
3	7.399	59.760	1.480
4	6.549	66.310	1.310
5	4.017	70.327	
6	3.937	74.264	
7	3.266	77.530	
8	3.073	80.603	
9	2.729	83.332	
10	2.630	85.963	
11	2.184	88.146	
12	2.073	90.219	
13	1.655	91.874	
14	1.541	93.414	
15	1.515	94.929	
16	1.169	96.098	
17	1.098	97.197	
18	.996	98.193	
19	.943	99.136	
20	.864	100.000	

Four factors (components) were extracted using principal component analysis and varimax orthogonal factor rotation method. Unlike oblique rotation, orthogonal rotation is suitable for exploratory factor analysis, where it assumes that the items being investigated are uncorrelated (Walton et al., 2023). Walton et al. (2023) suggests that this aspect of orthogonal rotation preserves the total variance explained by the extracted factors, generating independent components that are easy to interpret.

The four components were extracted based on eigenvalues, where only the components with eigenvalues greater than one were extracted. Studies suggest that any component that has eigenvalue greater than 1.00, meaningfully contribute to the total variance explained by the components and it's worthwhile to retain it (Iacobucci et al., 2022). The four extracted components combined explained 66.3% of the total variance. Verma et al. (2019) suggest that the total variance explained by the extracted components should be above 50%.

Different items had varied factor loadings on the extracted factors as shown in table 11.

**Table 11:** Rotated Component Matrix

<b>Item</b>	<b>Component 1.</b>	<b>Component 2.</b>	<b>Component 3.</b>	<b>Component 4:</b>
I am proud to be among other smallholder farmers	.835			
I celebrate success with other smallholder farmers	.764			
I get emotional support from other smallholder farmers	.711			
I have a shared identity with other smallholder farmers	.707			
Other smallholder farmers are willing to accept my support with resources	.591			
I trust opinions from other smallholder farmers	.540			
I receive support and cooperation from other smallholder farmers		.812		
I am satisfied with the support I get from other smallholder farmers		.774		
I am willing to share resources with other smallholder farmers		.698		
Other smallholder farmers have helped me to succeed in farming		.611		

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It is important to maintain relationships with other smallholder farmers	.760	
I interact with other smallholder farmers freely	.739	
I feel connected to other smallholder farmers	.610	
I know other smallholder farmers in the community	.599	
I feel as part of the smallholder farmers community	.591	
My concerns are heard by other smallholder farmers in the community		
I am involved in decision-making on matters that concern me and other smallholder farmers		.875
My opinions are valued by other smallholder farmers		.768
I have the responsibility to make smallholder farmers' community better		.695
I participate in activities and events that concern smallholder farmers		.568

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During the analysis, items that had factor loadings less than .50 were suppressed to reduce chances of multicollinearity, and to establish items that strongly load together. Studies suggest that setting the factor loading cut-off point at .30 or higher is suitable, after examining the factor loading trends carefully (Steiner & Grieder, 2020).

Extracted component one was labeled as shared emotional connection. The factor had six items which include; I am proud to be among other smallholder farmers, I celebrate success with other smallholder farmers, I get emotional support from other smallholder farmers, I have a shared identity with other smallholder farmers, other smallholder farmers are willing to accept my support with resources, and I trust opinions from other smallholder farmers. The items had correlations of

.835, .764, .711, .707, .591, and .540 respectively. Combined, these items explained 44.092% of the total variance. This means that shared emotional connection matters the most in explaining SOC among smallholder farmers in Molo Sub County.

Component two was labeled as integration and fulfillment of needs. The component had four items named; I receive support and cooperation from other smallholder farmers, I am satisfied with the support I get from other smallholder farmers, I am willing to share resources with other smallholder farmers, and other smallholder farmers have helped me to succeed in farming. These items explained 8.269% of the total variance with variations of .812, .774, .698, and .611 respectively. This means that integration and fulfillment of needs is second most important component of SOC among smallholder farmers in Molo Sub County.

The third component was labeled as membership. It had five items; it is important to maintain relationships with other smallholder farmers, I interact with other smallholder farmers freely, I feel connected to other smallholder farmers, I know other smallholder farmers in the community, and I feel as part of the smallholder farmers' community. These items had variations of .760, .739, .610, .599, and .591 respectively, and together, these items explained 7.399% of the total variance. This component is the third most important component that explains SOC among smallholder farmers in Molo Sub County.

The fourth component was labeled as influence. It had four items; I am involved in decision-making on matters that concern me and other smallholder farmers, my opinions are valued by other smallholder farmers, I have the responsibility to make smallholder farmers' community better, and I participate in activities and events that concern smallholder farmers had higher factor loadings on component four. The four items had variations of .875, .768, .695, and .568. Together, these items explained 6.549% of the total variance. This is the fourth most important component that explains SOC among smallholder farmers in Molo Sub County.

Notably, however, after the factor analysis, a specific item - my concerns are heard by other smallholder farmers in the community- had no factor loading on any of the four components, indicating that the item had no significant relationship with the extracted components. This finding implies that this particular item did not align well with the underlying constructs measured by the rest of the items in the SOC index.

Generally, items within the SOC index produced components of SOC that closely resemble those defined by McMillan and Chavis (1986), who characterized SOC in terms of four components: membership, influence, integration and fulfillment of needs, and shared emotional connection. The order of the components established by McMillan and Chavis (1986) does not necessarily signify order of importance. However, these components guided this study in establishing SOC components that matter the most in explaining SOC among smallholder farmers in Molo Sub County.

The four components were used to establish overall SOC for all the participants in the survey. This was done by establishing the average scores of all the item scores for individual respondents into the four components as identified in the factor analysis. For instance, component one, labeled as shared emotional connection, was established by calculating average scores from the six items that were found to have higher loadings on the component, which are; I am proud to be among other smallholder farmers, I celebrate success with other smallholder farmers, I get emotional support from other smallholder farmers, I have a shared identity with other smallholder farmers, other smallholder farmers are willing to accept my support with resources, and I trust opinions from other smallholder farmers. Similarly, components two, three and four were determined using the same procedure. Eventually, the average of scores from the established four components were used to establish the overall SOC for each respondent. This was important in facilitating analysis of SOC variation by age and gender.

#### **4.3.2. SOC Variation by Age and Gender**

As part of SOC characterization, the study sought to establish possible variances of SOC between different age groups and gender. Kruskal–Wallis test was done to test these variations, and the results are discussed in the following sections.

#### 4.3.2.1. SOC Variation by Age

In the analysis of SOC variation by age groups, a Kruskal–Wallis H test was used. This test is a non-parametric alternative for ANOVA and T-tests. Table 12 shows a summary of the results.

**Table 12:** Kruskal–Wallis Test for SOC Variation by Age

Age groups of the respondents	N	Mean Rank	Chi-square	df	p-value
18-35 years	73	66.08	9.344	2	.009
36-60 years	58	82.53			
Above 60 years	21	96.10			
Total	152				

The results revealed a significant difference among the age groups,  $\chi^2(2) = 9.344$ ,  $p = .009$ . These results are consistent with the findings of a study by Ross and Searle (2019) that revealed age-related differences in neighborhood SOC. The results indicated that respondents aged 18-35 years (Mdn = 66.08) reported a significantly lower SOC compared to those aged 36-60 years (Mdn = 82.53) and those above 60 years (Mdn = 96.10). These findings are similar to those of Fisher et al. (2002), who found out that people with 60 years and over are most likely to have a strong SOC, and that SOC advances with age. Therefore, the findings suggest that age plays a role in the perception of SOC among smallholder farmers in Molo Sub County, with younger individuals expressing a comparatively lower SOC.

Further, a Kruskal-Wallis H test was conducted to assess the variation of SOC components by age. The results are summarized in Table 13.

**Table 13:** Kruskal–Wallis H Test for Variation of SOC Components by Age

SOC component	Age group	Mean Rank	Kruskal-Wallis H	df	p-value
Shared emotional connection	18-35	71.97	1.649	2	.438
	36-60	79.59			
	Above 60	83.71			
Integration and fulfillment of needs	18-35	68.00	5.462	2	.065
	36-60	83.66			

Membership	Above 60	86.29	5.707	2	.058
	18-35	68.67			
	36-60	80.65			
Influence	Above 60	92.26	9.335	2	.009
	18-35	66.75			
	36-60	80.99			
	Above 60	98.00			

From the results, no significant differences were found for the shared emotional connection ( $H(2) = 1.649, p = .438$ ), integration and fulfillment of needs ( $H(2) = 5.462, p = .065$ ), or membership ( $H(2) = 5.707, p = .058$ ) components. However, the Kruskal-Wallis H test revealed significant differences among age groups for the influence component ( $H(2) = 9.335, p = .009$ ). The mean ranks for this component indicate that sense of influence increase with age with the youth (18-35 years) having lower sense of influence (Mdn = 66.75) compared to the rest of the age groups. In a study to examine SOC among the youth, Evans (2007) revealed that young individuals often experience influence from adults in community and family settings, but the chance for them to exert reciprocal influence is frequently absent. They tend to be recipients or subjects of adult influence and power, with limited opportunities to reciprocate.

#### 4.3.2.2. SOC Variation by Gender

To test SOC variation by gender, Kruskal–Wallis H Test was conducted, and the results are summarized in Table 14.

**Table 14:** Kruskal–Wallis H Test for SOC Variation by Gender

Gender of the respondents	N	Mean Rank	Chi-square	df	p-value
Male	94	71.32	3.406	1	.065
Female	58	84.89			
Total	152				

The data revealed a marginally non-significant difference as indicated by Kruskal-Wallis H test results of  $\chi^2(1) = 3.406, p = .065$ . The mean rank for male respondents (Mdn = 71.32) was found

to be lower than that of female respondents (Mdn = 84.89). These findings are contradicting to those of Kissinger and colleagues that revealed that men and women exhibit differences in SOC and belonging experiences (Kissinger et al., 2009). However, despite the fact that there was no statistically significance difference in SOC between men and women, the results show a trend towards a difference in SOC between male and female among smallholder farmers in Molo Sub County. Further research with a larger sample size may provide additional insights into potential gender-related variations in SOC.

Further, data analysis was conducted to assess variation of SOC components by gender using Kruskal Wallis test, and the results are summarized in Table 15.

**Table 15:** Kruskal Wallis H test for Variation of SOC Components by Gender

SOC component	Gender	Mean Rank	Kruskal-Wallis H	df	p-value
Shared emotional connection	Male	73.05	1.538	1	.215
	Female	82.09			
Integration and fulfillment of needs	Male	71.38	3.436	1	.064
	Female	84.79			
Membership	Male	71.83	2.869	1	.137
	Female	84.07			
Influence	Male	72.36	2.210	1	.137
	Female	83.21			

The results revealed no statistically significant differences among gender groups for the SOC components as shown by; shared emotional, (H (1) = 1.538, p = .215), integration and fulfillment of needs (H (1) = 3.436, p = .064), membership (H (1) = 2.869, p = .090), and influence (H (1) = 2.210, p = .137).

#### 4.4. Influence of SOC Components on Quality Seed Potato Adoption

Objective two (ii) of the study sought to explore the influence of SOC components on quality seed potato adoption among smallholder farmers in Molo Sub County. In Objective one (i) SOC components were identified and described. The components were named as; shared emotional connection, integration and fulfillment of needs, membership, and influence.

First, this section describes major sources of seed potato preferred by the respondents in order to understand quality seed potato adoption among smallholder farmers in Molo Sub County.

#### 4.4.1. Sources of Seed Potato among Smallholder Farmers in Molo Sub County

The sources of seed potato were explored among the smallholder farmers in Molo Sub County. The participants were asked to indicate where they obtained their seed potato in the last three planting seasons. Table 16 presents descriptive statistics.

**Table 16:** Sources of Seed Potato Preferred by Participants

Source	Frequency	Percentage
Farm saved seed potato from previous harvest	115	75.7
Family and friends	76	50
Molo ADC and other authorized seed suppliers	51	33.6
Own produced seed potato without any expert monitoring	34	22.4
Own produced seed potato under expert monitoring	7	4.6
Open markets	6	3.9

From the data, majority of the respondents, 75.7% (n= 115), 50% (n=76), 22.4% (n= 34) and 3.9% (n= 6) used farm saved seed potato from previous harvests, family and friends, own produced seed potato without any expert monitoring, and from open markets; at least once in the last three planting seasons respectively. Also notably, some respondents, 33.6% (n= 51) and 4.6% (n= 7) acquired their seed potato from Molo ADC and other authorized seed suppliers, and from own produced seed potato under expert monitoring respectively; at least once in the last three planting seasons. This information confirms findings by Taiy et al. (2017), who found out that a majority of smallholder farmers select smaller tubers from their previous harvest to use as seeds, exchange seed potato among friends and family or buy seed potato from open markets.

Respondents gave varied reasons for choosing sources of seed potato. Table 17 gives a summary of the frequencies and percentages of what respondents gave as main reasons for choosing the sources of seed potato.

**Table 17: Reasons for the Choice of Sources of Seed Potato**

<b>Source</b>	<b>Frequency</b>	<b>Percent</b>	<b>Cumulative Percent</b>
Trust for the source	34	22.4	22.4
Good quality seed potato	75	49.3	71.7
Cost of seed potato	19	12.5	84.2
Seed potato availability	24	15.8	100.0
Total	152	100.0	

The research found out the main reasons that respondents gave were trust for the seed potato source (22.4%), seed potato quality (49.3%), cost of seed potato (12.5%), and seed potato availability (15.8%).

The results imply that quality of seed potato as well as trust of the source are important considerations when selecting a source of seed potato. Further analysis of the data revealed that among those who selected seed potato from a particular source because of trust, 94.1% (n= 32), obtained their seed potato from non-formal sources. Also, 76% (n=57) of the respondents who chose the source of seed potato because of good quality of seed potato, obtained their seed potato from non-formal sources.

This data backs up information from a FGD that was held with 12 smallholder potato farmers from Molo Sub County, that points to the fact that most farmers were reluctant on acquiring seed potato from Molo ADC and other authorized seed suppliers because the farmers believed that seed quality has been tempered with. The participants in the FGD claimed that seed potato is bought from local farmers and repackaged as certified seeds. Also, the FGD participants alleged that seed potato from Molo ADC is produced in farms where the farmers are not able to visit and see the process of production. Therefore, the farmers preferred to select seeds from previous harvests or buy from their neighbors and friends where they can actually see the potato production process and ascertain the seed potato quality by the potato growth characteristics and yielding potential. Although the farmers might not have the scientific knowledge of testing the quality of the seed potato, the farmers relied on observation, trust, and their vast experience in seed selection and potato production.

The mean of the number of years that respondents had been engaged in potato farming was 9.07 years, indicating that farmers in Molo Sub County had relatively vast experience in potato production. In the FGD farmers agreed that reliance on farmer’s experience may be a reason why the farmers use their knowledge and skills to produce their own seed potato and not necessarily buy from certified bodies or produce under expert monitoring. Farming experience is a survival skill and can be used as a reference point by farmers and end up not needing expert help with farming technologies (Patrick et al., 2020).

#### **4.4.2. Quality Seed Potato Adoption among Smallholder Farmers in Molo Sub County**

To determine quality seed potato adoption among smallholder farmers in Molo Sub County, two data categories were established; adopters of quality seed potato and non-adopters. Those who in their last three planting seasons acquired seed potato at least twice from Molo ADC and other authorized seed suppliers, and produced seed potato under expert monitoring; and were willing to use pest and disease-free seed potato were considered as adopters, while the rest were considered as non-adopters. The descriptive statistics of quality seed potato adoption are shown in Table 18.

**Table 18:** Quality Seed Potato Adoption

<b>Category</b>	<b>Frequencies</b>	<b>Percentage</b>
Non-adopters	132	86.8
Adopters	20	13.2
Total	152	100

From the study, a majority of the respondents, 86.8% (n= 132) were non-adopters of quality seed potato while the rest, 13.2% (n= 20) were adopters. The data shows that quality seed potato adoption was low, although the percentage of adopters was high, (13.2%) compared to the national level of 6% (KIPPRA, 2022).

#### **Test of Hypothesis One**

Hypothesis one stated that;

**H0<sub>1</sub>.** SOC components have no statistically significant influence on quality seed potato adoption among smallholder farmers in Molo Sub County.

To test the influence of SOC components on quality seed potato adoption among smallholder farmers in Molo Sub County, a logistic regression was conducted. A logistic regression model is a type of generalized linear model that is employed when dealing with a binary response variable, where the outcome can be categorized as either a success or a failure in the context of a specific event (Jawa, 2022). Since adoption was dichotomous, categorized as adopters and non-adopters, this model was deemed fit for the analysis.

The first step was to ascertain how well the regression model was fit for the data. Data in Table 19 shows the findings.

**Table 19:** Logistic Regression; Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	7.858	8	.447

The Hosmer and Lemeshow Test indicated that the model was fit for the data,  $\chi^2(8) = 7.858$ ,  $p > .05$ . When the p-value is greater than .05, the results suggests that there is no significant difference between the observed and expected outcomes, indicating that the model fits the data well (Nattino et al., 2020).

Further, logistic regression was conducted, and Table 20 presents the results.

**Table 20:** Logistic Regression Model Summary on Influence of SOC Components on Quality Seed Potato Adoption

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	104.082a	.090	.166

The data indicate that SOC components have significance influence on quality seed potato adoption among smallholder farmers in Molo Sub County. This is because The Cox & Snell R Square and Nagelkerke R Square coefficients indicated that the independent variables (SOC components) explain approximately 9% and 17% of the variance in the dependent variable (quality seed potato adoption), respectively (Cox & Snell R Square = 0.090, Nagelkerke R Square = 0.166).

Although the logistic regression R-Squared values were small, Adhikari (2022) states that small R-squared values are not always a problem. The author notes that for human behavior, which is

very difficult to predict, a high R-Squared is almost impossible. Therefore, the null hypothesis is rejected. SOC components significantly influence quality seed potato adoption among smallholder farmers in Molo Sub County.

The results from the research are therefore in agreement with the initial assumption of this study, that SOC components may significantly influence adoption of farming technologies, in this case, quality seed potato adoption. The study is also in support of previous studies that show that SOC components positively influences different community development processes (Bergdahl et al., 2024; Fisher & Sonn, 1999; Park et al., 2023). However, not all SOC components had significant influence on quality seed potato adoption. Table 21 presents a summary of variables in the logistic regression equation.

**Table 21:** Summary of Variables in the Logistic Regression Equation

<b>SOC component</b>	<b>B</b>	<b>Wald</b>	<b>df</b>	<b>p-value</b>	<b>Exp (B)</b>
Shared emotional connection	.189	.099	1	.754	1.208
Integration and fulfillment of needs	-.749	2.521	1	.112	.473
Membership	1.738	6.368	1	.012	5.684
Influence	.482	1.483	1	.223	1.620
Constant	-9.441	10.657	1	.001	.000

The results indicate that only membership had a statistically significant influence on quality seed potato adoption ( $p = 0.012$ ). This suggests that individuals with a higher sense of membership in their community are approximately 5.684 times more likely to adopt quality seed potato compared to those with a lower sense of membership ( $\text{Exp}(B) = 5.684$ ). On the other hand, the remaining SOC components, including shared emotional connection ( $p = 0.754$ ), integration and fulfillment of needs ( $p = 0.112$ ), and influence ( $p = 0.223$ ), did not demonstrate statistically significant influence on quality seed potato adoption. The results imply that sense of belonging and shared identity within the community plays a pivotal role in shaping agricultural practices. These results are in line with findings by Iles et al. (2020) who notes that small-scale farming has more to do with lifestyle, sense of belonging and connection to others. Despite the fact that not all SOC components had influence on quality seed potato adoption, this study provide insight into the important role of SOC in designing targeted strategies for sustainable agricultural development.

#### 4.5. Influence of SOC Variation by Gender on Quality Seed Potato Adoption

Objective three (iii) of the study sought to examine the influence of SOC variation by gender on quality seed potato adoption among smallholder farmers in Molo Sub County.

First, logistic regression analysis was employed to establish the overall influence of SOC variation on quality seed potato adoption among the smallholder farmers in Molo Sub County. The significance of the model was explored. The results are shown in the Table 22.

**Table 22:** Omnibus Coefficients on SOC Variation for All Respondents

Chi-square	df	p-value
6.473	2	.039

Omnibus tests of model coefficients revealed a statistically significant model,  $\chi^2(2) = 6.473$ ,  $p = .039$ . Further analysis showed that SOC variation is a significant predictor of quality seed potato adoption among smallholder farmers in Molo Sub County ( $B = 1.230$ ,  $Wald = 5.246$ ,  $p = .022$ ,  $Exp(B) = 3.420$ ). For each one-unit increase in SOC, the odds of adopting quality seed potato increase by approximately 3.42 times. Table 23 summarizes the results.

**Table 23:** Summary of Variables in the Equation on SOC Variation for All Respondents

Test variable	B	Wald	df	p-value	Exp(B)
SOC	1.230	5.246	1	.022	3.420

Additionally, logistic regression analyses were conducted separately for male and female participant. The results were compared to assess influence of SOC variation by gender on quality seed potato adoption. Omnibus tests of model coefficients revealed different patterns for male and female farmers as shown by Table 24.

**Table 24:** Omnibus Coefficients for Influence of SOC Variation by Gender on Quality Seed Potato Adoption

Gender	Chi-square	df	p-value
Male	6.873	1	.009
Female	.476	1	.490

The model for male farmers was statistically significant,  $\chi^2(1) = 6.873$ ,  $p = .009$ , suggesting that SOC significantly influence quality seed potato adoption. In contrast, the model for female farmers did not show statistical significance,  $\chi^2(1) = 0.476$ ,  $p = .490$ .

### Test of Hypothesis Two

Hypothesis two stated that;

**H0<sub>2</sub>.** SOC variation by gender has no statistically significant influence on quality seed potato adoption among smallholder farmers in Molo Sub County.

To test hypothesis two, results from male and female logistic regression models were compared. Table 25 summarizes the results.

**Table 25:** Summary of Variables in the Equation of Influence of SOC Variation by Gender on Quality Seed Potato Adoption

Gender	Test Variable	B	Wald	df	p-value	Exp(B)
Male	SOC	1.664	5.232	1	.022	5.281
Female	SOC	.527	.436	1	.509	1.694

The results indicate that among the male farmers, SOC was a significant predictor of quality seed potato adoption ( $B = 1.664$ ,  $Wald = 5.232$ ,  $p = .022$ ,  $Exp(B) = 5.281$ ). This indicates that an increase in SOC was associated with 5.28 times higher odds of adopting quality seed potato among males. On the other hand, among the female respondents, SOC was not a significant predictor of quality seed potato adoption ( $B = 0.527$ ,  $Wald = 0.436$ ,  $p = .509$ ,  $Exp(B) = 1.694$ ). Therefore, the null hypothesis is rejected; SOC variation by gender has statistically significant influence on quality seed potato adoption among smallholder farmers in Molo Sub County.

The results suggest that SOC among the male respondents is a significant aspect of adoption, while among the females, factors other than the SOC may be driving quality seed potato adoption decisions among the smallholder farmers in Molo Sub County. Kissinger et al. (2009) notes that there are disparities in SOC perception between males and females, and this may affect people's life experiences differently. He suggests that greater number of women fosters a stronger SOC, or alternatively, the nature of their interaction offers more opportunities for creating a sense of belonging, and therefore tend to focus on emotional support for one another. Among the men, SOC is more geared toward leadership and influencing change. Therefore these results underscore the

importance of considering gender-specific dynamics in studies of adoption of agricultural technologies, highlighting the need for tailored interventions that are gender-sensitive.

#### 4.6. Influence of SOC Variation by Age on Quality Seed Potato Adoption

Objective four (iv) of the study sought to examine the influence of SOC variation by age on quality seed potato adoption among smallholder farmers in Molo Sub County. To explore this phenomena, logistic regression was conducted on the three age groups (18-35, 36-60 and above 60 years) separately and the results compared. Table 26 shows the results.

**Table 26:** Omnibus Tests Coefficients on Influence of SOC Variation by Age on Quality Seed Potato Adoption

Age group	Chi-square	df	p-value
Youth	1.681	1	.195
Middle-aged	2.936	1	.087
Older adults	0.935	1	.334

The Omnibus tests of model coefficients revealed no-significant model for the youth (18-25 years),  $\chi^2(1) = 1.681$ ,  $p = .195$ ; middle-aged (36-60 years)  $\chi^2(1) = 2.936$ ,  $p = .087$  and among older adults (above 60 years)  $\chi^2(1) = 0.935$ ,  $p = .334$ . All the p-values were above the 0.05 cut-off point for social statistics.

#### Test of Hypothesis Three

Hypothesis three stated that;

**H0<sub>3</sub>.** SOC variation by age has no statistically significant influence of on quality seed potato adoption among smallholder farmers in Molo Sub County.

To test the hypothesis, results from logistic regression modes for the three age groups (youth, middle-aged and older adults) were compared, as summarized in Table 27.

**Table 27:** Summary of Variables in the Equation of Influence of SOC Variation by Age on Quality Seed Potato Adoption

Age group	Test Variable	B	Wald	df	p-value	Exp(B)
Youth	SOC	1.019	1.432	1	.231	2.770
Middle-aged	SOC	1.154	2.332	1	.127	3.172
Older adults	SOC	1.546	0.820	1	.365	4.694

From the analysis, the results shows that SOC variation by age did not influence quality seed potato adoption among the youth ( $B = 1.019$ ,  $Wald = 1.432$ ,  $p = .231$ ,  $Exp(B) = 2.770$ ), the middle-aged ( $B = 1.154$ ,  $Wald = 2.332$ ,  $p = .127$ ,  $Exp(B) = 3.172$ ) and among the older adults ( $B = 1.546$ ,  $Wald = 0.820$ ,  $p = .365$ ,  $Exp(B) = 4.694$ ). The p-values in each model were more than the 0.05 significance level. Therefore, the null hypothesis was not rejected and concluded that SOC variation by age does not have statistically significant influence on quality seed potato adoption among smallholder farmers in Molo Sub County.

These results emphasize on the importance of a wholesome approach when exploring factors influencing adoption of farming technologies. Kwambai et al. (2023) mentions that the subject of technology adoption is a wide area of concern, and the factors that contribute to adoption are complex. The authors suggest that examining the intricacies of the process of adoption is crucial for navigating the evolving landscape of technological integration in agriculture.

## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 5.1. Introduction

This chapter provides a summary of major findings of the study and the study conclusions in line with the objectives of the study. Also, recommendations for policy, practice and further research are presented based on the conclusions.

#### 5.2. Summary of the Study

The purpose of the study was to explore the influence of SOC (SOC) on quality seed potato adoption among smallholder farmers in Molo Sub County. The study sought to provide insights on how SOC components are perceived and understood between different age groups and gender and how these aspects influence quality seed potato adoption among smallholder farmers in Molo Sub County. To explore this concept, the study had four specific objectives, which included, to characterize SOC components among smallholder farmers in Molo Sub County, to explore the influence of SOC components on quality seed potato adoption among smallholder farmers in Molo Sub County, to examine the influence of SOC variation by gender on quality seed potato adoption among smallholder farmers in Molo Sub County, and to examine the influence of SOC variation by age on quality seed potato adoption among smallholder farmers in Molo Sub County.

The research had one research question; what are the characteristics of SOC components among smallholder farmers in Molo Sub County? Additionally, there were three research hypotheses stated as; SOC components have no statistically significant influence on quality seed potato adoption among smallholder farmers in Molo Sub County, SOC variation by gender has no statistically significant influence on quality seed potato adoption among smallholder farmers in Molo Sub County and SOC variation by age has no statistically significant influence of on quality seed potato adoption among smallholder farmers in Molo Sub County.

Mixed methods were used to collect data in Molo Sub County. A survey using questionnaires was conducted to collect data among 152 smallholder farmers who were proportionately sampled from the four wards of Molo Subcounty. A Focus group discussion (FGD) was also conducted with 12 smallholder farmers drawn from the four wards of Molo Sub County. The majority of the respondents (48%) were youth farmers aged between 18-35 years with notably fewer farmers aged

above 60 years, constituting only 13.8% of the total respondents. The majority of the farmers were male (61.8%) while the rest (38.2%) were female. Most of the respondents reported to have social connections with other smallholder farmers as indicated by 63.8% of the total respondents who admitted to belong to community groups for various reasons which included; to create social connections, to gain financial benefits, for community welfare and to access information pertaining the community and farming.

Objective one of the study sought to characterize SOC components among smallholder farmers in Molo Sub County. SOC components were established from the SOC index using factor analysis. Likewise, SOC variation by age and gender was also explored as part of SOC characterization using the Kruskal Wallis test. Four components were extracted and labeled as shared emotional connection, integration and fulfillment of needs, membership and influence in their order of importance. Shared emotional connection was the most important component in explaining SOC among the smallholder farmers in Molo Subcounty while influence was the least important component. These components resembled those defined by McMillan and Chavis (1986). The study revealed significant SOC variation among the age groups and a marginally non-significant difference between male and female respondents. Moreover, the data revealed non-significant variation of SOC components by age and gender except for the influence (a SOC component) which had significant variation among the age groups.

Objective two of the study sought to explore the influence of SOC components on quality seed potato adoption among smallholder farmers in Molo Sub County. Among the respondents, quality seed potato adoption was low, where a majority (86.8%) were non-adopters of quality seed potato and only (13%) were adopters. Farmers preferred seed potato saved from previous harvest and from friends and neighbors because they trusted these sources and the quality of seed potato. This information facilitated testing of the first hypothesis which stated that SOC components have no statistically significant influence on quality seed potato adoption among smallholder farmers in Molo Sub County using logistic regression model at the 0.05 significance level. The study found that SOC components significantly influence quality seed potato adoption among smallholder farmers in Molo Sub County, and therefore the null hypothesis was rejected. However, further analysis revealed that only the membership component had a statistically significant influence on

quality seed potato adoption. The findings suggest that group identity and a sense of belonging are crucial in influencing farming practices, in this case, quality seed potato adoption.

Objective three of the study sought to examine the influence of SOC variation by gender on quality seed potato adoption among smallholder farmers in Molo Sub County. Logistic regression analyses were conducted separately for male and female participant and the results were compared. This enabled for testing of the second hypothesis, which stated that SOC variation by gender has no statistically significant influence on quality seed potato adoption among smallholder farmers in Molo Sub County. The results revealed that SOC was a significant predictor of quality seed potato adoption among the male respondents while it was not a significant predictor among the female respondents. Therefore, the null hypothesis was rejected and concluded that SOC variation by gender has statistically significant influence on quality seed potato adoption among smallholder farmers in Molo Sub County. The findings indicate that among the male respondents, SOC variation is a significant factor in adoption, however among the female respondents, reasons other than SOC variation may be driving the choice of quality seed potato.

Objective four (iv) of the study sought to examine the influence of SOC variation by age on quality seed potato adoption among smallholder farmers in Molo Sub County. In order to investigate this phenomenon, three age groups (18–35, 36–60, and over 60) each underwent separate logistic regression analyses, and the outcomes were compared. This enabled testing of the third hypothesis which stated that SOC variation by age has no statistically significant influence of on quality seed potato adoption among smallholder farmers in Molo Sub County. The results showed that SOC variation by age did not influence quality seed potato adoption among all the age groups at the .05 significance level. Therefore, the null hypothesis was not rejected and it was concluded that SOC variation by age does not have statistically significant influence on quality seed potato adoption among smallholder farmers in Molo Sub County. The results imply that there is need to take a holistic approach when investigating factors impacting adoption of farming technologies among different age groups, in this case, quality seed potato adoption.

### 5.3. Conclusions

From the research findings, the study can conclude that;

- i. There are four distinct components of SOC among smallholder farmers in Molo Sub County namely; shared emotional connection, integration and fulfillment of needs, membership and influence with shared emotional connection being the most influential component. The four components resemble those identified by McMillan and Chavis (1986) and may vary among age groups.
- ii. Quality seed potato adoption is influenced by SOC components, especially the membership component. This means higher sense of belonging among smallholder farmers enhance quality seed potato adoption in Molo Sub County.
- iii. Quality seed potato adoption is influenced by SOC variation by gender among smallholder farmers in Molo Sub County. This is because SOC was found to be a significant predictor of quality seed potato adoption among the male farmers while it was not a significant predictor among the female farmers. This imply that SOC may be a significant contributing factor for quality seed potato adoption among the male, while other factors (apart from SOC) influence quality seed potato among the females.
- iv. Quality seed potato adoption is not influenced by SOC variation by age. The results mean that despite the fact that SOC (particularly the membership component) influence quality seed potato adoption among smallholder farmers, within the distinctive age groups, SOC may not be a significant predictor of quality seed potato adoption.

## **5.4. Recommendations**

SOC is an important aspect of community with different components. SOC and SOC components have the potential for influencing quality seed potato adoption. However, the disparities in SOC perception and experience between gender and among different age groups, as revealed by the study, underscore the complexity of these dynamics. The study therefore makes the following recommendations:

### **5.4.1. Policy Recommendations**

- i. There is need to review the Agricultural Development Corporation Act (Cap. 444) regulatory and managerial policies to allow smallholder farmers to participate and learn from the ADC farms. This is necessary for the farmers to develop trust on the quality of seed potato produced in ADC facilities and appreciate its importance in enhancing potato production.
- ii. There is need to ensure enforcement of regulatory policies under the KEPHIS Act No. 54 of 2012, to ensure that only quality seeds are provided to farmers by the authorized seed distributors to avoid seed adulteration.

### **5.4.2. Recommendations for Extension Workers**

- i. Extension workers working with communities in enhancing quality seed potato adoption should target enhancing SOC among farmers. This is because sense of membership enhances quality seed potato adoption. Extension workers can do this by facilitating formation of working groups for smallholder potato farmers.
- iii. Extension workers should provide expert monitoring services to farmers on quality seed potato production on their farms since farmers have the capacity to produce affordable and reliable seed potato to improve potato production.

### **5.4.3. Suggestions for Further Research**

- i. The research was limited to non-parametric tests to reveal relationships between SOC, SOC components and quality seed potato adoption. More robust research can be conducted on these variables with a larger sample to reveal more insights on the influence of SOC on quality seed potato adoption among smallholder farmers.
- ii. The study was a cross-sectional survey conducted within a short period of time. Therefore, a qualitative research can be done to document lived experiences among smallholder farmers, which may be helpful in providing more insights on SOC and quality seed potato adoption practices.
- iii. Further research can be conducted among smallholder farmers of specific groups (female, male, youth, middle-aged and older adults) to explore specific factors driving their choice of seed potato.

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**APPENDICES**

**Appendix A: Questionnaire for Smallholder Potato Farmers**

Date. ....

Questionnaire No.....

My name is Raphael Masaku. I am a student at Egerton University Department of Applied Community Development Studies pursuing Master of Science in Community Studies and Extension. For my thesis, I am examining influence of SOC on quality seed potato adoption among smallholder farmers in Molo Sub County. Data generated through this study will be useful in informing policy on seed potato and potato production. Because you are a potato farmer in Molo Sub County, I am inviting you to participate in this study by responding to the questions in the provided questionnaire which will take about 20 minutes. There is no compensation for responding nor is there known risk. For confidentiality purposes, please do not have your name written on the questionnaire. Copies of the thesis will be placed in the university library through the Graduate School. Participation in this study is voluntary.

If you require any additional information or have questions concerning this study, please contact me at 0795 954 225 or my university supervisors through *acds@egerton.ac.ke*.

Yours faithfully

Raphael Masaku EM21/13108/21.

masakuraphael@gmal.com

Instructions: *Tick or write your responses in the appropriate spaces. Answer all questions and be honest with your responses.*

**SECTION 1: DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENT**

1. Indicate your ward of residence.

Molo [ ]            Turi [ ]            Mariashoni [ ]    Elburgon [ ]

2. What is your age range? 18-35 [ ]            36-60 [ ]            Above 60 years [ ]

3. What is your gender? Male [ ]    Female [ ]    Other [ ]

4. What is the highest level of education that you have attended?

Not attended formal education [ ]    Primary school [ ]    Secondary school [ ]

Tertiary (college/university) [ ]    Any other. ....

5. On average, what size of land do you farm on in acres? .....

6. Who mostly provides labor for farming on your farm?

Family members [ ]    Friends [ ]    Hired casual workers [ ]    Tractors & machines [ ]

7. On average, what is your household income per month? .....

**SECTION 2: SOC**

8. Do you belong to any community organizations or groups? Yes [ ] No [ ]

9. If no, why? Please list your reasons.

- i. ....
- ii. ....
- iii. ....

10. If yes, what is kind of community organizations or groups do you belong to? Please tick all that are relevant to you.

- Church groups [ ] School [ ] Community welfare [ ] Community self-help [ ]
- Community based organization [ ] Farmer training and learning groups
- Farmer cooperative society [ ] Any other, please name. ....

11. What are the **main reasons** for joining the group (s)? Please name.

- i. ....
- ii. ....
- iii. ....

12. Do you have community members or neighbors that you can ask for help when you need assistance? Yes [ ] No [ ]

13. If yes, what kind of help do you get from other community members? Please tick all that are relevant to you.

- Foods [ ] Loans [ ] Money for your needs (Harambee) [ ]
- Seed potato [ ] Any other, please name .....

**14. Please indicate your agreement with the following statements in a scale of 1-5 by ticking in the appropriate section where 1= Strongly disagree; 2= Disagree; 3= Neutral 4= Agree; 5= Strongly agree.**

S/No	Statement	1	2	3	4	5
1.	I feel connected to other smallholder farmers					
2.	I interact with other smallholder farmers freely					
3.	I feel as part of the smallholder farmers community					
4.	I have the responsibility to make smallholder farmers' community better					

5.	I know other smallholder farmers in the community					
6.	It is important to maintain relationships with other smallholder farmers					
7.	My concerns are heard by other smallholder farmers in the community					
8.	I am involved in decision-making on matters that concern me and other smallholder farmers					
9.	My opinions are valued by other smallholder farmers					
10.	I am willing to share resources with other smallholder farmers					
11.	Other smallholder farmers are willing to accept my support with resources					
12.	I trust opinions from other smallholder farmers					
13.	I receive support and cooperation from other smallholder farmers					
14.	I am satisfied with the support I get from other smallholder farmers					
15.	I participate in activities and events that concern smallholder farmers					
16.	Other smallholder farmers have helped me to succeed in farming					
17.	I am proud to be among other smallholder farmers					
18.	I have a shared identity with other smallholder farmers					
19.	I celebrate success with other smallholder farmers					
20.	I get emotional support from other smallholder farmers					

**SECTION 3: QUALITY SEED POTATO ADOPTION**

15. For how many years have you been engaged in potato farming activities?

Below one year [ ]      One to three years [ ]      Over three years [ ]

16. Do you have access information on seed potato? Yes [ ]      No [ ]

17. If yes, please rate the relevance of the seed potato information from the following sources on a scale of 1-5, where 1= Not relevant and 5= Very relevant.

Source	1	2	3	4	5
Fellow farmers					
Extension services					
Family members					
Radio					
Television					
Social media					

18. What seed potato variety do you **prefer the most** to grow? .....

19. Why do you prefer the named seed potato? Please give your reason(s).

- i. ....
- ii. ....
- iii. ....

20. In your last three planting seasons, how many times did you use seed potato from the following source(s)? Please tick in the appropriate boxes, where 0= Never; 1= once; 2= twice; 3= thrice.

S/No	Source	0	1	2	3
1.	Molo ADC and other authorized seed suppliers				
2.	Own produced seed potato under expert monitoring				
3.	Own produced seed potato without any expert monitoring				
4.	Farm saved seed potato from previous harvest				
5.	Family and friends				
6.	Open markets				

21. Why do you prefer seed potato from the selected source(s)? Please tick all that are relevant to you.

Level of productivity [ ]

Disease resistance [ ]

Drought resistance [ ]

The taste of the potato [ ]

Cost [ ]

Availability [ ]

I trust the source [ ]

22. How willing are you to use/continue using pest and disease-free seed potato?

Not willing [ ]

Neutral [ ]

Willing [ ]

\*\*\*\*\*

I appreciate your time and participation in answering all the questions.

God bless you.

Raphael Masaku

## Appendix B: Questionnaire Reliability Statistics Results

### *Reliability Statistics*

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.803	.803	34

The tool is reliable, as shown by the Cronbach Alpha reliability coefficient of  $\alpha = .803$ , at the cut-off point of .70 for social statistics.

### *Item-Total Statistics*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I_feel_connected_to_smallholder_farmers	105.96	80.563	.302	.798
I_interact_with_other_farmers_freely	105.92	82.601	.130	.803
I_feel_as_part_of_the_r_farmers_community	106.25	79.500	.390	.795
I_have_the_responsibilities_community_better	106.12	80.897	.348	.797
I_know_other_smallholders_in_the_community	105.96	78.303	.455	.792
It_is_important_to_smallholder_farmers	105.79	77.737	.463	.792
My_concerns_are_heard_in_the_community	106.04	78.563	.498	.792
I_am_involved_in_decisions_smallholder_farmers	106.42	80.167	.255	.800
My_opinions_are_valued_smallholder_farmers	106.17	79.101	.398	.795
I_am_willing_to_share_smallholder_farmers	105.92	80.428	.399	.796
Other_smallholder_farmers_support_with_resources	106.17	84.493	-.051	.801

I_trust_opinions_fro_s mallholder_farmers	106.00	82.174	.147	.803
I_receive_support_an_ smallholder_farmers	106.17	83.275	.049	.801
I_am_satisfied_with_s mallholder_farmers	106.04	79.259	.432	.794
I_participate_in_act_s mallholder_farmers	106.21	79.911	.362	.796
Other_smallholder_o_s ucceed_in_farming	106.12	82.897	.084	.805
I_am_proud_to_be_am o_smallholder_farmers	105.92	82.080	.153	.803
I_have_a_shared_id_s mallholder_farmers	105.96	81.868	.269	.799
I_celebrate_success_s mallholder_farmers	106.37	79.810	.398	.795
I_get_emotional_supp_ smallholder_farmers	106.04	81.868	.189	.801
Farmer_training	106.21	75.563	.504	.788
Fellow_farmers	106.67	79.362	.189	.805
Extension_services	106.33	77.884	.394	.794
Family_members	106.21	78.346	.374	.795
Radio	105.46	79.824	.310	.797
Television	106.04	74.650	.482	.789
Social_media	107.25	84.196	-.061	.822
Molo_ADC_and_other _a_rized_seed_supplier s	109.58	77.993	.605	.789
Own_produced_seed_p o_er_expert_monitorin g	109.58	75.906	.508	.789

Own_produced_seed_p109.25	71.761	.678	.778
o_ny_expert_monitoring			
Farm_saved_seed_potato107.96	78.650	.426	.793
_rom_previous_harvest			
Family_and_friends 108.67	78.667	.306	.798
Open_markets 109.50	81.391	.214	.801
_34_How_willing_are 107.00	87.826	-.477	.805
_ase_free_seed_potato			

---

## **Appendix C: Focus Group Discussion Guide for Smallholder Farmers**

### **SECTION 1: INTRODUCTION**

The discussion section will begin with a prayer from a volunteer. The researcher will do a self-introduction and state the purpose of the FGD. The researcher will invite the farmers to introduce themselves and to participate in the group discussion. Permission to record the session will be requested.

### **SECTION 2: DISCUSSION**

1. In what ways do you collaborate and support each other with farming?
2. How would you describe your relationship with other smallholder potato farmers? How do you feel being among other small holder farmers?
3. How do you access information on farming technologies, especially on seed potato? Describe how the information is useful to you on potato farming.
4. How important is group learning in acquiring new knowledge and skills in potato farming? Discuss the role and advantages of group learning.
5. What are the steps you take or issues you consider before adopting a new technology in potato farming? Describe the motivation to try new technologies in potato farming.
6. What seed potato varieties do you grow? Why do you prefer the seed potato varieties and where do you get them from?
7. Can you describe the success you have achieved and challenges you have faced using quality seed potato?
8. In your own opinion, how would you describe the overall usage of quality seed potato among the small holder farmers?
9. Based on your experiences, what recommendations would you provide to improve quality seed potato adoption among the smallholder farmers?

### **SECTION 3: ADJOURNMENT**

The researcher will ask for any further comments from the participant. He will thank them for their time and willingness to participate. The discussion will then end with a word of prayer and all participant will leave.

**Appendix D: Research Permit**



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**This is to Certify that Mr. Raphael Masaku Wambua of Egerton University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nakuru on the topic: Influence of sense of community on quality seed potato (*Solanum tuberosum*) adoption among smallholder farmers in Molo Sub County for the period ending: 12/ October 2024.**

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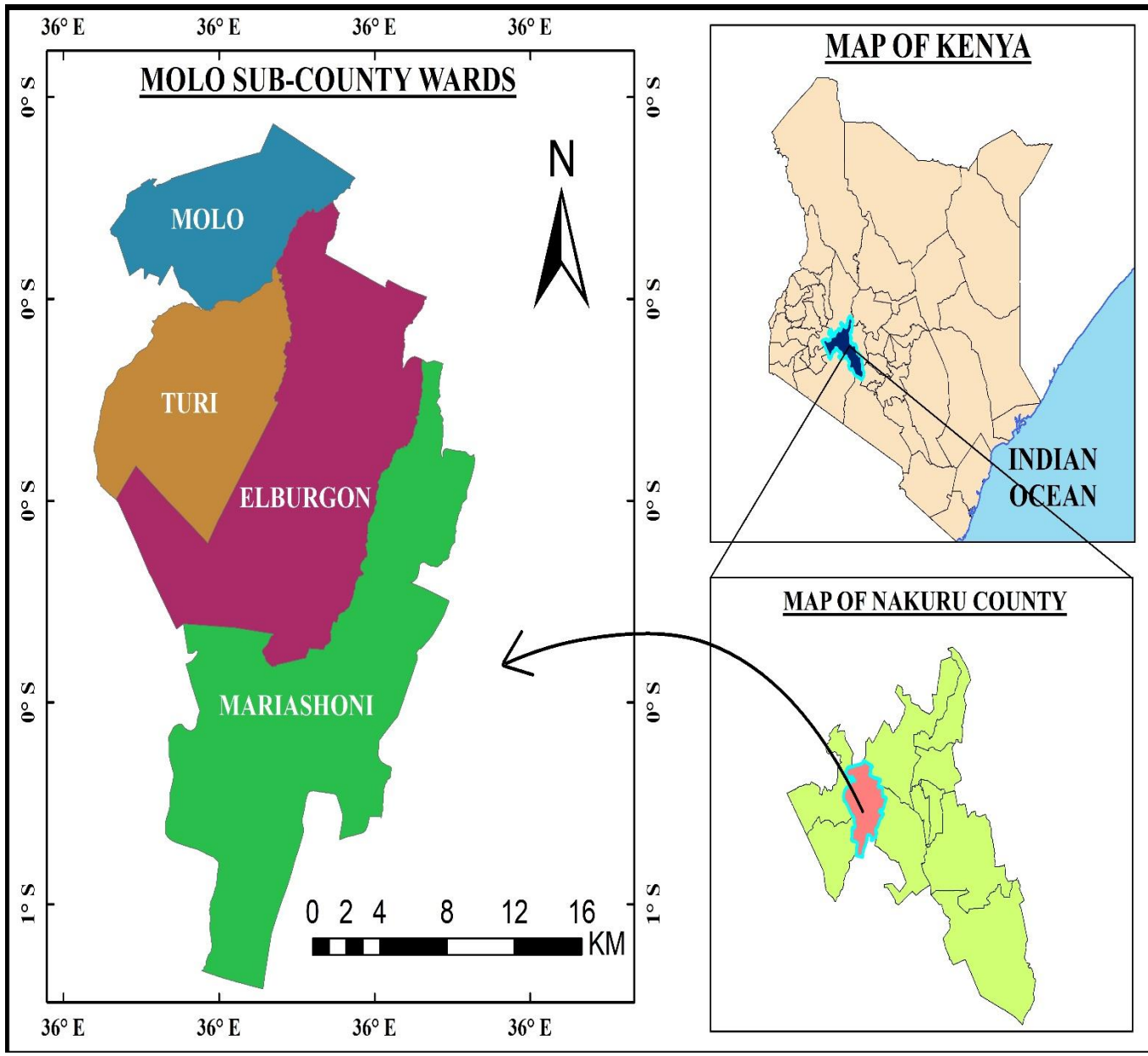
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**Appendix E: Map of Molo Sub County**



*IOSR Journal Of Humanities And Social Science (IOSR-JHSS)*  
Volume 29, Issue 4, Series 1 (April, 2024) 29-34  
e-ISSN: 2279-0837, p-ISSN: 2279-0845.  
[www.iosrjournals.org](http://www.iosrjournals.org)

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## **Influence Of Sense Of Community On Quality Seed Potato (*Solunum Tuberosum*) Adoption Among Smallholder Farmers In Kenya**

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### **Abstract**

*In Kenya, quality seed potato adoption remains a challenge among smallholder farmers. This is despite stakeholder interventions to improve access to quality seed potato based on conventional socioeconomic factors with limited focus on building blocks of a community such as the sense of community (SOC). SOC has four components - membership, influence, integration and fulfillment of needs and shared emotional connection - that have been found to influence community development activities. However, much of the research on SOC has been conducted with Western, educated, industrialized, rich and democratic (WEIRD) populations. Therefore, a study was conducted to explore influence of SOC on quality seed potato adoption among smallholder farmers in Molo Sub County. A correlational research design was adopted for the research. Data was collected from a population of 6,000 smallholder potato farmers in the four wards of Molo Sub County. 152 respondents were sampled using a multilevel sampling procedure. Semi-structured questionnaire was used to collect data from individual respondents. Descriptive statistics and logistic regression analysis were used in data analysis using Statistical Package for Social Sciences (SPSS) version 22 software. Logistic regression determined that SOC influence quality seed potato adoption, especially the membership component ( $p = 0.012$ ). Therefore, initiatives to promote quality seed potato adoption should prioritize strengthening group identity and fostering a sense of belonging among farmers.*

**Keywords:** *quality seed potato adoption, Molo Sub County, sense of community components, smallholder farmers*