EFFECT OF ENTREPRENEURIAL BEHAVIOUR ON COMPETITIVE ADVANTAGE AND PERFORMANCE OF SMALL SCALE POTATO ENTERPRISES IN MOLO SUB COUNTY, KENYA

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DECLARATION AND RECOMMENDATION

Declaration

This thesis is my original work and has not been submitted in this or any other university for the award of a degree.

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Recommendation

This thesis has been submitted with our approval as University supervisors.

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DEDICATION

I dedicate this thesis to Mr. Livingstone Agbolosoo and Miss Agnes Agbenuawor all of the blessed memory and to my sister, Christiana Dzifa Agbolosoo.

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ABSTRACT

Small scale potato enterprises play a central role in creation of jobs and wealth creation for 3.8 million potato farmers along the potato value chain in Kenya. Although, potato production and marketing emerges as a promising farm enterprise that can contribute to increased incomes for smallholder potato farmers. There is little or lack of competitiveness among potato farmers. This study intended to fill this knowledge gap by determining the effect of entrepreneurial behaviour on the competitive advantage and performance of small scale potato enterprises in Molo Sub-County, Kenya. To achieve this, levels of smallholder potato farmers' entrepreneurial behaviour were determined and, challenges facing small scale potato enterprises characterized. Furthermore, the effect of entrepreneurial behaviour on competitive advantage and performance of small scale potato enterprises was determined. The study used multistage sampling techniques to sample 267 smallholder potato farmers using semi-structured questionnaires and data analyzed using STATA version 15. Analytically, an entrepreneurial behaviour index was developed and used to generate the levels of entrepreneurial behaviour. Secondly, a multivariate probit model was used to determine the effect of entrepreneurial behaviour on competitive advantage. Finally, seemingly unrelated regression was used to analyze the effect of entrepreneurial behaviour on performance of small scale potato enterprises. The study results found that the majority of smallholder potato farmers had a medium level of entrepreneurial behaviour. In addition, the main challenges facing small scale potato farm enterprises included high pest and disease infestation, unfavorable weather conditions, high cost of agro-chemicals, poor price for potato and exploitation by brokers. The multivariate probit results showed that risk-taking ability, proactiveness, innovativeness, information-seeking, cosmopoliteness and decision-making ability more likely influenced small scale potato farmers to gain a competitive advantage in the small scale potato enterprises. The seemingly unrelated regression results showed that risk-taking ability affects performance of small scale potato enterprises in Molo Sub-County, Kenya. The study concludes that farmers possess medium entrepreneurial behaviour that constrains them in achieving sustainable competitive advantage and improving performance of potato enterprise activities. The study recommends that farmers should be provided with training on seasonal climate change, use of certified seeds, access to farm credits and participate more in farmer groups. This could build their farming capacity for increased competiveness and improved performance of potato enterprises. Overall, potato value chain actors need to come up with supportive programs that help nurture and harness entrepreneurial farming practices and behaviour skills among the smallholder potato farmers.

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LIST OF ABBREVIATIONS AND ACRONYMS

CFA	Confirmatory Factor Analysis
EB	Entrepreneurial Behaviour
EBI	Entrepreneurial Behaviour Index
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FBO	Framer Based Organization
GDP	Gross Domestic Product
GoK	Government of Kenya
KEPHIS	Kenya Plant Health Inspectorate Service
KMO	Kaiser-Meyer-Olkin
KSh	Kenyan Shillings
MBV	Market Based View
MOALFI	Ministry of Agriculture, Livestock, Fisheries and Irrigation
MVP	Multivariate probit model
KNBS	Kenya National Bureau of Statistics
PCA	Principal Component Analysis
RBV	Resource Based View
SE	Standard Error
SSA	Sub-Saharan Africa
SUR	Seemingly Unrelated Regression
VIF	Variance Inflation Factor

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

Potato (*Solanum tuberosum*) is an annual herbaceous plant belonging to Solanaceae family (Sharma *et al.,* 2014). Potato is a high yielding tuber crop with a short cropping cycle between 3 and 4 months with a potential yield of about 40t/ha (Bymolt, 2014). The tuber crop is well recognized as the fourth most cultivated and consumed food crop after cereals. Empirical statistics found that potato is being grown on about 20 million hectares in over 150 countries across the world Food and Agriculture Organization of the United Nations (FAO) 2010) with an annual global production of 320 million tonnes (Muthoni *et al.,* 2013). Taiy *et al.* (2016) reported that potato cultivation creates employment opportunities to more than 800 million people along the value chain worldwide. Food and Agriculture Organization of the United Nations statistics (FAOSTAT) in 2015 documented that about 5.3% of the global potato production comes from African continent.

 In Sub-Saharan Africa (SSA), Kenya has been recognized as the fifth largest producer of potatoes with an annual production of 1.4 million tonnes with a worth of Kenya Shillings 30 to 40 billion annually (KEPHIS, 2019). The potato sector contributes about 1.9 % to agricultural gross domestic product (GDP) in Kenya (Mwangi *et al*., 2013) and the sector plays a significant role through the improvement of livelihood and increase income for smallholder potato farmers (Okello *et al*., 2016). This vegetable crop plays a crucial role in national food nutrition and ensures food security that alleviates poverty in potato farmers (MOALFI, 2016).

In Kenya, potato is an important food security and cash crop for smallholder farmers in the highlands of Central, Eastern, and Rift Valley (KEPHIS, 2019). The crop is second only to maize in terms of production and marketing in Kenya. Potato is grown between 1800-3000 m above sea levels mostly by about 800, 000 smallholder farmers with an annual production of 1 million tonnes in two growing seasons (KEPHIS, 2019). Kaguongo *et al.* (2014) cited that potato is produced on about 160,000 hectares per seasons accounting for 3% of total arable farmlands of 5,500,000 hectares in Kenya. Janssens *et al.* (2013) estimated that 83% of the farmlands under potato production belong to smallholder farmers who allocate 0.2 to 0.6 hectares of their farmland for potatoes in Kenya.

Furthermore, the Government of Kenya (2012) cited potato enterprises as one of the promising farming enterprises that can play a central role towards realization of the set objectives of Kenya Vision 2030 by ensuring food security. Kenya Plant Health Inspectorate Service (2019) postulates that potato enterprises provide employment opportunities to about

3.8 million smallholder farmers both directly and indirectly along the potato value chain. Also, National Potato Council of Kenya (2016) posited that potato enterprise activities started in the late 19th century by indigenous farmers in Kiambu, Murang'a and Nyeri districts. According to Ministry of Agriculture and Livestock, Fisheries and Irrigation (2016) and Ruto (2018) asserted that potato enterprises are located in more than 13 counties where Nyandarua County (29.8%) is the leading producer of potatoes followed by Nakuru (18.20%) and Elgeyo Marakwet (16.2%) in Kenya.

In Nakuru County, smallholder potato farmers produced 541,000 metric tonnes of potatoes in 2018 worth KSh 9.4 billion (KEPHIS, 2019) in the production year. Small scale potato enterprises are lucrative farming enterprises that provide employment opportunities and incomes to most smallholder farmers living in Molo, Njoro, North and South Kuresoi Sub-Counties where Molo Sub-County leads the potato enterprise activities (NPCK, 2017; GOK, 2018). Prior research indicated that the farm enterprise contributes to economic growth and rural development among smallholder potato farmers in Molo Sub-County (MOALFI, 2016).

Despite the contribution of small-scale potato enterprises to ensure food security at farm household and national level in Kenya. It has been stated that the small-scale potato enterprises are characterized by a number of constraints leading to a declining production and yields at a rate of 11% per year in Kenya (FAO, 2010). NPCK (2015) documented that the national average potato yield in Kenya are below 10t/ha against a potential of 40t/ha-50t/ha mainly due to poor husbandry and agronomic practices. The use of poor quality seeds and crop husbandry were found to be the main reasons for the low yields and incomes for smallholder potato farmers in Kenya. Riungu (2011) also cited poor production practices, lack of planting materials, lack pest and disease management, limited inputs, poor storage facilities and disorganized marketing systems as the major problems facing the potato sector in Kenya.

Muthoni *et al.* (2013) observed that the smallholder potato farmers ignore good agricultural practices thereby recording very low potato yields that make the farming enterprises unprofitable in Kenya. Also, Taiy *et al*. (2016) mentioned in their study that limited knowledge of good agricultural practices and climate variability leads to low yields and low incomes for smallholder farmers in Molo Sub-County. The main reason behind the poor agronomic practices among the smallholder potato farmers can be attributed to their poor socio-economic characteristics, low farming experience and low entrepreneurial behaviour skills in the potato farm enterprises. All these influence smallholder potato farmers' entrepreneurial behaviour to undertake entrepreneurial farming practices through taking production risks in

trying new seed varieties, and making appropriate farm decisions in adopting good agricultural practices to increased potato productivity and farm profitability.

1.2. Statement of the Problem

Potato production and marketing emerges as a promising farm enterprise that can contribute to increased incomes for smallholder potato farmers. However, there is a lack of competitiveness among smallholder potato farmers. Smallholder farmers are unable to practice entrepreneurial agriculture and undertake entrepreneurial farming practices in the potato enterprises. As such, most of the potato farmers are not proactive, innovative, risk-takers and their production decisions are based on what they can produce not what the market demand. This represents poor entrepreneurial behaviour and contributes to low farm productivity and profitability. Furthermore, past studies only focus on entrepreneurial behaviour and performance of farm enterprises without incorporating competitive advantage. Therefore, there is little empirical documentation on the effect of entrepreneurial behaviour on the competitive advantage and performance of small-scale potato enterprises, especially in Molo Sub-County. This study is therefore intended to fill this knowledge gap.

1.3. Study Objectives

1.3.1. General Objective

The study aimed to improve performance of small-scale potato enterprises through enhanced entrepreneurial behaviour and competitive advantage in Molo Sub-County, Kenya.

1.3.2. Specific Objectives

i.   To describe entrepreneurial behaviour of smallholder potato farmers in Molo Sub-County, Kenya.

ii.   To characterize challenges facing small scale potato enterprises in Molo Sub-County.

iii.   To determine the effect of entrepreneurial behaviour on competitive advantage of small-scale potato enterprises in Molo Sub-County, Kenya.

iv.   To determine the effect of entrepreneurial behaviour on performance of small-scale potato enterprises in Molo Sub-County, Kenya.

1.4. Research Questions

i.   What is entrepreneurial behaviour of smallholder potato farmers in Molo Sub-County, Kenya?

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ii.   What are the challenges facing small scale potato enterprises in Molo Sub-County?

iii.   What is the effect of entrepreneurial behaviour on competitive advantage of small scale potato enterprises in Molo Sub-County, Kenya?

iv.   What is the effect of entrepreneurial behaviour on performance of small scale potato enterprises in Molo Sub-County, Kenya?

1.5.   Justification of the Study

Small scale potato enterprises contribute to economic growth and rural enterprise development of the Kenyan economy. However, smallholder potato farmers are ignorant of competitive agricultural practices and effective farm management systems. They are unable to deal with poor agronomic practices and crop husbandry due to their poor entrepreneurial farming practices. Looking the significance of potato industry in Kenya through creation of employment and wealth opportunities for smallholder farmers. Therefore, it is necessary to assess the current status of entrepreneurial behaviour of smallholder potato farmers on the competitive advantage and performance of small scale potato enterprises. The entrepreneurial skills of smallholder potato farmers need to be developed and addressed by all the stakeholders in the value chain. Hence, the findings of the study would help new and emerging potato enterprises to create a competitive advantage and improve their economic and financial performance. The outcome of this study could help the country to achieve one of the objectives of Vision 2030 thus creating wealth opportunities for citizens and increase incomes of small scale farmers through innovation, commercially-oriented farming and use of modern agriculture technologies (GOK, 2012; MOALFI, 2016). This can be achieved by investing more in the small scale potato enterprises thereby reducing poverty level and unemployment amongst youths and women. It would influence potato enterprises to grow and develop in the harsh and changing competitive farm environment.

The findings of the study would inform policy makers of agribusiness and rural development about how entrepreneurial behaviour affects competitive advantage and performance of small scale potato enterprises. It would also play crucial roles in Kenya's Big Four Agenda through improving food security at the household level and creating job opportunities for youths in the agriculture sector (MOALFI, 2016). The outcome of the research would provide available information for researchers who want to conduct a study on small scale potato enterprises. Researchers would find the outcome useful as a source of literature for further research on other related areas.

1.6. Scope and Limitation of the Study

The study focused on determining the entrepreneurial behaviour on the competitive advantage and performance of small scale potato enterprises. The study selected randomly and interviewed only farm households who engaged in small scale potato enterprise activities. The study was conducted between May and August 2019 in Elburgon, Molo, and Turi wards respectively within Molo Sub County, Nakuru County, Kenya. The limitation was that the study only took place in Molo Sub-County due to the short time available for the study.

1.7. Operational Definition of Terms

Agri-enterprise refers to the farm activities that involve the production, processing, transporting and marketing of agricultural farm products and services.

Competitive advantage in this study refers to creating superior value to potato produce that attracts and pleases buyers, and making fellow farmers difficult to imitate. These competitive strategies are grading, sorting, differentiation, and farm diversification.

Enterprise refers to any undertaking that deals with the production and distribution of farm products that satisfy human needs and wants.

Enterprise environment refers to the surroundings in which the potato enterprise is situated that influence entrepreneurial behaviour and farm performance.

Enterprise performance refers to the ability of oriented farmers to create reasonable outcomes from farm activities within a specific production cycle. It determines the success of the farm enterprise and measured in terms of profitability.

Entrepreneur in the study refers to smallholder potato farmer who is innovative, proactive, risk-taker, information seeker and make rational production decisions to produce for the market.

Entrepreneurial behaviour refers to the personal attitude portrays by individual smallholder potato farmer that affects competitive advantage and farm performance. These attitudes include innovativeness, proactiveness, cosmopoliteness, risk-taking ability, decision-making ability and seeking information behaviour.

Entrepreneurial farmer refers to a smallholder farmer who sees his farming as a business of earning maximum profits. He is passionate about his farming activities and willing to take risks to make the farm business profitable.

Entrepreneurship refers to a discipline of creating new enterprise ventures through introduction of new farm products and services to meet market demand. It provides self-employment, improve livelihood and alleviate poverty amongst farmers.

Grading refers to categorization of harvested potatoes based on size, shape, color and weight.

Small scale enterprises refer to business entities that engage in farm enterprises to produce and market agricultural farm produce. They are being undertaken on farmland below 1 acre to 5 acres respectively.

Smallholder farmer refers to an entrepreneurial farmer who owned and cultivated food and cash crop on below five acres of farm land during the production cycle.

Sorting refers to removal of rotten, diseased, infested, green and cut potatoes before marketing.

Potato enterprise refers to potato farm activities undertaken on the farm by oriented farmers who produced and marketed potatoes in a competitive market.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

This chapter presents literature review on entrepreneurship, entrepreneur, entrepreneurial behaviour, competitive advantage and performance of small-scale potato enterprises.

2.2. Concept of Entrepreneurship and Entrepreneur

Entrepreneurship is one of the key drivers for economic growth and industrial development of the society (Mariammal & Seethalakshmi, 2017). The development of entrepreneurship is directly linked to the social and economic development of the society. It has been related to improved growth, increased wealth and improved quality of life. Adesoji (2015) and Okeke *et al.* (2015) considered entrepreneurship as the creation of employment opportunities, income generation, alleviation of poverty, improvements in nutrition, health and food security in the national economy.

Oko-Isu *et al.* (2014) postulates that entrepreneurship stands as a vehicle to improve quality of life for community members and sustain a healthy economy and environment. Kumar *et al.* (2013) cited entrepreneurship as a dynamic process of creating incremental wealth where the wealth is created by entrepreneurs who take risks in terms of equity, time and career commitment of providing values to products and services. Entrepreneurship is not necessarily doing new things but also doing things in a new way that has been already done but with different results (Oko-Isu *et al.,* 2014). Singh (2014) made a crucial statement that entrepreneurship is a feasible approach for upward mobility where 1 percent increase in entrepreneurial activities decreases the poverty rate by 2. Entrepreneurship research has gained much attention in current decades due to globalization, urbanization and consumers preferences resulting in high market demand for farm produces (Sachitra & Choy, 2017).

Entrepreneurship in agriculture has a significant impact on agribusiness growth and development. It is the key factor for the survival of small scale farming in an ever-changing and increasingly complex global economy (Kahan, 2012). Entrepreneurship transforms potential smallholder farmers to develop and introduce new farm products and services to new and existing agricultural markets. It provides farmers the chance to discover new production methods and techniques. Through entrepreneurship, entrepreneurial farmers tap into unexploited new market opportunities and develop a new pathway of engaging in farm enterprises.

In the agriculture sector, entrepreneurship creates a competitive edge between emerging and existing enterprises to improve farm performance. In recent studies, many scholars document the importance of entrepreneurship on building competitive advantage and its influence on performance of agribusinesses. Entrepreneurship can be regarded as the social and economic drivers adopted by most agribusinesses to grow and sustain its success for a period i.e. from business initiation to decline stage (Tamminana & Mishra, 2017). Entrepreneurship provides self-employment to individual smallholder farmers and enhances rural development in an emerging economy (Mudiwa, 2018).

Entrepreneurial activities and entrepreneurial behaviour are considered as the main components of entrepreneurship responsible for transforming the mindset of potential smallholder farmers to establish a new agribusiness venture. Entrepreneurial activity is the driving force behind the creation of innovation that changes an economy. This activity motivates a potential smallholder farmer to create and start-up a new farm enterprise in a competitive and changing agribusiness environment (Tarus *et al*., 2016). Entrepreneurship depends on the ability and willingness of smallholder farmers to seek more available information by taking a calculated risk and making effective decisions to establish new ventures (Mukhtar *et al.*, 2018).

Entrepreneurs are well known as the key persons for promoting economic growth and technological changes through adoption of innovations in the society (Chouhan, 2015). Giridhara (2013) operationalized entrepreneur as the one who undertakes an enterprise by taking personal risks in initiating change and expected to be rewarded for it. Kumar et al. (2013) stated that an entrepreneur is a person who initiates, organize the activities, manages and controls the affairs of business venture combing all the factors of production to supply goods and services. Giridhara (2013) noted that entrepreneurs need degree of freedom to purse new ideas and seize opportunities to come out with new goods and services to satisfy human needs. Kahan (2012) mentioned that entrepreneurs always determine to look for untapped opportunities to improve and expand their farm business ventures.

It is not news that entrepreneurs effectively utilize physical and financial resources for creating wealth, income and employment to reduce economic problems in the society. Nitu & Feder (2012) stated that entrepreneurs bring new products, standardize of existing products for creating new markets and new customers. Giridhara (2013) said that entrepreneurs are recognized for eliminating disequilibrium between aggregate supply and aggregate demand. Entrepreneurs also organize economic ventures for producing goods and services at lower cost with objectives of maximizing profit (Giridhara, 2013). Chouhan (2015) stated that a nation

with able entrepreneurs will always go faster on the path of industrialization compare a nation without potential entrepreneurs.

Potato farm enterprises depend on the entrepreneurial behaviour of smallholder farmers but hardly do the society thought of them as entrepreneurs. Smallholder farmers are entrepreneurs because they see their farms as a business of making profits. These farmers are so passionate about their farm business and are willing to take calculated risks to make it profitable and sustainable one (Kahan, 2012). Smallholder farmers try new crop varieties, use modern agricultural technologies to increase farm productivity, diversify production, reduces risks and to increase farm profits. Entrepreneurial farmers are more market oriented and learn how to take risks to open in new markets for their farm products (Bwisa & Doye, 2015).

2.3.   Concept of Entrepreneurial Behaviour

Entrepreneurial behaviour is simply a form of human behaviour that involved in identification and exploitation of business opportunities through creation and development of new business ventures (Bhosale *et al.,* 2014). Giridhara (2013) operationalized entrepreneurial behaviour as the extent of qualitative and innovative activities carried out by an entrepreneur in his enterprise to increase production. Entrepreneurial behaviour can be considered as the changes in the knowledge, skills and attitude of smallholder farmers toward farming enterprises (Giridhara, 2013). Entrepreneurial behaviour is an inborn attitude that compels entrepreneurial farmers to be more technically competent and innovative to thrive and survive in the business environment since farm enterprises are operated within a complex and dynamic environment (Kahan, 2012).

Konté *et al.* (2019) conceptualized entrepreneurial behaviour as the attitude, aptitude, and ability of potential entrepreneurial farmer to discover and exploit available opportunities to establish a new agribusiness venture within a particular environment. This entrepreneurial behaviour is being influenced individual, situational, psychological, social and experiential factors (Kumar *at al.,* 2013). Entrepreneurial behaviour has been cited as a major determinant of maintaining a sustainable competitive advantage leading to improvement in business performance.

Entrepreneurial behaviour was used in this present study as one of the basic competitive marketing strategies that small scale potato enterprises could exploit to build a competitive edge over their competitors in the same farm enterprises and could be used to improve the financial performance of farming enterprises. Entrepreneurial behaviour focuses on individual actions that begin from the point when a farmer participates in entrepreneurial activities

through searching for an available agribusiness opportunity to create new farm enterprise in particular competitive farming environment.

This behaviour drives an entrepreneurial oriented farmer to initiate, allocate, distribute and manage scarce economic resources to create and capture value to products and services within dynamic agribusiness climate (Palma *et al*., 2009). Recently, many agribusiness firms are using entrepreneurial behaviour as one of the defensive mechanisms to outperform rivals as a result of high competition and changes for the demand of goods and services in the competitive market. Entrepreneurial behaviour has been examined by scholars from psychological perspective. In psychology, entrepreneurial behaviour focuses on entrepreneurs' personal traits i.e. achievement motivation, autonomy, self-confidence, self-motivation, risk-taking, proactiveness, innovativeness, decision-making, planning ability, coordinating ability and information seeking. A successful smallholder farmer possesses this behaviour that enables him to achieve sustainable competitive advantage and increase performance (Kahan, 2012).

In human resource and strategic management, entrepreneurial behaviour has been cited as an inherent human capital and competitive asset agribusiness firms use to create competitiveness around new firms making competitors difficult to imitate. This behaviour drives entrepreneurial farmers to identify agribusiness opportunities and develop new products to meet customers' needs in a changing and complex agribusiness environment. All these serve as a source of the competitive edge that influences the social, economic and financial performance of small scale enterprises. Palma *et al.* (2009) cited that entrepreneurial behaviour positively influenced enterprise environment and performance of farm enterprises. According to them, the behaviour of smallholder farmer is been shaped when that person interacts more with the agribusiness climate.

Entrepreneurial behaviour compels an emerging enterprise to thrive, survive and grow in a favorable farming environment. According to Abeyranthne and Jayawardena (2014), entrepreneurial behaviour contributes to the development of an individual entrepreneurial farmer and drives that farmer to make a maximum profit from farm enterprise activities. Entrepreneurial behaviour contributes to the success of most agribusiness sectors across the food value chains at the same time promotes farm performance in terms of profitability, sales growth, market share and return on asset, return on capital employed among other related indicators (Dlamini *et al.,* 2014).

In the agriculture sector, entrepreneurial behaviour is a psychological pathway and marketing strategy used by firms to improve sustainable growth and development of agribusiness performance. It influences entrepreneurial farmers to be determined and creative

in looking for available opportunities to start a new farm enterprise and expand the enterprise in a competitive environment (Kahan, 2012).

It also helps agribusiness firms to get greater profit and grow simultaneously if that firm adopts competitive strategies. It also makes the firms to use scarce resources efficiently and effectively to achieve superior performance. Agribusiness firms should take this opportunity to develop and supply superior products that meet customers' needs to create competitive advantage (Omare & Kyongo, 2017). Entrepreneurial behaviour creates an avenue for agribusiness to function well in entrepreneurial environment. The entrepreneurial environment can positively or negatively influence performance of agribusiness. Kahan (2012) acknowledges that most entrepreneurial farmers look for opportunities to create and introduce new products and services to market which their competitors find difficult to copy. Fayaz (2015) postulates that entrepreneurial skills influence successful smallholder farmers to perform better in the agribusiness which contributes to economic growth and development of developing and developed economies. Entrepreneurial behaviour serves as a direct link between competitive advantage and performance of farm enterprises. This behaviour enables most agribusiness firms to achieve and maintain a sustainable competitive advantage over a long time in the business operations.

Entrepreneurial behaviour can be considered as the ability of smallholder farmers to introduce new products to the market by taking calculated risks searching for information and making effective decisions concerning those products. Most smallholder farmers display common personal characteristics i.e. innovativeness, decision-making, and leadership, risk-taking, coordinating, planning and organizing ability and allocating scarce resources to make them perform very well in farm enterprise activities (Mubeena *et al.*, 2017). A study conducted by Khalid *et al.* (2016) provides more insight into entrepreneurial behaviour. The study found that achievement needs, legitimacy seeking behaviour and risk-taking ability as the major determinants of high performance of micro and small livestock-based enterprises in the North Eastern Region of Kenya. Wanole *et al.* (2018) postulate that innovativeness, farm decision-making achievement motivation, information-seeking behaviour, leadership ability, cosmopoliteness and risk-taking ability of farmers play a significant role in increasing agricultural farms performance of micro and small banana-based enterprises in Uganda.

Entrepreneurial behaviour can be classified into five major components relevant to entrepreneurship studies. These components include background, entrepreneurial intention, agri-enterprise environment, resourcefulness, and behaviour. The background components are the individual factors that have both positive and negative influences on the farmer's way of

thinking and reaction (Williams, 2010). These factors are known as demographic and psychological characteristics include personal attitude, situation, and intentions. Entrepreneur's attitude may also affect the behaviour of that farmer to start a new farm enterprise. The situation causes the farmer to decide to venture into a new farm enterprise by comparing two or more opportunities depending on the availability of scarce resources. At last entrepreneur chooses the best alternative opportunities among the available options.

Entrepreneurial intentions are another competitive strategy employed by a smallholder farmer to set a certain goal and objective to achieve desirable results. The entrepreneurial environment influences the entrepreneur's willingness to venture into entrepreneurial activities. The enterprise environment has a direct influence on behaviour of the smallholder farmer and farm performance. The farm enterprise environment is influenced by political, cultural, demographic, economic, technology, and social factors. These factors positively or negatively influence performance of farm enterprise (Kimuru, 2018). Some cultural settings do not allow a certain agribusiness operation; those farm enterprises are likely to perform poorly. Entrepreneurial environment can be classified as government policies, socio-economic conditions, entrepreneurial and business skills, access to financial support (William, 2010).

2.4. Dimension of Entrepreneurial Behaviour

Entrepreneurial behaviour consists of seven to thirteen elements: Achievement motivation, autonomy, innovativeness, proactiveness, and cosmopoliteness behaviour, decision-making ability, and locus of control, information-seeking behaviour, risk-taking propensity, and self-efficacy, self-confidence, coordinating and planning ability. These components are perceived differently by researchers (Mudiwa, 2018). This study is limited to six major elements which are mostly use in entrepreneurship studies. Those dimensions include risk taking, proactiveness, innovativeness, information-seeking behaviour, cosmopoliteness and decision-making ability behaviour of smallholder potato farmers in Molo Sub-County. These various dimensions can make potato smallholder farmers achieve a competitive advantage and improve performance of small scale potato enterprises in Molo Sub-County.

2.4.1. Risk-taking ability

The ability to take calculated risk is used to describe the trade-off between accepting higher risk to gain higher profits (Jelle, 2016). These risks include psychological risk, production risk, marketing and financial risk. In most agriculture fields, the main risks that affect farmers are production and marketing risks.

According to Mudiwa (2018), high risk-takers have the qualities of high decision-making, self-awareness, analytical and effective information management. Kumar *et al.* (2012) stated that high risk takers are energetic, hardworking, result-oriented, realistic goal achievers, persistent, determined and responsible for actions taken in farm enterprise activities. Boruah *et al.* (2015) stated that the majority (55%) of vegetable growers had medium level of risk-taking ability followed by high (27.5%) and low (17.5%) in Jorhat District of Assam.

Mubeena *et al.* (2017) found that rural women had 73.34% of medium level of risk-taking ability followed by low (26.66%) and high (0%). The main reason was that these women had a low socio-economic profile and they thought that taking risks would lead to low economic gain making them unable to take risks to introduce a transformation or change unless others tried and use them. This study used risk-taking behaviour is as a pathway to provide a competitive advantage and increase performance of potato farms. The risk taking components used in the study were trying of new seed varieties and new potato production techniques. Based on the risk-taking ability behaviour score, the respondents were classified into three groups namely, low, medium and high on the basis of Mean ± Standard deviation.

2.4.2. Proactiveness behaviour

Proactive behaviour is a term used to describe the ability to take initiatives by anticipating and pursing new opportunities and by participating in the emerging markets. It is the propensity of business firms towards seeking new opportunities which may not be related to the present line of operations, introduction of new products and brands ahead of competitors (Vora *et al.,* 2012). Okangi (2019) noted that a business firm that follows the proactive approach in the market continuously seeks to bring improvements in its operations through acquisition of entrepreneurial knowledge.

A business firm with high proactive behaviour has forward looking attitude and ability to change the business environment by thinking ahead of competition (Aladejebi and Olufemi, 2018). This behaviour makes organizations becoming a pioneer in the market by introducing new product lines and exploiting the market opportunities through their own innovation (Vora *et al.,* 2012). It drives firms to become market leaders because of their early responsiveness to market signals. An entrepreneurial farmer looks for more agribusiness opportunities and seize them at the same time seek relevant information to introduce new products and services ahead of his competitors.

Kontè *et al.* (2019) explained that smallholder farmers are proactive in searching for active information and available opportunity in the agribusiness environment. In this study,

proactiveness behaviour of smallholder potato farmers can lead to the creation of competitive advantage and improvement of farm performance in Molo Sub-County, Kenya. The study used identification and exploitation of new market opportunities ahead of competitors and trying of new production techniques before other potato growers as proactiveness behaviour. Based on the proactiveness behaviour score, the respondents were classified into three groups namely, low, medium and high on the basis of Mean ± Standard deviation.

2.4.3. Innovativeness behaviour

Innovativeness is considered as the ability of potential smallholder farmer to introduce new products and services in a perfectly competitive farm market. An innovative farmer search and exploit on agribusiness opportunities to bring out new farm products to satisfy customers in the market place (Jelle, 2016).

Innovative smallholder farmers have creative spirits and willingness to introduce new products and services in a competitive environment. They are resource people and valuable assets recognize by the business community. Innovativeness behaviour can influence entrepreneurial farmers to create competitive advantage leading to high performance of potato farms. Innovative farmers have creative spirits and willingness to introduce new products and services in a competitive environment.

Boruah *et al.* (2015) in their study on entrepreneurial behaviour of tribal winter vegetable growers in Jorhat District of Assam found that the majority (73.34%) of growers had medium level of innovativeness followed by high (13.33%) and low (13.33%). Mubeena *et al.* (2017) stated that most (69.16%) of the rural women had medium level of innovativeness followed by low (18.34%) and high (12.50%). The possible reason was that not only did rural women avoid a change but also they were not prepared to take risks, and make efforts to introduce new products in the market due to their low educational background and economic status. In this study, trying locally available materials to control weeds, pests, and diseases were used as the innovative behaviour of potato growers.

Porchezhiyan *et al.* (2014) found out that innovativeness had a significant relationship with education, dairy farm experience, attitude towards dairy farming, knowledge of farming enterprise and milk production. Based on the innovativeness behaviour score, the respondents were classified into three groups namely, low, medium and high on the basis of Mean ± Standard deviation.

2.4.4. Information-seeking behaviour

This is the personal attitude and behaviour of an individual farmer to search for reliable information outside the farm enterprise environment to gain competitive advantage and increase farm performance. Boruah *et al.* (2015) postulated that the majority (70.84%) of vegetable growers possessed medium level of information-seeking behaviour followed by high (15%) and low (14.16%).

Mubeena *et al.* (2017) cited that most (80%) of the rural women had medium level of information-seeking behaviour followed by low (19.16%) and high (0.84%). The possible reason for this trend was that most of the rural women had no access to information from newspapers, magazines, and television among other social media platforms in the rural area due low literacy level and poor economic status. The study also found that the low paying capacity of the rural people made women unable to have a better contact with information channels in the rural area. In this study, information-seeking behaviour was used as an attribute of gaining competitive advantage leading to high performance of small scale potato enterprises.

Porchezhiyan *et al.* (2014) also stated that information-seeking behaviour had a positive and significant association with education, social participation, annual income, land holding, livestock possession, milk production, extension participation, knowledge of farm enterprise and attitude towards dairy farming. The study employed the usage of social media platforms and mobile applications as a mean of accessing the information on potato farming from both formal and informal sources. Based on the information-seeking behaviour score, the respondents were classified into three groups namely, low, medium and high on the basis of Mean ± Standard deviation.

2.4.5. Cosmopoliteness behaviour

Cosmopoliteness is one of the aspects of entrepreneurial behaviour that motivates an individual smallholder farmer to look for information outside the farm environment to create competitiveness as well as to improve farm performance. Cosmopoliteness behaviour drives entrepreneurs to join social groups within or outside his farming community. Boruah *et al.* (2015) stated that the majority (65.83%) of growers had medium level of cosmopoliteness followed by high (23.34%) and low (10.83%) in Jorhat District of Assam.

Porchezhiyan *et al.* (2014) cited social participation, extension participation and scientific orientation as crucial factors in improving livestock enterprises performance. Mubeena *et al*. (2017) found that most (62.50%) of the rural women had medium level of cosmopoliteness behaviour followed by low (20.83%) and high (16.67%). The possible reason

for the above trend was that rural women kept personal contacts with marketing agents in their farming community and sell produces through these agents than selling outside the community.

Through these organizations they were able to sell their farm products without selling to outsiders. These smallholder farmers participated in entrepreneurial training, exhibitions and agricultural trade fairs outside their farming community. In this current study, seeking information outside the farming community, participation in agricultural workshops and field would make smallholder potato farmers to gain more knowledge on potato farm management. Based on the cosmopoliteness behaviour score, the respondents were classified into three groups namely, low, medium and high on the basis of Mean ± Standard deviation.

2.4.6. Decision-making ability

An entrepreneurial farmer can select the best choice among the alternative and available options concerning farm enterprise activities to build and maintain a sustainable competitive advantage through effective decision-making process. A study conducted by Boruah *et al.* (2015) reported that most (68.34%) of the vegetable growers had moderate decision-making ability followed by poor (17.5%) and good (14.16%) decision-making ability in Jorhat District of Assam.

Mubeena *et al.* (2017) established that the majority (59.16%) of rural women had medium level of decision-making ability followed by high (21.68%) and low (19.16%). The study found that rural women had quality of choosing the best alternative course of action and they were not frightened for failures rather than anticipated for accomplishment of their ambitions in farm enterprise activities.

Porchezhiyan *et al*. (2014) cited that education, dairy farming experience, attitude towards dairy farming, knowledge of farming enterprise, milk production, landholding, annual income, social participation, livestock possession, and scientific orientation had a significant and positive relationship with performance of livestock enterprise. The study used decision-making ability as a crucial tool to build and maintain competitive advantage and enhance performance of small scale potato enterprises in Molo Sub County, Kenya.

Growing of certified seed potatoes and observing good agricultural practices were used as decision making ability behaviour of smallholder potato growers. Based on the decision-making ability behaviour score, the respondents were classified into three groups namely, low, medium and high on the basis of Mean ± Standard deviation.

2.5. The Concept of Competitive Advantage Strategies

Competitive advantage is the position of superior performance achieved by an enterprise through leadership, cost, and differentiation to be successful in the agribusiness operations (Porter, 1990). It is one of the agribusiness strategies used by a farm enterprise to outperform their competitors in the same agribusiness venture. The competitive advantage distinguishes individual farm enterprises from the competitors. Milao (2012) states that some farm enterprises use low production cost, high-quality products, product reliability, customer loyalty, process and product innovation, a better farm enterprise location, creating direct market channels and productive resources as strategic pathways to attain competitive advantage. Entrepreneurial farmers employ competitive advantage as a crucial tool to create and capture value as well as to attract the attention of cherished customers to pay more to get high-value farm products in the small scale potato enterprises (Kahan, 2012).

In addition, competitive advantage drives new and emerging entrepreneurial farmers to massively increase food crop production, productivity and growth (Dziwornu, 2014). Competitive advantage enables entrepreneurial farmers to compete with other farmers from different places in a competitive market environment (Dlamini, 2012). The competitive advantage assists agribusiness firms to get higher profits from business operations and activities than competitors in the same agri-industry. Agribusiness ventures that create competitive advantage attract and please potential customers. The enterprise also gains market leadership position, compete successfully and that enterprise grows very well in the competitive environment (Vinayan *et al.,* 2012). Competitive advantage is the road map for every agribusiness firm to achieve competitiveness by using its resources and capabilities efficiently and effectively. Most agri-industries use the competitive advantage as a valuable intangible asset to meet social, economic and financial farm performance objectives.

Competitive advantage enables entrepreneurial farmers to meet market needs, respond to changing market conditions to outcompete rivals selling the same products (Kahan, 2012). According to Huang (2012), farm enterprises use porter's competitive rivalry model as a strategic pathway to beat competitors in the same agri-industry. These strategy pathways include price competition, product introduction, differentiation, farm diversification, increased customer service, and advertising (Wang, 2014). These strategy pathways lead to an increase in farm performance by obtaining high profitability. In this study, competitive advantage used were value addition thus (grading, sorting), differentiation, and farm diversification. Competitive advantage in this study can be used as a strategy to create employment opportunities, alleviate poverty and improve social welfare among smallholder potato farmers.

It ensures sustainable food security in farm and non-farm households that brings about economic and financial growth and development to the Kenyan economy.

2.6.   Empirical literature on competitive advantage strategies in Agriculture

An empirical study conducted by Dziwornu (2014) found cost of day-old chick, feed labor, vaccine, operating cost, broiler market age and capacity utilization as the main factors affecting competitive advantage of broilers agribusiness in Ghana. In this study, variable cost of production was used as yardstick for achieving competitive advantage. The study recommended that reduction in production cost particularly feeding could promote competitive advantage in the broiler production. Karuoya (2014) conducted a study about factors influencing sustainable competitive advantage among cut flower company in Naivasha, Kenya. The study stated that human resources, infrastructure, location and horticultural clusters influenced sustainable competitive advantage of the companies.

The competitive advantage strategies employed in the study were exports volumes, new flower products, production methods and cost reduction. The infrastructure components used were access to potable roads, water supply, electricity, telecommunication and airport. Access to transport, irrigation, availability of cheap labor and good climate conditions were used as location. Judgement and intelligence, knowledge experience, and skills were employed as human resources and foreign investment, bargaining power for member organizations, and improved accessibility of resources were used as horticultural clusters that influenced sustainable competitive advantage.

Dlamini *et al.* (2014) found that unavailability of unprofessional labors, cost of inputs, incompetent of public sector personnel were the main factors influencing competitiveness of agribusiness firms in Swaziland. All the above literature reviewed failed to incorporate entrepreneurial behaviour is one of the major key determinants of agricultural growth and development in Sub Saharan Africa. In addition, there is inadequate literature on entrepreneurial behaviour and competitive advantage strategies used by the smallholders in the agribusiness sector. Dlamini (2012) in his research recommends that the government and other stakeholders need to quantify the competitiveness status of the agribusiness sector.

2.7.   Contribution of Small-Scale Enterprises in Economic Growth and Development

Small and Medium Enterprises (SMEs) can be defined as enterprises that provide basic commodities to feed and clothe approximately 1.5 billion people as well as provide income to improve their livelihood around the world (Gichichi *et al*., 2019). Small and Medium

Enterprises (SMEs) are recognized worldwide as the major drivers of economic growth and development (Ingasia, 2017; Thuku, 2017). Small and Medium Enterprises (SMEs) sector enhance competition among entrepreneurs producing the same the products or services to the same consumers (Katua, 2014). It has been indicated that small and medium enterprises account for 99.7% of all the enterprises created at the same time it employs about 45% of most employees working in private sectors. Kimuru (2018) and Muturi (2016) postulate that Small and Medium Enterprises employ 70 to 85% of employees in any economy worldwide.

Fariza (2012) highlighted that SMEs contribute to more than 55% GDP in the developed countries. For instance, in 2012, SMEs contribute to 40%, 52%, 55% and 47.5% of the GDP in India, Japan, Sri Lanka and Thailand (Fink, 2012). It contributes to more than 47% of Singapore's GDP and creates sustainable self-employment to 62% of entrepreneurs. There are about 21 million SMEs located in the European Union (EU). It provides more than 59 million jobs to young, middle and old entrepreneurs as well as representing 73% of all enterprises in the union (Kimuru, 2018). In the year 2011, SMEs provide 48% GDP and employ 4.47% million entrepreneurs accounting 1.48 trillion British pounds in the United Kingdom. The enterprises support 65% of entrepreneurs in the countries like Germany, the United States of America and the United Kingdom respectively.

Small and Medium Enterprises dominant most business sectors in Sub-Saharan Africa. It accounts for between 60%-90% of all the major enterprises as well as provides 41% of self-employment and contributes to more than 50% of GDP (Kawira et al., 2019). In countries like South Africa, Nigeria, Kenya, and Ghana respectively, SME contributes 60% to GDP and supports 70% entrepreneurs. In the countries like Benin and Togo, micro and small enterprises support over 95% entrepreneurs. Most studies classified enterprises as micro enterprises, small enterprises and medium enterprises based on the size, number of people employ and an annual turnover (KNBS, 2018). Micro enterprises employ enterprise workers below 10 with annual turnover less than or equal to KSh 500 thousand. Small enterprises employ 10 to 49 workers with annual turnover less than or equal to KSh 5 million. Medium enterprises employ 50 to 249 workers with annual turnover less than or equal to KSh 500 billion (Kimuru, 2018).

In Kenya, the agribusiness sector has a large proportion of micro and small enterprises which generate 60 % of the export earnings annually (Gichichi et al., 2019). Small and Medium Enterprises in Kenya provide good and services, enhance competition, forest innovation, generate employment as well as reduce poverty level among the citizens (Kimathi et al., 2019). The purpose of engaging in SMEs in Kenya is to promote, develop and regulate SMEs by providing an enabling environment, facilitating access to business development services,

formalization and upgrading of informal SMEs as promoting an entrepreneurial culture among the entrepreneurs in the country. (GoK, 2012). SMEs comprise 75% of business enterprises and account for 87% of new jobs created in Kenya (Mugo, 2016).

According to Kawira *et al.* (2019), the SMEs sector employs 14.9 individual entrepreneurs with the output of KSh 3,371.7 billion against the national output of KSh 9,971 billion in 2015. The sector contributes 33.8% to the country's GDP. The contribution of Small and Medium Enterprises relation to gross add valued in the year 2015 was 1,780 billion compared to KSh 5,682 billion the whole Kenyan economy. SMEs employ below 50 enterprise workers with annual turnover between 500,000 to 5 million Kenya shillings. Medium enterprises provide employment to 50 and 100 workers respectively (Douglas *et al.*, 2017). They are classified as formal and informal enterprise sectors where formal enterprises are registered and licensed unlike informal enterprises are not registered and licensed under Kenyan business law. The formal sector alone creates more than 713,600 new jobs to citizens accounting for 84.8% inclusive of farm enterprises in Kenya. (KNBS, 2016).

Small and Medium Enterprises (SMEs) are classified as farming enterprises, manufacturing, service providers and trading enterprises in Kenya (Thinju and Gichira, 2017). Small and Medium Enterprises promote and increase competition, enhance innovation, and creation of employment opportunities and income generation amongst potential entrepreneurs across the manufacturing, service, trading and farming enterprises respectively. Marlow and McAdam (2013) cited that most of the SMEs start small and remain the same during the period of the enterprise leading to their vulnerability to market shocks, price takers and receive small market shares. Kenya National Bureau of Statistics (KNBS, 2018) stated that over millions of SME's die every year in Kenya due to harsh and high competition among emerging and existing enterprises. In 2016 alone, above 2.2 million small and medium enterprises were closed down due to poor entrepreneurial behaviour and lack of competition leading to poor performance. Statistically, over 400,000 small and medium enterprises in Kenya do not live to celebrate their second anniversary in enterprise operations. This accounts for 46% due to poor personal profile and entrepreneurial behaviours of respective enterprise owners (KNBS, 2018).

2.8.   Measurement of Performance of Small-Scale Enterprises

Many researchers measured performance of farm enterprises in terms of financial, non-financial and subjective indices. Most researchers measure performance of enterprises in financial perspective in terms of sales growth, profitability, market share, annual turnover, return on asset, and return on investment, return on capital employed. Douglas *et al.* (2017)

measured the performance in terms of profitability, returns on investment and number of employees engaged, market share, turnover, sales, and value-added. Saunila (2016) perceived enterprise performance in two dimensions; financial and operational performance. The above study measures financial performance using turnover, net profit, and return on investments, market share, employment levels, customer satisfaction, meeting personal goals and expanding infrastructure. Operational performance was measured in terms of how the enterprise achieved its set goals and objectives. This study measured performance of potato enterprises in terms of profitability since farmers set up farm enterprises with the purpose of making high profits.

2.9. Empirical Studies about effect of Entrepreneurial Behaviour on Performance of Small-Scale Enterprises

According to Kontè *et al.* (2019), smallholder farmers in Niono, Mali possess self-initiation behaviour, self-efficiency, risk-taking, innovativeness, previous-failure, and proactiveness. The study concluded that entrepreneurial behaviour, socio-economic and institutional factors affect the performance of small scale farm enterprises. Age, land size, network, business training, distance to extension service providers and innovativeness have positive influence farmers' decision on the uptake of government initiatives. Household size, initiation a previous failure does not affect uptake, education, access to a model farm, access to credit, innovativeness, initiation reduce post-harvest losses whereas sales and profitability were influenced by household size, total land size and access to a model farm. The findings revealed that risk-taking and proactiveness do not farmers' decision to uptake government initiatives. Finally, the study did not take into account decision-making ability, information-seeking behaviour and cosmopoliteness of farmers and competitiveness.

Wanole *et al.* (2018) found that motivation, innovativeness, farm decision-making, risk-taking, information-seeking behaviour, leadership ability and cosmopoliteness, education level, family size, annual income, farming experience, land holding, social participation, use of mass media, economic and market orientation influence performance of micro and small banana growers in Uganda. The study fails to document the competitive advantage of banana growers. Tarus *et al.* (2016) noted that innovativeness, self-efficacy, social network, and education have a positive influence on students' entrepreneurship in Kenya. Khalid *et al.* (2016) revealed that legitimacy seeking behaviour, risk-taking, and achievement motivation influence performance of micro and small livestock enterprises.

Wanyonyi and Bwisa (2015) reported that age, gender, marital status, occupation, extension contact, extension participation, economic motivation and scientific orientation, risk

orientation, decision-making ability, achievement orientation have influence while scientific orientation, economic motivation, education, and farm size have no influence on cabbage farmers in Kiminini Ward, Trans-Nzoia County of Kenya. The findings indicated that although decision making ability, innovation and risk orientation of farmers' influence cabbage farmers, famers need to improve upon these entrepreneurial behaviour traits to increase productivity, income, and employment of cabbage farmers.

Kaunda (2012) reported that entrepreneur proactiveness has a positive influence on small business performance while risk-taking and innovativeness of entrepreneurs have a negative influence on small business performance in Johannesburg. The age of entrepreneurs influences agribusiness performance where an increase in age brings a reduction in agribusiness performance. Most of these studies find the relationship between agripreneurial behaviour and farm performance in trading, services, and manufacturing and agriculture sectors. All the reviewed literature used different analytical techniques such as Analysis of variance, multinomial logistic, hierarchical regression, and multiple linear regression, multivariate probit and structural equation modeling to measure the effect of entrepreneurial behaviour and performance of small scale potato enterprises. For instance, Karus *et al.* (2012) used hierarchical regression to measure the effect of entrepreneurial behaviour on performance of business firms. Kaunda (2012) used multivariate regression to determine the effect of entrepreneurial orientation on performance of small scale enterprises.

The current study used multivariate probit to measure the effect of entrepreneurial behaviour and competitive advantage among small scale potato enterprises. Seemingly unrelated regression was used to determine the effect of entrepreneurial behaviour on farm performance. This study intended to document the role and impact competitive advantage among small scale potato enterprises. Smallholder potato farmers can use this competitive advantage as a strategy to increase high farm performance of potato enterprises in Molo Sub-County. The research gap existed where most of the literatures reviewed were unable to link entrepreneurial behaviour of smallholder farmers and competitive advantage strategies adopted by these famers with the farm performance of their small scale enterprises. Thus, this present study will look at the effect of entrepreneurial behaviour on competitive advantage and performance of small-scale potato enterprises in Molo Sub County, Kenya.

2.10. Theoretical Framework

The study adopts entrepreneurial behaviour theories and competitive advantage theories from previous studies. The entrepreneurial behaviour theories used were Neoclassical,

Austrian and behavioral. Competitive advantage theories employed in this study were both resource and market-based view theories respectively.

2.10.1. Entrepreneurial Behaviour Theories

The study compares entrepreneurial behaviour of smallholder potato farmers using three different schools of thought; Neoclassical, Austrian and Behavioral theories. Neoclassical theory focuses on production theory in a competitive market structure where there are many buyers and sellers, producers are price takers, free entry and exit, and homogenous products.

In the neoclassical theory, entrepreneurship is treated as one of the factors of production apart from land, labor, and capital (Endres & Wood, 2006). Surprisingly, most economists tend to remove entrepreneurship from the production function because scholars thought entrepreneurship is not a scarce resource unlike land, labor, and capital used to produce and market agricultural products. Entrepreneurial behaviour is a valuable scarce resource and competitive asset farm enterprises can employ to achieve competitive advantage leading to high farm productivity and profitability. According to neoclassical theory, actual entrepreneurial farmers make an effective decision on how to allocate and use scarce resources to produce products in a competitive market by taking a risk. The theory highlights the function of smallholder farmers. According to the theory, entrepreneurial farmers have equal access to the same technology and receive all profits of risk-taking. The neoclassical entrepreneurial farmers are risk neutral, so that a unit of entrepreneurial labor input is homogenous in respect of risk attitude (Endres & Wood, 2006). The theory has a notion that entrepreneurial farmers are the principal decision makers and enjoy free entry and exit in the industry. Most entrepreneurial farmers always minimize cost to make maximum profits from their businesses. These entrepreneurs list all alternative opportunities for allocating resources in an equilibrium manner in existing markets. The neoclassical entrepreneurial farmers find opportunities evenly distributed in the market (Endres & Wood, 2006). They determine all the possible consequences of acting upon an opportunity and have access to information required initially to perceive alternative opportunities and their consequences. Entrepreneurial farmers are willing and able to seek and acquire more relevant information to achieve competitiveness.

In Austrian theory, farmers are omitted from being part of deployable input need to produce goods (Endres & Wood, 2006). The theory has a notion that entrepreneurial farmers seek opportunities for gainful exchange over time thus they are not conceived as part of a unique class of risk bearers distinguishable from laborers, consumers and managers. Profit opportunities are created by existing market circumstances. The profit opportunities are not all

discovered and exploited instantly and are unlikely to be recognized by all entrepreneurial farmers even if they are furnished with the same market information. Austrian theory stated that entrepreneurial farmers are opportunity seekers and are not considered as risk-takers. The theory says the market is driven by entrepreneurial alert, entrepreneurial farmers look for profit opportunities in the enterprise environment where profit opportunity is a determinant of entrepreneurial action and there is information symmetry in the market place.

Behavioral theory focuses on the identification of profit opportunity in the enterprise activities. The theory assumes that profit making opportunities are not always available in most market circumstances for entrepreneurial farmers. Profit opportunities for entrepreneurial farmers are not straight forwardly and objectively representable. They must be distinguished from entrepreneur's perception. Profit opportunities are generated by bounded rational individuals using heuristics (Endres & Wood, 2006). The profit opportunities are deliberated upon in a non-optimizing serial cognitive process involving mental construction both of the opportunities and aspirational levels associated with them. Opportunities normally appear to the entrepreneurial farmer in complex, uncertain and rapidly changing environment and are never available in an exhaustive set.

2.10.2. Competitive Advantage Theories

Resource based-view and market based-view are the main theories used in most competitive advantage studies. Resource based-view gives rise to knowledge based-view and capability based-view in human resource and strategic management.

2.10.2.1 Resource Based-View Theory

The Resource Based-View (RBV) argues that sustained competitive advantage is generated by the unique bundle of resources at the core of the firms (Wekesa, 2015). The resources are the key to superior firm performance and the resources enable firms to gain and sustain competitive advantage (Milao, 2018). Entrepreneurial farmers build their farm businesses from the resources and capacities available in the business. These resources include physical resources, capital resources, and human resources. The resources can be tangible or intangible that makes an enterprise to attain a competitive advantage through improving its performance. RBV view firms as the collection of unique resources and competencies employed by agricultural enterprises making them successful and sustainable. It focuses on the internal environment of the enterprise where resources and capabilities are the major determinants. These resources are the primary inputs used to produce an output in any farm

enterprise which tends to be one of the best organizational strategies. The resource based-view argues that for a farm enterprise to achieve competitive advantage, it needs to have key resources, resources that have values and various strategic choices (Wang, 2014). The study regards entrepreneurial behaviour as an important resource that could be used by farmers to achieve a competitive advantage in potato enterprises. Entrepreneurial behaviour can help smallholder farmers enhance performance of their small-scale potato enterprises through an increase in farm productivity and profitability.

2.10.2.2. Market Based-View Theory

Market Based-View (MBV) theory argues that an enterprise performance is determined by industry factors and external market orientation through the use of strategic positions. Strategic positions define how a farm enterprise performs similar activities to other enterprises but in different ways. Enterprise performance is determined by the structure and competitive dynamics of the enterprise environment. The market based-view focuses on the environmental factors where performance depends on the enabling environment. To achieve a competitive advantage, enterprises must develop good competitive strategies in response to the structure of the enterprise based on the five forces model. Market based-view has three sources of market power; monopoly, barriers to entry and bargaining power. Whenever a farm enterprise has a monopoly; it has a strong market position which leads to better performance. High barriers to entry for new competitors reduce competition among businesses. Higher bargaining power relative to suppliers and customers can lead to agribusiness performance. Porter's five forces model has two limitations by assuming the perfect market and determinant of profitability are firm-specific rather than industry-specific (Wang, 2014).

2.11. Diamond Competitive Advantage Determinants

The present study was based on Porter competitive model. According to Porter (1990), the environment in which firms compete and promote the creation of competitive advantage is shaped by a number of competitive determinants. The competitive determinants include factor conditions, demand conditions, related and supporting industries, firm strategy, structure and rivalry, government attitude and policy, and the role of the chance (Porter, 1990; 1998). These factors determine the competitive environment in which farm enterprises compete and shapes its success. When the farm enterprises use its resources and capabilities to achieve a lower cost structure, then it creates a competitive advantage as postulated by Porter (1985). This study limited to factor conditions as one of the determinants that shape the farm environment in which

potato enterprises compete that promote the creation of competitive advantage in the small-scale potato enterprises (Abei & Van Rooyen, 2018). The factor conditions depend on the quantity, quality and cost of the human, physical, knowledge, capital as well as infrastructural resources of the potato farm enterprises (Dziwornu, 2014). The potato farm enterprises involve the use of resources or inputs such as skilled labor, location entrepreneurial behaviour skill among others. The resources are likely to determine the factor condition, and ultimately competitive advantage in the potato sector.

2.12.   Conceptual Framework

Conceptual framework is a graphical representation that shows the interaction between dependent variable and independent variables. The study adopted Porter's Diamond competitive model but focused only on factor conditions. As shown in the conceptual framework, the factor conditions affect both the competitive advantage and farm performance directly. The competitive advantage also directly affects performance. Take an example, the government policies will affect competitive advantage in the sense that whatever policies they make will make the farm businesses abide by it. Let's say the smallholder potato farmers want to sell the potatoes at the local market, they are certain standards that they have to meet for them to trade in the local market. Similarly, through policies such as taxation, licensing, and use of 50 kg bags, farm margins will reduce since part of their money will have to be remitted to the government through taxes and licenses. So in one way or the other, these policies affect smallholder potato farmers indirectly.
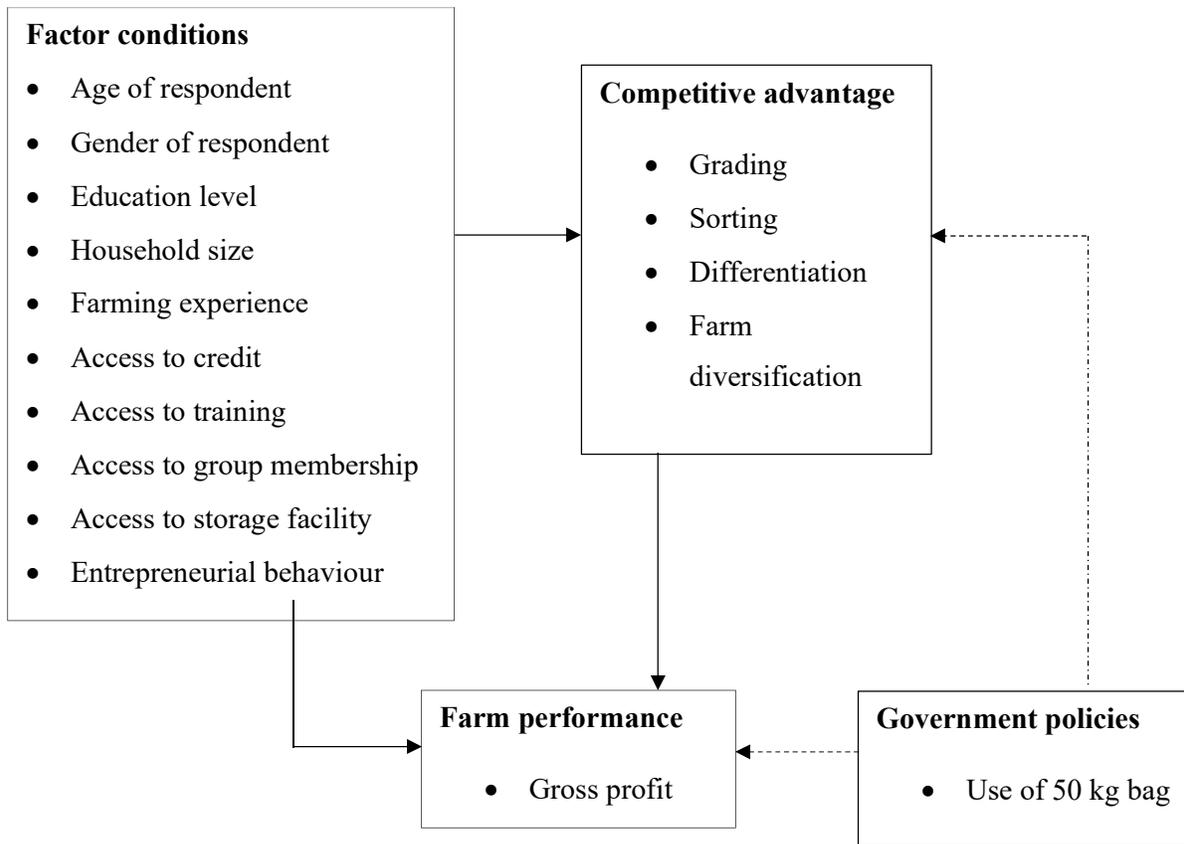
Figure 1: Entrepreneurial Behaviour Variables and their effect on competitive advantage

CHAPTER THREE
METHODOLOGY

3.1.   Study Area

Nakuru County is the 32nd county out of the 47 counties in Kenya. It has a total population projection of 1.2 million. The county shares a border with eight counties; Kericho and Bomet to the West, Baringo, and Laikipia to the North, Nyandarua to the East, Narok to the South-West and Kajiado and Kiambu to the South. The county has a total land area of 7,495.1 Km² and is located between Longitude 35 º 28` and 35º 36` East and Latitude 0 º 13 and 1º 10` South (GoK, 2018). This County covers an altitude of between 1800-2300 m above sea level with a rainfall pattern ranges between 1100 and 1400 mm per annum. Nakuru County is a major potato producing zone in the central Rift Valley. The County was selected as the study area due to its second-largest producer of potatoes in the country after Nyandarua (GoK, 2018). The county has eleven sub-counties which include Molo, Gilgil, Njoro, Subukia, Bahati, Rongai, North Kuresoi, South Kuresoi, Naivasha, Nakuru East town and Nakuru East town. The county engages in food and cash crop production, fish farming and livestock production. Nakuru County aims to improve agricultural productivity and increase incomes through improved farm yields, value addition and adoption of modern technologies. The county also seeks to enhance more job creation through funding MSEs and the creation of market linkages for smallholder farmers in the agriculture sector (GoK, 2018). The main cash crops grown include horticulture and floriculture with food crops like: maize, potatoes, beans, and wheat. The county also grows vegetables; kales, cabbage, carrots, onion, peas, French beans, and strawberries. About 273, 7110.60 Ha of land is used for food crops and 71,416.35 Ha for cash crop production in Nakuru County. The average farm size hold per farm household is below one hectare (0.77 Ha). The agriculture lands are mostly used for food and cash crop farming with the remaining land unutilized. The majority of the lands used for commercial farming are located in Molo, Njoro, Rongai and Naivasha Sub-County.

The study was conducted in Molo Sub-County within Nakuru County. Molo is one of the sub-counties located in Nakuru County which is along the Mau Forest and runs on the Mau Escarpment with a 2018 population projection of 42,866. This sub-county shares border with North and South Kuresoi, Njoro and Rongai Sub Counties. It has four administrative wards such as Elburgon, Molo, Marioshoni and Turi. It is the second-largest producer of potatoes in the country. Apart from potato farming, the sub-county also grows maize and barley with vegetable crops like kales, cabbage, and carrot (GoK, 2018). Molo Sub-County falls under zone three with a rainfall pattern of between 1100 and 1400 mm per annual as well as covers areas

with an altitude of between 1800-2300 m above sea level which is suitable for agricultural activities (GoK, 2018).
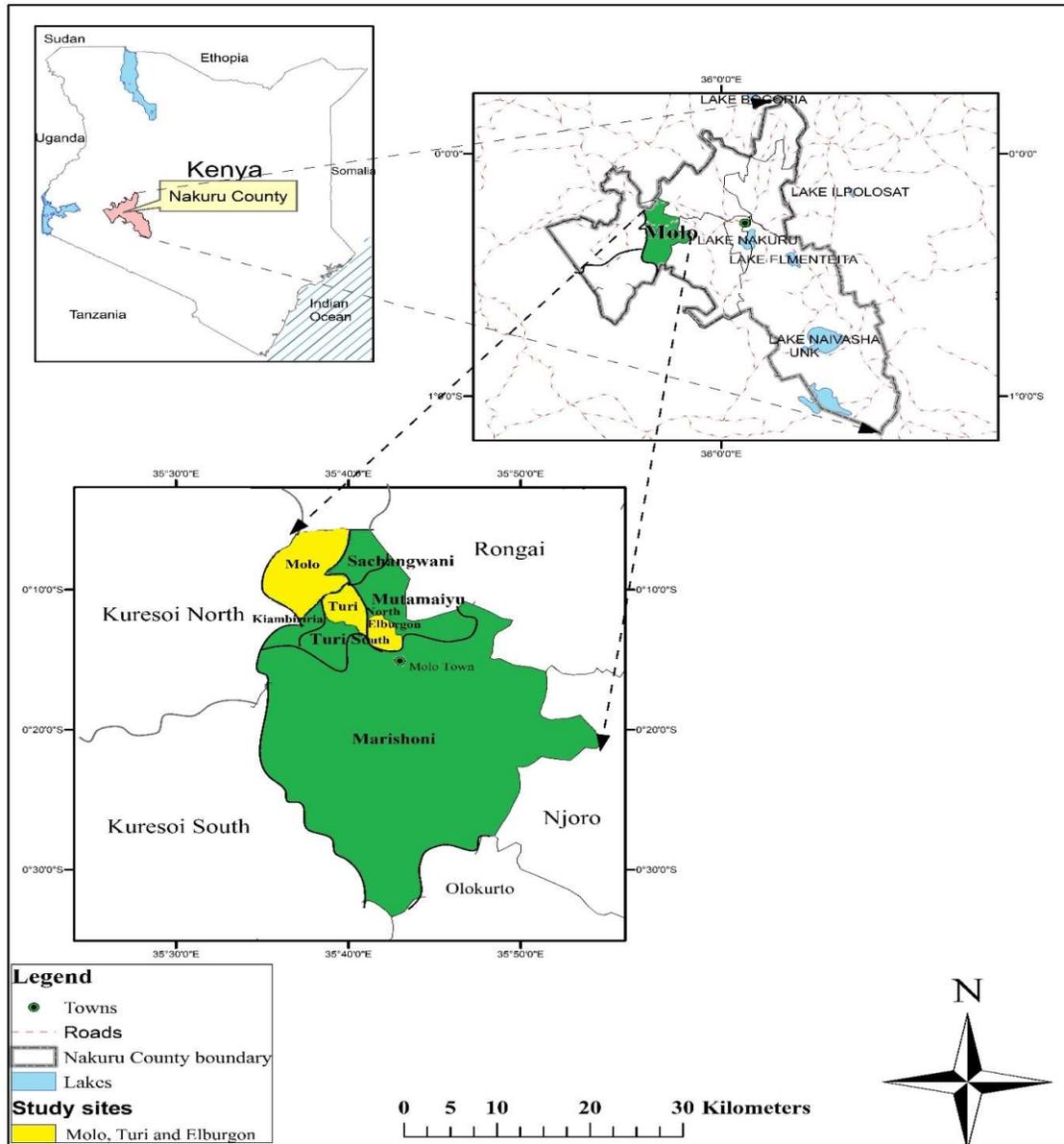

Figure 2: Map of the study area

Source: Department of Geography, Egerton University

3.2. Research Design

The study used a descriptive research design to produce statistical information about entrepreneurial behaviour, competitive advantage and performance of small-scale potato enterprises that interest policymakers and other crucial stakeholders in the potato value chain

in Kenya. This research design allows the researcher to gather information, summarize, present and interpret data for the purpose of clarification. The descriptive research design was suitable because the researcher collected data and report it the way the situation was without manipulating any variables. This design enabled the researcher to make inferences and generalizations about the population of interest.

3.3. Target Population and Respondents of the Study

The target population for this study was smallholder potato farmers who cultivated potatoes on less than five acres of farmland in Molo Sub-County. According to a report from Sub-County agricultural officer, there are 6,678 smallholder potato farmers in the three selected wards engage in small scale potato enterprises.

3.4. Sampling Procedure

The present study used a multistage sampling technique to sample smallholder potato farmers. In the first stage, purposive sampling was done to select Nakuru County and Molo Sub County due to their high potato farming activities in Kenya (GoK, 2018). The second stage involved simple random sampling to select three wards, namely Elburgon, Molo, and Turi. In the third stage, samples were collected from each ward according to the proportion of potatoes produced and marketed. A list of smallholder potato farmers was obtained from Molo Sub County Agriculture Office and used for the sample purposes. The final stage involved the use of systematic sampling, whereby every 25th smallholder farmer on the list was picked as the respondent for the study.

3.5. Sample Size

The sample size was 267 smallholder potato farmers from Molo Sub-County. The population formulae proposed by Yamane in 1967 was used to compute the sample size as follows:

$$n = \frac{N}{1 + N(e)^2}$$ ………………………………………………………………………………… (1)

Where n is the sample size, N = total population, and e = marginal error. The study used 6% as a marginal error. The main reason for choosing the above marginal error is that it is sufficiency enough to remove 95% sample bias in the data as stated by Anderson *et al.* (2007).

$$n = \frac{6678}{1 + 6678(0.06)^2} = 267$$

Table 1 below provides detailed information on the distribution of smallholder potato farmers in the selected wards in Molo Sub-County.

Table 1: Distribution of smallholder potato farmers in Molo Sub-County

Ward	Estimated population	Proportionate	Calculated sample size
Elburgon	2,565	0.38	103
Molo	2,586	0.39	103
Turi	1,527	0.23	61
Total	**6,678**	**1**	**267**

Source: Ministry of Agriculture, Livestock, Fisheries, and Irrigation Office in Molo Sub-County, 2019

3.6. Research Instruments

The study employed semi-structured questionnaires comprising open and closed questions to collect primary data from individual smallholder potato farmers. Semi-structured questionnaires were used to collect relevant information from smallholder potato farmers. The semi-structured questionnaires used were categorized into four different sections.

Section (A) describes the socio-economic of individual smallholder potato farmers. The questions include head of household, sex of respondents, age of respondent, gender, marital status, education level, household size, type of land ownership, total farm size, annual income. Section (B) provides more information on farm enterprise characteristics that include number of years in potato farming enterprise, size of potato enterprise, purpose of farming enterprise and ownership of farm enterprise. Section (C) highlights institutional factors; access to credits, source of credits, purpose of credits, source of information, access to entrepreneurial training, purpose of entrepreneurial training, frequency of entrepreneurial training, access to group membership, frequency of meeting, and purpose of group and section (D) provides more information on entrepreneurial behaviour; risk-taking ability, proactiveness behaviour, innovativeness behaviour, information-seeking behaviour, cosmopoliteness behaviour, and decision-making ability. The 5-points Likert scale was used to measure only entrepreneurial behaviour attributes. The scale ranges from strongly agree to strongly disagree where 1= strongly agree, 2=agree, 3=neutral, 4=disagree, and 5=strongly disagree. Section E had questions on competitive advantage; grading and sorting of potatoes, and production of different potato varieties and farm diversification. (F) describes various challenges facing small

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scale potato enterprises; production and marketing challenges and the last section (G) provides an update on performance indicators of small-scale potato enterprises in Molo Sub-County, Kenya; total cost of production, number of bags sold and price per season.

3.7. Data Collection

The study collected both primary and secondary data where the actual data was collected using questionnaire. The questionnaire consists of both open and closed format questions which were relevant and understandable for answering. Most of the questions were multiple choices requiring ticking of the appropriate answers. Data collection commenced after a pilot study which was conducted in Marioshoni ward (May, 2019) to ensure the reliability and validity of the study instrument. The questions were tested for validity and reliability where Cronbach alpha was used for checking reliability and experts for validity. During piloting, the questionnaire was pre-tested in a neighboring ward called Marioshoni ward. The pilot study involved 30 respondents with the aimed of refining the questionnaire. The results of the pilot study were not included in the final data analysis. The questionnaires were administered to the respondents on a face to face basis.

The ethical consideration considered before data collection were as follows: The researcher first obtained an introductory letter from the Graduate School of Egerton University. Secondly, the research applied for a research permit from the National Commission for Science, Technology and Innovation (NACOSTI) in order to access and collect data from the smallholder potato farmers in the study area. Thirdly, the researcher also consulted the Sub County Agricultural Officers in charge of the selected wards on how to access the respective respondents. Finally, the researcher used a translator together with three other trained enumerators to administer questionnaires to smallholder potato farmers. The translator translated the research questions from Kiswahili to the English Language since the researcher cannot communicate very well in the local dialect to the respondents. The trained enumerators assisted the researcher in interviewing respondents during the data collection. The primary data was collected directly from smallholder potato farmers in Elburgon, Molo, and Turi of Molo Sub-County, Kenya from June to August, 2019.

3.8. Data Analysis

The data collected was coded in SPSS version 26 and analyzed during STATA version 15. Both descriptive statistics and econometric analysis were used to meet the specific objective of this study. In descriptive statistics; mean, standard deviations, frequency and percentage

were used to describe the hypothesized variables whilst for econometric analysis of MVP model and SUR were used after subjecting data to various tests; namely normality, linearity, heteroscedasticity, and multicollinearity to check if the level of compliance with the assumptions. Entrepreneurial Behaviour Index (EBI) has been used for determining the entrepreneurial behaviour of smallholder potato farmers while multivariate probit (MVP) regression for determining the effect of entrepreneurial behaviour on gaining competitive advantage. Seemingly unrelated regression was used to measure the effect of entrepreneurial behaviour on performance of small-scale potato enterprises.

3.9. Analytical Framework

Objective 1: To characterize the entrepreneurial behaviour of smallholder potato farmers in Molo Sub-County, Kenya. This present study adopted entrepreneurial behaviour index used by Wanole *et al*. (2018) to measure entrepreneurial behaviour of smallholder farmers. The formula is specified as

$$EBI = \frac{\sum_{n=i}^{n} \frac{Tn}{Mn} x \operatorname{Re} n}{\sum_{n=i}^{n} \operatorname{Re} n} x 100 \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (2)$$

Where *EBI*= Entrepreneurial Behaviour Index, *n*= number of components. The study used different six components which include risk-taking, proactiveness, innovativeness, information-seeking behaviour, cosmopoliteness and decision-making ability. *Tn* = total obtained score of the components, *Mn* = Maximum obtained score of components, *Ren*= Scale value of components. Principal Component Analysis (PCA) was used to check the reliability of the entrepreneurial behaviour constructs (Dendup *et al*., 2017) with Varimax rotation (Karus *et al*., 2012). The result shows that Cronbach produced an alpha value of 0.837 on 13 items of entrepreneurial behaviour attributes. The reliability test indicates that alpha value for the attributes all satisfied the ground rule of 0.60 and above (Khalid, 2015). Three factors were retained from the rotation because the factors produced Eigenvalues greater than one with a cumulative value of 60.935%, meaning that the factors represent well the entrepreneurial behaviour of small-scale potato farmers. In addition, Bartlett's sphericity and Kaiser-Meyer-Olkin (KMO) was used to check suitability and sampling adequacy of the entrepreneurial behaviour constructs (Dendup *et al.*, 2017). The result of KMO was 0.787 with Bartlett Test of sphericity of 1368.268, 78 and 0.000 indicating that the items satisfied all the conditions for factor analysis (Sachitra & Chong, 2017).

Objective 2: To characterize the challenges facing small scale potato enterprises in Molo Sub-County, Kenya**.** The study used descriptive statistics; frequency and percentage for describing the various productions and marketing challenges faced by small scale potato enterprises in Molo Sub-County, Kenya.

Objective 3: To determine the effect of entrepreneurial behaviour on gaining competitive advantage of small-scale potato enterprises in Molo Sub-County, Kenya.

In this present study, a multivariate probit regression model was employed to ascertain the effect of entrepreneurial behaviour on the competitive advantage of small-scale potato enterprises in Molo Sub-County, Kenya. Most often, the multinomial regression models are appropriate models to estimate nominal outcomes of unordered categories (Wosene *et al*., 2018). According to Tarekegn *et al.* (2017), multinomial models are used when individual smallholder potato farmers can choose only one outcome among a set of mutually exclusive and collectively exhaustive alternatives. The models assume independence across the choices meaning it does not allow correlation between the explanatory variables (Wosene *et al*., 2018). In this present study, the multinomial model is inappropriate because individual smallholder potato farmers choose from more than one outcome from several strategic options which are not mutually exclusive due to various set choices and correlation among competitive advantage choice decisions.

Based on the above empirical literature review, the study employed multivariate probit model to estimate several correlated binary outcomes jointly because it captured the impact of explanatory variables on each competitive advantage options while allowing for correlations between unobserved distances and relationships between the choices of different competitive advantage options (Tarekegn *et al*., 2017). When you observe the binary value of y_{ic}, there are unobserved variables y_{ic}^{*} that are determined by the value of y_i. The y_{ic}^{*} is determined by the explanatory variables, the greater its values, the greater and the trend towards the likelihood of dependent variables. In this case, a competitive advantage is the explanatory variable of interest that includes storage, sorting, grading, and farm diversification.

It is the smallholder potato farmers' decision whether to build and maintain a sustainable competitive advantage over competitors or not is considered as profit maximization objective. It is assumed that given potato farmer i in making a decision considering not exclusive alternatives that constituent that choice set c^{th} of gaining competitive advantage, the

choice sets may differ according to the individual smallholder potato farmer who decides to participate in the small scale potato enterprises.

Consider the ith smallholder potato farmer $(i=1,2,...,n)$ facing a decision problem on whether or not to achieve a sustainable competitive advantage to improve performance of small scale potato enterprises. Let u_c represents the benefit that potential individual potato farmer gains to choose c^{th} competitive advantage: where c denotes the choice of grading(gra), sorting (sor) differentiation (dif), and farm diversification (div). The smallholder potato farmer decides to choose the cth competitive advantage if $y_{ic}^* = u_{ic}^* - u_0 > 0$. The net benefit (y_c^*) that smallholder potato farmer derives from gaining a competitive advantage is a latent variable determined by both explanatory variables (x_i) and error terms (ε_i)

$$y_{ic}^* = x_i'\beta_c + \varepsilon_i \,, c = gra, sor, dif, div \,,$$ ………………………….. (3)

Where y^* = unobserved variable, x_i' = explanatory variable, β = coefficient of explanatory variable and ε_i = standard normal error term. The unobserved preference in the above equation translates into the observed binary outcome equation for each choice as follows:

$$y = \begin{cases} 1 & if \\ 0 & otherwise \end{cases} y_i^* > 0 \ (c = gra, sor, dif, div)$$ …………………………………… (4)

Where y is the binary; 1 means if the smallholder potato farmer achieves competitive advantage over the competitors and 0 means if the farmer does not achieve a competitive advantage. In the multivariate probit model where the choice of several competitive advantages is possible, the error terms jointly follow Multivariate Normal Distribution with zero conditional mean and variance normalized to unity where $(ugra, usor, udif, udiv)$ MVN $\approx$ $(0, \Omega)$ and the symmetric covariance matrix Ω is given as:

$$\Omega \begin{bmatrix} 1 & pgrasor & pgradif & pgradiv \\ psorgra & 1 & psordif & psordiv \\ pdifgra & pdifsor & 1 & pdifdiv \\ pdivgra & pdivsor & pdivdif & 1 \end{bmatrix} =$$ …………………………………….…...... (5)

The off-diagonal elements in the covariance matrix represent the unobserved correlation among stochastic components of different competitive advantage options (Tarekegn *et al.*, 2017). This assumption means that the above equation generates a multivariate probit model jointly represent a decision to gain a competitive advantage. This specification with non-zero off-diagonal elements allows for correlation among the error terms of different unobserved factors.

Table 2: Description and measurement of variables used in Multivariate probit model

Variable	Description	Measurement	Hypothesized Sign
Dependent variable			
Grad	Grading of potatoes	1 if yes, 0 otherwise	
Sort	Sorting of potatoes	1 if yes, 0 otherwise	
Diff	Production of different potato varieties	1 if yes, 0 otherwise	
Div	Farm diversification	1 if yes, 0 otherwise	
Independent variables			
Ag	Age of respondent	Years	+
Gen	Gender of respondent	1 if male, 0 otherwise	-
Educ	Education level	Years in schools	+
Hszi	Household size	Number of members	+
Ex	Farming experience	Years in potato enterprises	+
Acr	Access to credit	1 if access credit, 0 otherwise	$\pm$
Aet	Access to training	1 if access entrepreneurial training, 0 otherwise	$\pm$
Agm	Access to group membership	1 if member, 0 otherwise	$\pm$
Sto	Access to storage facility	1 if access storage, 0 otherwise	+
Risk	Risk-taking ability	Mean score of risk taking attribute	+
Pro	Proactiveness behaviour	Mean score of proactive attribute	+
Inn	Innovativeness behaviour	Mean score of innovative attribute	+
Isbh	Information-seeking behaviour	Mean score of information seeking attribute	+
Cos	Cosmopoliteness behaviour	Mean score of cosmopoliteness attribute	+
Dec	Decision-making ability	Mean score of decision making attribute	+

Objective 4: To determine the effect of entrepreneurial behaviour on the performance of small-scale potato enterprises in Molo Sub-County, Kenya.

Finally, the seemingly unrelated regression (SUR) model was used to analyze the effect of entrepreneurial behaviour on the performance of small-scale potato farm enterprises. The model was proposed due to the direct and indirect effect of the error terms in the equation of entrepreneurial behaviour (equation 7) and farm performance (equation 8). The (SUR) method is more efficient than the ordinary least square method when the error terms between the equations in the system are highly correlated (Heidari *et al.,* 2017; Mehrabani & Ullah, 2020) and produces the best linear unbiased estimates (BLUE) which would have not been possible for OLS. The SUR estimates for correlations in the error terms and allows different dependent variables to have different sets of independent variables (Heidari *et al.,* 2017). Zellner (1962) postulates that the SUR method estimates the parameter of all equations simultaneously and the parameters of each single equation take the information provided by the subsequent equations into account.

Seemingly unrelated regression equation is given by

$$y_i = X_i\beta_i + u_i \quad i = 1,2 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (6)$$

Where y_i and u_i are $T \; x \; 1$ and X_i is $(T \; x \; K_i)$ with $u_i \sim (0, \sigma_{ii}I_T)$. Ordinary least squared (OLS) is best least unbiased estimates (BLUE) on equation separately. Zellner combined the SUR in one stacked model as

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} X_1 & 0 \\ 0 & X_2 \end{bmatrix} \begin{pmatrix} \beta_1 \\ \beta_2 \end{pmatrix} + \begin{pmatrix} u_1 \\ u_2 \end{pmatrix} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (7)$$

Where y_1 and y_2 = dependent variables of the two equations, X_1 and X_2 = independent variables, β_1 and β_2 = coefficients, u_1 and u_2 = random error terms of the equation.

To estimate the effect of entrepreneurial behaviour on the performance of small scale potato farm enterprises, consider two different single equations of farm performance is given by

$$Entreprenarial\_behaviour = \beta_{01} + \beta_{11}\text{Age} + \beta_{21}\text{Education} + \beta_{31}\text{Farming experience} +$$

$$\beta_{41}\text{Loan} + \beta_{51}\text{Training} + \beta_{61}\text{Group membership}\dots\dots\dots\dots\dots\dots\dots\dots. \text{Equation 4}$$

$$Performane = \beta_{02} + \beta_{12} \text{Age} + \beta_{22} \text{Education} + \beta_{32} \text{Farming} \quad \text{experience} + \beta_{42} \text{Loan} + \beta_{52}$$

$$\text{Training} + \beta_{62} \text{Group} \quad \text{membership} + \beta_{72} \text{Risk} \quad \text{taking} + \beta_{82} \text{Proactiveness} + \beta_{92} \text{Innovativeness}$$

$$+ \beta_{102} \text{Information seeking} + \beta_{112} + \text{Cosmopoliteness} + \beta_{122} \text{Decision making}\ldots\ldots\ldots\ldots \text{(8)}$$

Table 3: Description of variables used in the seemingly unrelated regression model 1

Variable	Description	Measurement	Hypothesized Sign
Dependent variables			
EB (Y1)	Poor Entrepreneurial behaviour	Mean EB attributes	
Independent variables			
Ag	Age	Years	+
Educ	Education level	Years in schools	+
Ex	Farming experience	Years in potato enterprises	+
Acr	Access to credit	1 if access credit, 0 otherwise	$\pm$
Aet	Access to training	1 if access training, 0 otherwise	$\pm$
Agm	Access to group membership	1 if member, 0 otherwise	$\pm$

Table 4: Description of variables used in Seemingly Unrelated Regression Model 2

Variable	Description	Measurement	Hypothesized Sign
Dependent variable			
Performance (Y2)	Gross margin	Ksh	
Independent variables			
Ag	Age	Years	+
Educ	Education level	Years in schools	+
Ex	Farming experience	Years in potato enterprises	+
Acr	Access to credit	1 if access credit, 0 otherwise	$\pm$
Aet	Access to training	1 if access training, 0 otherwise	$\pm$
Agm	Access to group membership	1 if member, 0 otherwise	$\pm$
Risk	Risk-taking behaviour	Mean score of risk-taking attribute	+
Pro	Proactiveness behaviour	Mean score of proactiveness attribute	+
Inn	Innovativeness behaviour	Mean score of innovativeness attribute	+
Isbh	Information-seeking behaviour	Mean score of information-seeking attribute	+
Cos	Cosmopoliteness behaviour	Mean score of cosmopoliteness attribute	+
Dec	Decision-making ability	Mean score of decision-making attribute	+

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1. Introduction

This chapter discusses the main findings of the study. It comprises of five different sections where the first section describes the socio-economic characteristics of smallholder potato farmers. The second section highlights entrepreneurial behaviour of smallholder farmers using an entrepreneurial behaviour index. In the third section, challenges faced by small scale potato enterprises are been discussed. The fourth section provides details on the effect of entrepreneurial behaviour on building sustainable competitive advantage. The last section presents the major findings on the effect of entrepreneurial behaviour on performance of small-scale potato enterprises in Molo Sub County, Kenya.

4.2. Descriptive Statistics

Information on socio-economic characteristics was collected from smallholder potato farmers who grew and marketed potatoes in Molo Sub County.

Table 5: Socio-economic characteristics of smallholder potato farmers in Molo Sub County, Kenya

Personal profile	Mean	Std. deviation	Minimum	Maximum
Age	43.48	12.96	20	75
Education level	9.56	3.16	0	16
Household size	4.33	2.17	0	15
Farming experience	10.20	8.64	1	42

The results in Table 5 reveal that the average age of smallholder potato farmers was 43 years. This means that most of the respondents sampled were middle aged farmers which may affect farm level decisions and participation in farmer group activities. The study observed that majority of the farmers are in their productive ages this could play a vital role in ascertaining competitiveness and improving farm performance through adoption of better farming techniques and better managerial skills (Esiobu *et al.,* 2015; Taiy *et al.,* 2016).

The mean of the education level of smallholder potato farmers was 9 years. The findings prove that the farmers had at least basic education which could make them to read and understand basic concepts about climate changes, new production methods, access marketing information and linkages. It would help farmers get exposed to more knowledge on adoption

of improved seed varieties leading to increase potato production and supply (Abitew *et al.,* 2015). The result is similar to Ondiba *et al.* (2019) and Taiy *et al.* (2016) cited that most of the smallholder potato farmers had primary education level in Kenya enabling them to read, write and understand basic agricultural concepts. As shown in Table 4, it was indicated that the majority of the respondents had 4 members per farm household. This means that most of the smallholder potato farmers had a small farm household size meaning that additional of one member would be used as a source of active farm labor for farmers to address labor challenges in the potato enterprises. The results disagree with Boruah *et al.* (2015) and Gurjar *et al*. (2017) who opined that majority of tribal winter vegetable and potato farmers had large family-sized of 5 members in Jorhat district of Assam and Morar district of Madhya Pradesh.

Majority of the smallholder potato farmers in the study area had an average of 10 years in the potato farm enterprises. It indicates that most of the farmers in the study area had a relative high farming experience in the potato farm enterprises which would enhance their grading skills, sorting skills, and adoption of improved potato varieties for constant production. Smallholder farmers with high farming experience are expected to be more knowledgeable and skillful about climatic conditions and development of entrepreneurial behaviour and successful in their potato farm enterprises (Ayelech 2011).

Table 6: Socio-economic of smallholder potato farmers in Molo Sub County, Kenya

Variable	Category	Frequency	Percent
Gender	Male	129	48.3
	Female	138	51.7
Access to credit	Yes	64	24
	No	203	76
Access to entrepreneurial training	Yes	109	40.8
	No	158	59.2
Access to farmer group	Yes	97	36.3
	No	170	63.7
Access to storage facility	Yes	96	36
	No	171	64

Gender is an important element that plays a significant role in farm enterprises in Kenyan farm labor force and known to influence agricultural production through access and control of resources for production (KNBS, 2017). This study used gender as a characteristic of potato farmer which can contribute to competitiveness and improve potato farm performance

due to the participation of both men and women in potato production activities (Mudege *et al.,* 2015). The result from Table 6 asserted that 51.7% of the potato farmers interviewed were females while 48.3 percent were males. This may indicate that female potato farmers participate more in the potato farm activities than male potato farmers in Molo Sub-County. According to Taiy *et al.* (2016) males participate more in potato enterprises in Mauche ward of Nakuru County than female potato farmers. Their study found that men had more access to productive resources and take part in decision-making compared to women.

The present study found that about 24% of the smallholder potato farmers had access to farm credit from financial institutions while 76% did not receive any farm credit. The farm credit was taken with purpose of purchasing farm inputs in order to support the potato enterprises making those farmers gained more competitive advantage and improved their potato farm enterprise's performance. It is argued that access to farm credits allow smallholder potato farmers to invest confidently in the potato farm enterprise activities through purchasing of improved seed varieties, fertilizers, agro chemicals and labor wage leading to high potato productivity and increased farm incomes (Abitew *et al.,* 2015; Akudugu, 2018).

The study observed that less than half (40.8%) of smallholder potato farmers received entrepreneurial training from institutions and organizations in the potato value chain on quarterly basis while 59.2%. did not receive any training. The study stated categorically that smallholder potato farmers who accessed training improved their farm enterprises because the training program opened new avenues and opportunities to adopt improved seed varieties, production practices and techniques resulting in increased productivity and farm incomes for the smallholder potato farmers (Ahmad *et al.,* 2007).

The study results show that 36.3% of smallholder potato farmers belonged to farmer groups whilst 63.7% do not belong to any farmer based organization (FBO). It was found that those farmers who belonged to a farmer groups received training on entrepreneurial skills, adoption of modern production methods and use of new seed varieties, accessed farm credits and purchased farm inputs at subsided prices and linked farmers to potato markets resulting in the improvement of their potato farm enterprises. Tolno *et al.* (2015) and Mwaura (2014) stated that access to farm groups enhanced potato productivity level through of adoption new agricultural technologies, linking of farmers to output market and increasing farm incomes. Etwire *et al.* (2013) posited that effective membership to farmer groups enable members to have competitive advantages over individual farmers in terms of purchasing power, advocacy, lobby and economies of scale in the agricultural production and marketing activities.

Storing potatoes produce for future consumer market enables the country to have sustainable food security (FAO, 2013). As shown in Table 7, it was found that 36% of farmers stored potatoes using traditional storage facilities, cold stores, diffuse light and concrete floor while 64% sold immediately after harvesting due to ready market and high perishability of potatoes. Smallholder farmers stored potatoes to get good prices when there is a limited supply in the market. Manyasa (2015) recommends that smallholder potato farmers need to store potatoes for at least three months to smoothen supply and obtain steady market prices in Kenya.

Table 7: Competitive advantage strategies of small-scale potato enterprises in Molo Sub County, Kenya

Competitive advantage strategies	Category	Frequency	Percent
Grading	Yes	158	59.2
	No	109	40.8
Sorting	Yes	177	66.3
	No	90	33.7
Product differentiation	Yes	176	65.9
	No	91	34.1
Farm diversification	Yes	183	68.5
	No	84	31.5

Grading potatoes could be used as a marketing strategy to help potato producer and seller to influence the determination of potato prices, reduce marketing cost, and help consumers to get standard potato at fair price (FAO, 2011). The results in Table 7 indicated that 59.2% of potato farmers' graded potatoes while 33.7% did not grade potatoes. The study found that the consumer market demanded for graded potatoes with medium-large sizes, good shapes and bright color without any defects. During the study, it was observed that most of potato farmers graded potatoes for the purpose of meeting market standard requirements in order to obtain higher prices leading to achieving a sustainable competitive strategy in the small scale potato enterprises. Noodram *et al.* (2001) stated that grading potatoes ensure that the products meet defined grade and quality requirements for potato sellers and provides expected quality for buyers.

Smallholder potato farmers had a marketing opportunity to use sorting as a pathway to achieve a competitive advantage in the potato enterprises. The results show that 66.3% of the respondents' sorted potatoes while 33.7% failed to sort potatoes. The majority of the

smallholder potato famers sort potatoes manually with the purpose of removing damaged and diseased tubers, green potatoes and cut potatoes to get better market price. FAO (2001) postulated that sorting potatoes improves quality of harvested potato tubers and fetch higher prices in the output market.

Production and marketing of different potato varieties is one of the pathways individual smallholder potato farmers could adopt to build a competitive advantage in the small-scale potato enterprises (FAO, 2013). As shown in Table 7, 66.9% of the respondents produced and marketed one variety known as Shangi due to its early maturity, ready market and resistance to pest and diseases, and adapt to climatic conditions while 34.1% produced different varieties such as Kenya Karibu, Kenya Mypa, Jelly, and Shangi. This implies that most of the respondents have a competitive disadvantage in producing and marketing different potato varieties. It could be due to inability of taking risks to adopt improved seed varieties, lack of proactiveness and information seeking behaviour. Merga and Dechassa (2019) advised smallholder farmers in Ethiopia to use improved potato variety in order to achieve better yield, increase their farm profits and income generation.

Farm diversification could be used as a basic and most utilized strategic option for smallholder potato farmers to attain a competitive advantage (FAO, 2013). The result in Table 7 indicates that 68.5% of respondents engaged in other farm activities apart from potato enterprises while 31.5% engaged in only potato farm enterprises. This means that most of the potato farmers ascertain competitive advantage through engagement of other farm activities with the aim of supporting their potato enterprises, farm households and achieving financial independently. FAO (2013) reported that agricultural diversification is a strategy for enhancing the welfare of farmers and improvement of food security and employment generation.

Table 8: Performance of small-scale potato enterprises in Molo Sub County, Kenya

Performance indicator	Mean	Standard deviation	Minimum	Maximum
Total Revenue	210,147.90	136,763.40	57,000.00	900,000.00
Total Cost	93,499.08	74,602.60	10,500.00	573,900.00
Gross Profit	116,648.82	93,872.39	27,160.00	797,700.00

As shown in Table 8, it is observed that the average of total cost of production for producing one acre of potatoes was KSH 93,499 and total revenue generated from sales of potatoes was KSH 210,147 with the gross profit earned from potato farm enterprise in the

production year was KSH 116,648. This is a clear indication that potato production is a profitable and viable agribusiness for youths in agriculture to invest and venture into for future returns.

4.3. Entrepreneurial Behaviour Index

Entrepreneurial Behaviour Index was used to describe the three different levels of behaviour of smallholder potato farmers in Molo Sub County, Kenya. Principal Component Analysis was used to check the validity and reliability of estimated construct variables. Bartlett's sphericity, Cronbach alpha, and Kaiser-Meyer-Olkin (KMO) tests were carried out to detect the fitness of the entrepreneurial dimensions. The results from Bartlett's sphericity was ($x^2 = 1957.45$, $DF = 190$, $p = 0.00$). This means that the behaviour dimensions were reliable and fit for factor analysis. After factor loading, only one factor was retained. This entrepreneurial behaviour index has been widely used by many researchers like Giridhara (2013), Ram *et al.* (2013), Boruah *et al.* (2015), Gurjar *et al.* (2017), Mariammal and Seethalakshmi (2017), Mubeena *et al.* (2017), Wanole *et al.* (2018), and Patil and Singh (2019) to measure entrepreneurial behaviour of smallholder farmers' worldwide. Hence, this present study adopted this index to assess the entrepreneurial behavior of potato farmers in Molo Sub County, Kenya.

Table 9: Distribution of Entrepreneurial Behaviour Index of smallholder potato farmers in Molo Sub County, Kenya

Dimension	Level	Score range	Mean	S.D.	Frequency	Percent
Risk taking	Low	Below 4.09	6.77	2.68	59	22.1
	Medium	4.09-9.45			148	55.4
	High	Above 9.45			60	22.5
Proactiveness	Low	Below 4.75	7.33	2.58	46	17.2
	Medium	4.75-9.91			144	53.9
	High	Above 9.91			77	28.8
Innovativeness	Low	Below 0.72	2.1	1.38	136	50.9
	Medium	0.72-3.48			99	37.1
	High	Above 3.48			32	12
Information seeking	Low	Below 3.72	6.99	3.27	65	24.3
	Medium	3.72-10.26			93	34.8
	High	Above 10.26			109	40.8
Cosmopoliteness	Low	Below 4.60	8.85	4.25	77	28.8
	Medium	4.60-13.10			118	44.2
	High	Above 13.10			72	27
Decision making	Low	Below 3.51	6.18	2.67	64	24
	Medium	3.51-8.85			166	62.2
	High	Above 8.85			37	13.8
Overall EBI	Low	22.95	32.03	9.08	46	17.2
	Medium	22.95-41.11			167	62.5
	High	41.11			54	20.2

The results in Table 9 show that the majority (55.4%) of smallholder potato farmers were medium risk-takers, 22.5% were high risk-takers and 22.1% were low risk-takers. This implies that smallholder potato farmers hardly take risks in trying new seed varieties and new production techniques. The possible reason is that most of the respondents has poor primary education and belonged to middle age group. In addition, these growers also had a low experience in potato farming enterprises and cultivated potato crop under one-acre farm size. The results concur with the findings of Boruah *et al.* (2015) and Ram *et al.* (2013) who pointed

out that the majority of the vegetable growers had medium risk-taking behaviour followed by high risk-taking behaviour and low risk-taking in the Jorhat District of Assam and in India.

Smallholder potato farmers possessed (53.9%) medium proactiveness behaviour. Some growers had 28.8% representing high proactiveness behaviour and 17.2% had low proactiveness behaviour. This implies that most of the potato farmers identified market opportunities ahead of other farmers and searched for where to market potatoes before engaging in the potato enterprises. The possible reason is that the majority of the farmers were females and search for untapped market opportunities due to their moderate education level. The result contends with Hajong (2014) who established that the majority of smallholder farmers possessed very low proactiveness, low proactiveness behaviour, medium, high and very high proactiveness behaviour in India.

More than a half (50.9%) of smallholder potato farmers had low innovativeness behaviour accompanied by medium 37.1% and 28.8% high innovativeness behaviour. The results show that most of the farmers were not innovative in using locally available materials to control weeds, pests, and diseases. These contributed to the high pests and diseases on their potato farms and resulted in production of one potato variety. The low innovativeness behaviour can be attributed to the low farming experience and size of potato farms

Most (40.8%) of the smallholder potato farmers had high information-seeking behaviour, 34.8% had medium and 24.3% low information-seeking behaviour. The results mean that potato growers access information on potato enterprises through social media platforms. Besides, these respondents had smart mobile phones which were used for communication purposes. This is so because majority of the respondents had at basic education level enabling them read and understands production information trends. The findings disagree with Boruah *et al.* (2015), who discovered that most of the smallholder farmers had medium information-seeking behaviour followed by high information-seeking and low information-seeking behaviour in Jorhat district of Assam.

The majority of smallholder potato farmers had medium (44.2%) cosmopoliteness behaviour followed by low (28.8%) and high (27%) level of cosmopoliteness. The low cosmopoliteness means that farmers did not seek information outside the farming community to improve potato enterprises. Furthermore, they failed to attend agricultural shows, conferences and field days outside their communities to gain more knowledge on potato farming enterprise management. This could be due to the age differences of the respondents. Young age group would have loved to attend agricultural programmes outside their communities to learn modern production techniques and methods compared to middle and old

age groups. The findings are consistent with studies conducted by Mariammal and Seethalakshmi (2017), which indicated that dairy farmers possessed a medium level of cosmopoliteness, low and high cosmopoliteness behaviour in Tamil Nadu.

About 62.2% of potato growers possessed a medium level of decision-making. This is followed by low decision-making ability with 24% and high decision-making ability 13.8%. It can be deduced that most of the growers did not make appropriate decisions on growing certified seeds which can lead to an improvement in potato farming performance. Although some potato growers followed good agricultural practices, they feared to insure their potato enterprises in case of natural disasters. The possible reason is majority of the respondents were females and land owners so they did not consult their husbands regarding what to cultivate on the farm land. The findings conform to Boruah *et al.* (2015), who indicated that majority of vegetable producers possessed moderate decision-making ability followed by good decision-making and low-decision-making ability in Jorhat district of Assam.

4.5. Challenges facing Small Scale Potato Enterprises

Small scale potato enterprises experienced constrains that inhibit the growth and development of the potato sector. Therefore, this present study finds out which constrains that are the major challenges facing the potato industry. The study found that the production and marketing challenges reduce competitiveness and performance of small-scale potato enterprises in Molo Sub County.

Table 10: Descriptive statistics for challenges facing small scale potato enterprises

Production challenge	Frequency	Percent
Unfavorable weather conditions	40	15
High pest and disease infestation	48	18
Lack of certified seed	12	4.5
High cost of agro chemicals and fertilizers	34	12.7
High transportation cost for inputs	2	0.7
Inadequate money to purchase inputs	8	3
Inadequate access to land	13	4.9
Lack of production skills	11	4.1
Inadequate inputs for potato farming	8	3
High cost of production	1	0.4
Inadequate storage facility	1	0.4
Marketing challenge		
High exploitation of brokers	23	8.6
Low price for potatoes	15	5.6
Poor market for potatoes	41	15.4
Inadequate credit loans	5	1.9
Poor road network	5	1.9
Total	**267**	**100**

As indicated in the Table 10, majority of small-scale potato enterprises were facing production challenges such as high pest and disease infestation, unfavorable weather conditions, high cost of agro chemicals and fertilizers, lack of certifies seeds, lack of production skills, inadequate access to land and inadequate money to purchase inputs among others. The findings of the study in line with the study conducted by Uddin *et al.* (2010) who cited that high pest and disease infestation, high price of fertilizers, inadequate credit facilities, inadequate quality seed, inadequate capital, and inadequate storage facilities were production challenges facing potato production in Bangladesh. Blas *et al.* (2009) cited that high pest and disease infestation and unfavorable climatic conditions were the most important challenges affecting potato production in Peru. Karanja *et al.* (2014) observed that rainfall variability was the main challenge facing potato production in the Oljro-Orok district.

Other challenges include inadequate clean seed, soil degeneration, high cost of inputs, and high disease infestation and inadequate field officer. Gurjar *et al.* (2017) cited that among various challenges facing potato production were high cost of agro-chemicals and fertilizers, inadequate quality seed, high pest and disease infestation, high wages of labor, and lack of knowledge on potato enterprise management. Muthoni et al. (2013) who cited that high pest and disease infestation, unfavorable weather conditions, high cost of agro-chemicals and fertilizers, lack of clean seeds and high cost of seed were the main challenges facing small potato production in Kenya. According to Abdi-Soojeede (2018) main production challenges facing small scale agricultural production include unfavorable weather conditions, high pest and disease infestation, poor road networks and inability to have access to agro chemicals, lack of capital to buy seeds and fertilizers, high post-harvest losses, unavailability of agro-chemicals and inadequate access to the market in Somalia. Biriam *et al.* (2014) announced that inadequate agricultural inputs, poor quality seed, unfavorable weather conditions, high pest, and disease infestation were the main challenges affecting potato production in Eritrea.

From Table 10, the marketing challenges affecting small scale potato enterprises include poor market prices, high exploitation of brokers, low prices for potatoes, inadequate credit loans and poor road networks. Wankhad *et al.* (2013) observed that price fluctuation, lack of crop insurance, high exploitation of middlemen, inadequate labor and high input cost were the major marketing challenges facing vegetable production in India. Biriam *et al.* (2014) cited that poor marketing was one of the main challenges affecting potato marketing in Eritrea.

4.6. Determinants of Entrepreneurial Behaviour on Competitive Advantage

Multivariate probit model (MVP) was used to determine the effect of entrepreneurial behaviour on gaining competitive advantage strategies of small-scale potato enterprises. Before the econometric model, pretests such as multicollinearity, normality and heteroscedasticity tests were conducted on the data to solve problems misspecification. The table below presents the multicollinearity test of competitive advantage strategies.

Table 11: Multicollinearity test of competitive advantage strategies

Continuous variable	VIF	1/VIF
Age	1.59	0.627
Information seeking	1.51	0.664
Farming experience	1.48	0.674
Innovative behaviour	1.48	0.677
Proactive behaviour	1.4	0.713
Decision making	1.36	0.735
Risk taking	1.11	0.903
Education level	1.1	0.909
Household size	1.08	0.927
Mean VIF	**1.35**	
Categorical variable	**VIF**	**1/VIF**
Gender	1.04	0.964
Training	1.76	0.568
Farmer group	1.7	0.587
Credit access	1.2	0.836
Storage	1.08	0.926
Mean VIF	**1.43**	

Variance Inflation Factor test was conducted to detect the presence of multicollinearity between independent variables for competitive advantage strategies. The ground rule says that when the mean value of VIF > 10, it means that there is the presence of multicollinearity in the numeric data. The results in Table show that there is no multicollinearity in the data as both variables had mean of 1.35 and 1.43 which were below 10.

Table 12: Heteroscedasticity test on competitive advantage strategies

Test	Chi2 value	Prob> Chi2
Breusch Pagan (Grading)	1.94	0.1632
Sorting	3.11	0.0777
Differentiation	5.46	0.0195
Diversification	0.53	0.4682

The results in Table 12 show that there was no heteroscedasticity in grading and diversification but it was observed in sorting and differentiation.

STATA version 15 was used to run multivariate probit analysis where the Wald test was computed during the analysis. The results for the Wald test (Wald $x^2(60) = 181.53$ with log-likelihood of -524.98584 and $p = 0.000$) show that the test was statistically significant at 1% level which reveals that the subset coefficients of the MVP model is jointly significant and the explanatory power of the factors added in the model is satisfactory. The above assumptions satisfied the multivariate probit model rule and reveal that the model best fits the data (Geremewe *et al.,* 2019, Wosene *et al.,* 2018). Another major test like simulated maximum likelihood (SML) for multivariate probit was conducted to check the fitness of the data. The result shows that Likelihood ratio test (LR x^2 (6) = 71.0037, p = 0.0000) was statistically significant at 1% level. After running the test, null hypothesis was rejected at 1% due to independence between dependent variables such as grading, sorting, differentiation and diversification choice decision (rho21 = rho31 = rho41 = rho32 = rho42 = rho43 = 0). Therefore, there are significant joint correlations for the estimates across the equation in this multivariate probit model. This indicates the goodness of fit of the model and supports the use of the MVP model over the individual probit model and multinomial logistic model.

Table 13: Estimated multivariate probit results on competitive advantage strategies

Variable	Sorting		Grading		Differentiation		Farm diversification	
	Coef.	Std.Err	Coef.	Std.Err	Coef.	Std.Err	Coef.	Std.Err
Age	-0.007	0.009	0.003	0.008	-0.013***	0.009	0.009	0.008
Gender	0.079	0.180	-0.084	0.175	-0.004	0.179	0.170	0.170
Education level	-0.032	0.030	-0.027	0.027	-0.080	0.030	0.031	0.028
Household size	0.017	0.041	0.051	0.041	-0.029	0.042	-0.008	0.040
Farming experience	-0.008	0.012	-0.011	0.012	0.007	0.013	-0.016	0.012
Credit	0.546**	0.237	-0.023	0.221	-0.051	0.231	-0.444**	0.217
Training	0.104	0.255	0.052	0.255	0.249	0.267	0.351	0.247
Farmer group	0.120	0.235	-0.550**	0.233	0.741***	0.249	-0.309	0.233
Storage	-0.436**	0.196	-0.820***	0.188	0.313	0.195	0.268	0.189
Risk taking	0.131*	0.068	-0.084	0.069	-0.048	0.070	-0.006	0.066
Proactive	-0.137*	0.081	-0.088	0.076	0.257***	0.079	-0.102	0.075
Innovative	0.084	0.068	-0.271***	0.067	0.058	0.069	0.184***	0.065
Information seeking	-0.270***	0.068	-0.104	0.067	-0.043	0.067	0.193***	0.064
Cosmopolite	-0.060	0.091	-0.129	0.093	0.183*	0.093	0.009	0.085
Decision making	0.055	0.087	0.203**	0.090	0.046	0.090	-0.206**	0.085
_cons	1.721**	0.740	2.113***	0.738	-0.057	0.735	-0.301	0.670

Note: ***, **, * significant at 1%, 5% and 10% probability level.

The results in Table 13 indicate that access to farm credit had a positive and significant impact on sorting at 1% significance level. A unit increases in farm credit access by one unit increases the probability of sorting harvested potatoes by 0.546. The possible reason is that smallholder potato farmers who had access to farm credit from the financial institutions used the money in purchasing farm inputs and paying laborers to ascertain sustainable competitive advantage in the small-scale potato enterprises holding all other variables constant. This finding agrees with Akumbole *et al.* (2018) found that maize farmers who took credits invest to in their farms gained competitive advantage in adoption of improved maize technology.

Having access to storage facilities was found to negatively influence sorting at 5% significant level. A unit increase in additional access to storage facility decreases the probability of sorting by 0.436. This shows that smallholder potato farmers who had access to storage facilities store potatoes and sell within three months usually earned low farm income. The reason is that stored potatoes lose its quality and quantity due to the type of storage facility used during storage. Most of the respondents used traditional storage structure. The findings disagree with Tadesse *et al.* (2018), Kiaya (2014) and Kitinoja and Alhassan (2012) who stated that storing potatoes for the future market make potato farmers more competitive and increase food accessibility and availability which tend to ensure food security across Africa.

Risk-taking ability behaviour of smallholder potato farmers had a positive and significant effect on sorting at 10% significance level. A unit increase in risk-taking behaviour score increases the probability of sorting by 0.131. The implication is that risk takers take risks to remove unwanted foreign materials attain competitive advantage. The finding is line with the findings of Tarfa *et al.* (2019) cited that crop farmers who took risks in adopting different adaptation strategies ascertain sustainable competitive strategy.

Proactive behaviour of smallholder potato farmers was found to have negatively influenced sorting at 10 significant levels. A unit increases in proactive behaviour score decreases the probability of sorting potatoes by 0.137. This implies that proactive potato farmers were unable to look for more market opportunities to sell their farm produce to achieve sustainable competitive advantage. The study differs from the findings of Olannye and Eromafum (2016) who stated that fast-food vendors who are proactive achieve a sustainable competitive advantage in food services at Asaba, Delta State.

Information seeking behaviour of smallholder potato farmers had negative impact on sorting at 1% significant level. A unit increase in information seeking score decreases the probability of sorting potatoes by 0.270. This implies that most of potato farmers were unable to seek relevant information from reliable source on sorting potatoes. The study found that

farmers usually obtained agricultural information from their family and friends instead of extension officers. The finding is not line with Yuliansyah *et al.* (2017) who stated that information-seekers acquire more relevant information from agricultural officers to ascertain competiveness resulting in improvement of agricultural performance.

Having access to storage facilities was found to negatively influence sorting and grading at 5% significant level. A unit increase in additional storage facility decreases the probability of sorting by 0.436 and 0.820. This shows that smallholder potato farmers who had access to storage facilities store potatoes and sell within three months got low farm income. The reason is that stored potatoes lose its quality and quantity due to the type of storage facility used during storage. Most of the respondents used traditional storage structure. The findings disagree with Tadesse *et al.* (2018), Kiaya (2014) and Kitinoja & Alhassan (2012) who stated that storing potatoes for the future market make potato farmers more competitive and increase food accessibility and availability which tend to ensure food security across Africa.

Group membership of smallholder potato farmers had a negative impact on grading at 5% significant level. A unit increases in one member decreases the probability of grading harvested potatoes according to different sizes by 0.550. Access to group membership makes the farmers to have better access to information that helps them in making effective decisions through their participation in group activities. Although, grading is a group activity, it is observed that majority of the farmers who belonged groups did not involve the members in grading potatoes as source of labor since grading requires more labor force. The reason is that most of the respondents who belonged to the group were staying in different communities and were unavailable during grading activities. The findings disagree with Donkor *et al*. (2019) who cited that smallholder rice farmers who belonged to farmer-based organization participate more in group activities. The group participation influenced the farmers in adopting improved agricultural technologies in the Upper East and Northern Region of Ghana.

Innovative behaviour of smallholder potato farmers had negative and significant effect on grading at 1% level. A unit increase in innovative score decreases the probability of grading potatoes by 0.271. This means that innovative potato farmers were unable to grade potatoes according to different sizes to attain a competitive advantage. The possible reason is for not grading potatoes could be attributed to poor education level and low production scale of potato farmers since most of the respondents interviewed had land size less than five acres. The finding is inconsistent with Konté *et al.* (2019) that cited that innovative behaviour influences smallholder farmers to uptake fertilizer subsidy and Sirivanh *et al.* (2014) found that innovative

behaviour enables entrepreneurs to introduce new products to capture the attention of customers leading to competitiveness of Small and Medium Enterprises.

Decision making ability of smallholder potato farmers positively influenced grading at 5% significant level. A unit increase in decision making score increases the probability of grading harvested potatoes by 0.203. This means that potato farmers made appropriate decision to grade potatoes according to different sizes. The results are consistent with the findings of Cao and Duan (2014) who observed that entrepreneurs who make effective decisions bring out new products to the market achieve competitive advantage in manufacturing industry in the United Kingdom.

Age of smallholder potato farmers had a negative and significant effect on product differentiation at 1% level. A unit increases in additional year reduces the probability of planting different potato variety by 0.013. This is so because old smallholder potato farmers were not proactive enough to seek for more market opportunities to produce different potato varieties demanded by the consumer market to build and maintain a sustainable competitive advantage. It could be due to that most of respondents interviewed fall under middle age group and were females. The finding disagrees with Donkor *et al.* (2019) whose study reveal that age plays a crucial role in influencing smallholder rice farmers' decision to adopt and use improved technologies in rice production and marketing in Ghana.

Smallholder potato farmers who belonged to group member had a positive effect on product differentiation at 1% significant level. A unit increase in one member increases the probability of planting different potato varieties by 0.741. The main reason is that some of the respondents in farmer groups had more market information about consumer demand for more varieties. The results are consistent with the findings of Donkor *et al*. (2019) and Oyo and Baiyegeunhi (2018) who found that smallholder rice farmers that belonged to farmer-based organization adopt new agricultural technologies in Upper East and Northern Region of Ghana and adapt to different climate changes in rice production in Nigeria.

Proactive behaviour of smallholder potato farmers had a significant effect on product differentiation at 1%. A unit increases in proactive behaviour score increases the probability of engaging in other farm enterprises by 0.257. The explanation is that potato farmers who exploited more market opportunities had market for their new potato varieties produced. The finding is in agreement with Shalla (2018) and Kraus *et al.* (2012) cite that entrepreneurs who proactive create and build a sustainable competitive advantage in Small and Medium Enterprises leading to enterprise growth and development.

Cosmopolite behaviour for smallholder potato farmers positively influenced product differentiation at 10% significant level. A unit increase in cosmopolite behaviour score increases the probability of differentiation by 0.183. This means that potato farmers who had cosmopolite behaviour used this behaviour in producing different potato varieties to satisfy market demand. The result is in line with the findings of Lodhi (2017) who found that cosmopolite motived smallholder famers to run their micro-enterprises efficiently and effectively in Raipur district, India. Vinayan *et al.* (2012) also cited that entrepreneurs used product differentiation as one of the critical key success factors in manufacturing industries in Malaysia to achieve sustainable competitive advantage.

Farm credit access by smallholder potato farmers was found to have a negative effect on farm diversification at 5% significant. A unit increases in having access to credit by one unit reduces the probability of engaging in other farm enterprises by 0.444. This means that potato farmers do not have access to farm credit in purchasing farm inputs for the purpose of supporting their farm enterprises. The major reason why the respondents lack access of farm credit to diverse their farm enterprises was due to lack of collateral and information asymmetry about credit conditions. Akumbole *et al.* (2018) found that smallholder farmers who have taken credit invest more in their maize farm enterprises and make them to attain competitive advantage in adopting improved technologies.

Innovative behaviour of smallholder potato farmers was found to positively influenced farm diversification at 1% significant level. A unit increase in innovative behaviour score increases the probability of engaging in other farm enterprises by 0. 184. The possible explanation is innovative farmers took risks to diverse their farm enterprises against natural hazards and increase farm income as a strategy of achieving competitive advantage. Konté et *al.* (2019) observed that innovativeness behaviour influenced smallholder rice farmers in attaining competitive advantage through the uptake of fertilizer subsidy in Niono, Mali.

Information seeking behaviour of smallholder potato farmers had positive impact on farm diversification at 1% significant level. A unit increase in information seeking score increases the probability of engaging in other farm enterprises by 0.193. This implies that potato farmers who sook more information on production and marketing diverse their farm enterprises to get higher incomes. This means that those farmers obtained relevant information from reliable sources utilize the information to achieve sustainable competitive advantage. The results support the finding of Yuliansyah *et al*. (2017) who stated that information-seekers acquire more relevant information to ascertain competiveness resulting in improvement of agricultural performance.

Decision making ability of smallholder potato farmers negatively influenced farm diversification at 5% significant level. A unit increase in decision making score increases the probability of engaging in other farm enterprises by 0.206. This means that potato farmers made appropriate decision to diverse their farm enterprises find it difficult to manage different farm businesses at the same time. It could due to the majority of the farmers interviewed were females and married, hence they tend to focus on only enterprise at a time. The results are not in agreement with the findings of Cao and Duan (2014) who observed that entrepreneurs who make effective decisions bring out new products to the market achieve competitive advantage in manufacturing industry in the United Kingdom.

4.7. Effect of Entrepreneurial Behaviour on Performance of Small-scale Potato Enterprises

This section presents the findings on the effect of entrepreneurial behaviour such as risk-taking, proactiveness, innovativeness, information-seeking behaviour, cosmopoliteness and decision-making ability on performance of small-scale potato enterprises. Gross profit was used as an indicator for performance of small-scale potato enterprises in Molo Sub-County, Kenya using seemingly unrelated regression model.

Normality Test

The study conducted a normality test using Kolmogorov-Smirnov and Shapiro-Wilk test. The assumption is that whenever the significance value is below 0.05. It means that the data is not normally distributed.

Table 14: Normality test

Dependent variable	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Gross profit	0.279	267	0.000	0.569	267	0.000
Entrepreneurial behaviour index	0.066	267	0.007	0.983	267	0.003

The results from Table 14 both Kolmogorov-Smirnov and Shapiro-Wilk test had a significance level of 0.000 and 0.000 which were below 0.05. The non-hypothesis is being accepted and concluded that there is a significant difference between the data.

Variance Inflation Factor (VIF) test was conducted to detect the presence of multicollinearity between independent variables for performance indicators. When the mean value of VIF is greater than 10; it indicates that there is a presence of multicollinearity.

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Table 15: Multicollinearity test for both categorical and continuous variables used in Seemingly Unrelated Regression

Categorical variable	VIF	1/VIF
Farmer group	1.88	0.532
Training	1.82	0.550
Credit access	1.24	0.809
Gender	1.04	0.964
Mean VIF	1.43	
Continuous variable	**VIF**	**1/VIF**
Decision-making ability	1.71	0.586
Cosmopolite behaviour	1.63	0.615
Respondent's age	1.61	0.623
Information seeking	1.52	0.660
Innovative behaviour	1.5	0.667
Farming experience	1.48	0.674
Proactive behaviour	1.48	0.676
Risk taking ability	1.12	0.897
Education level	1.11	0.900
Mean VIF	1.42	

Table 15 presents the results of the multicollinearity test. From the results, all the explanatory has variance inflation factor below 10. The mean VIF was 1.43 for categorical variables and 1.42 for continuous variables which were below 10, it indicates that there is no exact linear relationship between explanatory variables.

Heteroscedasticity Test

The study conducted a heteroscedasticity test to detect the presence of error terms that have constant variance in the parameters to be estimated.

Table 16: Heteroscedasticity test on performance indicators

Test	Chi 2 value	Prob>chi 2
Breusch-Pagan	5.85	0.0156

Breusch-Pagan test was conducted to check heteroscedasticity. The results from Table 16 show that the chi-square value was 5.85 with a p-value of 0.01 which below acceptable

range of 5% significance level. The null hypothesis is accepted at 5%, therefore there is a presence of heteroscedasticity among the estimated parameters.

Table 17: Correlation matrix on residuals

	Entrepreneurial behaviour	**Performance**
Entrepreneurial behaviour	1	
Performance	0.0244	1

Breusch-Pagan Test of independence chi (2) =0.159   Pr=0.6898

Table 17 provides the results on the correlation matrix of residuals of the two equations. That is entrepreneurial behaviour equation and farm performance equation. It was indicated that the correlation matrix of the residuals was 0.0244. This means that the relationship between entrepreneurial and farm performance was very weak. The Breusch-Pagan Test for diagonality of the variance-covariance matrix of the disturbances of the two equations was 0.6898.

Table 18 shows the two equations of seemingly unrelated regression for entrepreneurial behaviour and performance of small-scale potato farm enterprises. Twelve parameters were used to establish direct and indirect interaction between entrepreneurial behaviour and farming performance. The independent variables used were socio-economic characteristics, institutional factors, and entrepreneurial behaviour attributes of smallholder potato farmers in the potato farm enterprises in Molo Sub County, Kenya.

Table 18: Seemingly Unrelated estimates for performance of small-scale potato enterprises in Molo Sub County, Kenya

Variable	Entrepreneurial behaviour (Y1)		Gross margin (Y2)	
	Coef.	Std. Err.	Coef.	Std.Err.
Age of respondent	0.021***	0.004	-0.020***	0.003
Education level	0.003	0.018	0.020*	0.012
Access to loan	-0.040	0.117	-0.179**	0.080
Access to training	-0.023	0.128	0.273***	0.089
Membership to farmer group	0.054	0.130	-0.202**	0.088
Farming experience	-0.271***	0.135	0.894***	0.093
Risk-taking			0.057*	0.031
Proactiveness			-0.043	0.028
Innovativeness			0.031	0.028
Information-seeking			-0.013	0.025
Cosmopoliteness			-0.004	0.030
Decision-making			0.019	0.033
_cons	2.300***	0.285	2.569***	0.224
RMSE	0.82		0.56	
R square	0.10		0.42	
Chi2	29.82		186.81	
P value	0.00		0.00	

* ** *** statistically significant at 1, 5 and 10%

The results in Table 18 indicate that the age of smallholder potato farmers had a positive significant effect on entrepreneurial behaviour at 1% significance level. This means that a unit increase in additional years of potato grower's age led to 0.021 increases in entrepreneurial behaviour of smallholder potato farmers. The possible explanation is that older potato farmers make informed decisions to grow certified seeds to minimise pest and disease infestation and follow good agricultural practices to increase potato yield. The finding concurs with Wanyonyi and Bwisa (2015) posited that age has a positive influence on the entrepreneurial behaviour of cabbage farmers in Kenya.

Farming experience had a negative and significant effect on the entrepreneurial behaviour of smallholder potato farmers at 1% significance level. This shows that an increase

in an additional year in potato farming led to 0.271 decreases in the risk-taking ability, proactiveness, innovativeness, information seeking, and decision making ability of potato growers. The reason is that experienced potato farmers follow traditional methods of farming rather than modern methods which never improve their entrepreneurial behaviour skills. This could be due to their education level since most of the farmers interviewed had a basic level of education and were females. The study disagrees with Kumar (2016) who found that entrepreneurship experience had a positive impact on the entrepreneurial behaviour of farmers in the Bhagalpur district of Bihar. The study stated that increase in farming experience helped farmers to minimize the expenditure required to manage their farm enterprises and ultimately resulting in an increase in farm income level.

Age of potato farmers negatively and significantly affected the performance of small scale potato farm enterprises at 1% significance level. Based on the result, a unit increase in age by additional year led to 0.020 decreases in farm profitability. The argument here is that older farmers who had more knowledge and skills in potato farm enterprises tended to stick to their old production methods and techniques because they were afraid of taking risks in the potato farm enterprises. Potato farming enterprises require a lot of entrepreneurial qualities to adopt new production methods and techniques. The results reflect that as the potato farmers advance in age their self-confidence, motivation, physical strength, and skills reduce leading to low farm performance. This is supported by the empirical finding of Karane (2016) who found that as the age of producers increases, their mental capacity to cope with farm challenges and physical ability to do manual works decreases; thereby causing a reduction in farm profitability of common bean production in the Babati District of Tanzania.

Education level of smallholder potato farmers was found to have a positive and significant effect on the performance of small-scale potato farm enterprises at 10% significance level. A unit increase in years spent in school increased the farm profitability by 0.020. The likely explanation for this is that access to formal education provides potato farmers with more knowledge and experiential learning skills in the farm enterprises, making them adopt and practice modern agricultural innovations without hesitating lead to higher productivity and profitability. Education brings about behavioral changes in farmers that contribute to self-development by changing their knowledge and motivate them to try new ideas in agriculture. The findings of the study concurred with that of Mersha and Demeke (2017) that farmers who were empowered with more knowledge and best skills through education, employed effectively in the farm potato enterprises increase in farm profitability in Ethiopia.

Access to farm credit plays a significant role in farming enterprises. Access to farm credit was negative and statistically influences the performance of small-scale potato farm enterprises at 5% significance level. The results indicated that potato farmers who had access to credits were less likely to increase farm profitability by 0.179. Though the main purpose of taking these credits was to support farm operations through purchasing of farm inputs, it was found that potato farmers who used credits from financial institutions use the fund to support other agribusiness activities other than potato farm enterprises this made them not to increase in the performance of potato farm enterprises. The finding disagrees with Kimuru's (2018) observation that credit is a major determinant of growth in business enterprises and entrepreneurs who accessed credit used to support the enterprises which tend to increase in the sales and profit of their MSE enterprises in Nairobi.

Access to entrepreneurial training services had a positive and significant effect on the performance of small-scale potato farm enterprises at 1% significance level. A unit increase in access to training led to 0.273 increases in farm profitability. This shows that small scale potato farmers who received entrepreneurial training services on potato farming from stakeholders in the potato value chain transferred knowledge to their farm enterprises. Training provides technical skills that are necessary for running farm enterprises successfully and enhance farmer's confidence level. Therefore, training services develop farmers' entrepreneurial behaviour and skills to increase the productivity and profitability of potato enterprises in the central Rift Valley of Kenya.

Membership to farmer group negatively and significantly affects the performance of small scale potato farm enterprises at 5% significance level. A unit increase in membership reduced farm profitability by 0.202. The result means that potato farmers who belonged to a farm group were exposed to entrepreneurial opportunities but failed to market their potatoes collectively. Majority of the farmers interviewed reported marketing their potatoes individually rather than collectively. The finding contradicts Ndegwa (2016) who found that farmers who belonged to groups had positively influenced the marketing of pumpkins because these farmers shared information and established stable social networks through the group that enables them to sell more pumpkins and get more farm profits.

Farming experience had a positive and significant effect on the performance of small-scale potato enterprises at 1% significance level. The results denote that a unit increase in the number of years in potato farming led to a 0.894 increase in farm profitability of small-scale potato farm enterprises. The possible explanation is that the experienced small-scale potato farmers depend on agriculture as their main source of income and livelihood with their primary

objective of achieving higher farm profits through the adoption of modern agricultural practices. A similar finding was found by Donkor *et al.* (2019) whose study found that more experienced smallholder rice growers make better production decisions to adopt and used improved irrigation technology in their rice farm enterprises in Ghana.

The results from Table 18 indicate that risk-taking behaviour of potato farmers had a positive influence on the performance of small-scale potato enterprises at 10% significance level. A unit increase in risk-taking behaviour score led to a 0.057 increase in farm profitability. Risk taking behaviour plays an important role in determining farm profitability, *ceteris paribus*. The implication is that those potato farmers who took risks to try new seed varieties and adopt modern production methods could have had good yields and sold at higher prices, as well as could have made more profits in the potato farm enterprises. The observation is consistent with the findings of Shalla (2017) that found that risk-taking had a positive impact on the performance of the horticulture sector in Kashmir.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary of the Findings

The study focused on improving entrepreneurial behaviour among smallholder potato farmers and, how this behaviour enable farmers achieve competitive advantage and increase performance of farm enterprises. The study was conducted in Molo Sub County due to its predominant potato enterprise activities in Kenya. Smallholder potato farmers who grew and marketed potatoes were sampled randomly to participate in the research survey. A semi-structured questionnaire was used to elicit information from farmers with the help of a translator and trained enumerators. Entrepreneurial behaviour index, multivariate probit, and seemingly unrelated regression were used to analyze the stated research objectives.

Results indicate that the majority of smallholder potato farmers had a medium level of entrepreneurial behaviour in Molo Sub County. This could be attributed to their gender, marital status, age difference, education level, and farming experience. The main production and marketing challenges facing small scale potato enterprises were: high pest and disease infestation, unfavorable weather conditions, poor market for potatoes, high cost of agro chemicals and exploitation of brokers. These challenges reduce smallholder potato farmers competitive advantage level resulting to low farm performance in the small-scale potato enterprises. Entrepreneurial behaviour of risk taking, proactiveness, innovativeness, information-seeking behaviour, cosmopoliteness and decision-making ability play a vital role in driving smallholder potato farmers to achieve competitive advantage in potato enterprises. Finally, risk-taking ability affects the financial performance of small-scale potato enterprises in Molo Sub-County, Kenya.

5.2. Conclusions of the Study

i. The study concluded that majority of smallholder potato farmers possessed a medium level of risk-taking ability, proactiveness behaviour, innovativeness behaviour, information-seeking behaviour, cosmopoliteness and decision-making ability.

ii. In addition, the main challenges facing small scale potato farming enterprises were a high pest and disease infestation, unfavorable weather conditions, high cost of agro-chemicals, low prices, poor market and high exploitation of brokers. These challenges reduce competitive advantage and performance of potato farm enterprises in Molo County, Kenya.

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iii. It was concluded that entrepreneurial behaviour of risk-taking, proactiveness, innovativeness, information-seeking, cosmopoliteness and decision making ability drive smallholder potato farmers to build and maintain a sustainable competitive advantage in the small scale potato enterprises in Molo Sub-County.

iv. Finally, the present study concluded that risk-taking behaviour of smallholder potato farmers influenced performance of small-scale potato enterprises in Molo Sub County, Kenya.

5.3. Recommendations

i. The study recommends that potato smallholder farmers need to improve their entrepreneurial behaviour skills using self-assessment test and Johari Windows. Stakeholders in the potato value chain should come up with supportive programs that would help promote entrepreneurial skills and qualities among the smallholder potato farmers.

ii. Agricultural extension officers should to educate smallholder potato farmers about weather unpredictability and adoption of good agricultural practices to reduce production challenges. Smallholder potato farmers should sign contractual agreement with potential potato buyers to minimize marketing challenges. These smallholder potato farmers need to be proactive in exploring other market outlets in their farming community.

iii. The government in partnership with the private sector should provide technical assistance and storage facilities for smallholder potato farmers to enhance the competitive advantage of small-scale potato enterprises.

iv. Government should provide financial support and agricultural consultancy services for smallholder potato farmers to improve the farm performance of small-scale potato enterprises.

5.4. Suggestions for Further Research

The study proposes further or future research should focus on the effect of entrepreneurial marketing on market outlet choices among smallholder potato farmers in Nakuru, Nyandarua and Meru County, Kenya.

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APPENDICES

Appendix A: Questionnaire for potato farmers
Introduction

My name is John Atsu Agbolosoo, pursuing MSc in Agri-enterprise Development at Egerton University. I am conducting a research on *Effect of entrepreneurial behaviour on competitive advantage and performance of small scale potato enterprises in Molo Sub-County, Kenya.* The purpose of this study is purely academic. You have been selected to participate in this research survey. I humbly request you to allow me ask you a number of questions in relation to my research. The information you provide shall be held strictly confidential.

Enumerator _____ **Date of interview** _____**Start time**_____ **End time** _____

1. **Respondent's name** _____**Tel. contact** _____ **Household ID**: _____ **Ward**: 1. Elburgon [ ] 2. Molo [ ] 3. Turi [ ]

2. **Information on farmer's characteristics**

2.1. Who is the head of your household? 1. Self [ ] 2. Spouse [ ] 3. Others……….. 2.2. Sex of respondent 1. Male [ ] 2. Female [ ]	2.3. Marital status of respondent 1. Single [ ] 2. Married [ ] 3. Divorced [ ] 4. Widowed [ ] 5. Separated [ ]	2.4. Age of respondent 1. 18-25years [ ] 2. 26-35 years [ ] 3. 36-45 years [ ] 4. 46 -55years [ ] 5. Above 55 years [ ]	2.5. Education level of respondent 1. Informal education [ ] 2. Primary [ ] 3. Secondary [ ] 4. Tertiary [ ]	2.6. How many people live and eat with you in the house? [ ] 2.7. How many of these people help you on farm	2.8. Which type of land ownership do you have: 1. Self-owned [ ] 2. Family [ ] 3. Rented [ ] 2.8.1. Total Farm size in acres: 1. Own […………] 2. Family [……….]	2.9. Do you get your main income from farming enterprise? 1. Yes [ ] 2. No [ ] 2.9.1. If yes, how much do you get

				activities? [….]	3. Rented […….…] Total……….………	per year? (KES) [……] 2.9.2. If no, what is your main source of income [...................]

3. Information on potato farming characteristics

3.1. Do you grow potato? 1. Yes [ ] 2. No [ ] 3.1.1. If yes, how many years have you been in this potato farming? 1. 1-5 years [ ] 2. 6-11 years [ ] 3. 12-17 years [ ]	3.1.3. How many times do you grow in potato in a year? 1.Once [ ] 2. Twice [ ] 3. Thrice [ ] 4. More than thrice [ ]	3.2. How many acres do you use for potato farming? 1. 0.1-1.0 acre [ ] 2. 1.1-2.0 acres [ ] 3. 2.1-3.0 acres [ ] 4. 3.1-4.0 acres [ ] 5. 4.1-5.0 acres [ ] 6. 5.1 acres & above [ ]	3.3. Who owns this potato farm? 1.Self-owned [ ] 2. Joint-ownership [ ] 3. Farmer association [ ] 3.3.1 If joint, how many people own it? […..]	3.4. Did you use your own money to start this potato farming? 1. Yes [ ] 2. No [ ] 3.4.1. If yes, how much did you use to start this potato farming? […………………….]	3.5. Which type of labour do you use for your potato farming? 1. Family members [ ] 2. Hired labor [ ] 3. Family and hired [ ] 4. Group members [ ] 5. Others……………… 3.5.1. Among family and hired labor,

4. 18 years and above [ ]		3.2.1. Level of farming enterprise	3.3.2. If farmer association, how many	3.4.2. Where did you get money to start it?	which one do you use most?
		1. Micro sized [ ]	members? [……]	1.Own savings [ ]	1. Family members [ ]
3.1.2. Why do you grow potatoes?		2. Small sized [ ]		2. Family& friends [ ]	2. Hired laborers [ ]
1. Home consumption [ ]		3. Medium sized [ ]		2. Banks [ ]	
2. For fresh market [ ]				3. SACCO [ ]	3.5.2. How many of these people do you use per season […….]
3. Processing [ ]				4. Others………………	
4. Home consumption & fresh market [ ]					3.6.4. How many days do you use them per season […………….]
5. Others……………..					

4. Information on potato farming environment

4.1. Have you ever taken a loan for potato farming?	4.2. Do you sell your potato?	4.3. How do you get information on potato farming?	4.4. Have you ever received training on potato farming?	4.5. Do you belong to a farmer group?
1. Yes [ ] 2. No [ ]	1. Yes [ ] 2. No [ ]	1. Family & friends [ ]	1. Yes [ ] 2. No [ ]	1. Yes [ ] 2. No [ ]
4.1.1. If yes, where did you get the loan?		2. Group [ ]		4.5.1. If yes, what is the purpose of the group?
		3. MOALFI [ ]		

1. Bank [ ] 2. Cooperative [ ] 3. Table banking [ ] 4. SACCO [ ] 5. Digital platform (Mshwari, Tala, Branch) [ ] 6. Others………………… 4.1.2. When was the last time you took a loan? 1. This year [ ] 2. Last year [ ] 3. Last two years [ ] 4. Last three years [ ] 5. Last four years [ ] 4.1.3. What was your purpose for taking this loan? 1. Lease land [ ] 2. Purchase inputs [ ] 3. Pay causal laborers [ ]	4.2.1. If yes, where do you sell your potato? 1. At farm gate [ ] 2. Direct market [ ] 4.2.2. If direct, what is the distance to market place? 1. 1-10 km [ ] 2. 11-20 km [ ] 3. 21-30 km [ ] 4. 31-40 km [ ] 5. 41 km and above [ ] 4.2.3. If through direct market, how much do you	4. Social media [ ] 5. Others…………. 4.3. 1.How often do you receive this information? 1. Weekly [ ] 2. Monthly [ ] 3. Quarterly [ ] 4. Annually [ ] 4.3.2. Do you feel the information is adequate? 1. Yes [ ] 2. No [ ] 4.3.3. Do you keep record on potato farming? 1. Yes [ ] 2. No [ ] 4.3.3.1. If yes, how often do you keep records? 1. Every season [ ]	4.4.1. If yes, who provided the training? 1. MOALFI [ ] 2. Research institution [ ] 3. NGOs [ ] 4.Universities/Colleges [ ] 5. Others ………………. 4.4.2. How often you do receive training? 1. Weekly [ ] 2. Monthly [ ] 3. Quarterly [ ] 4. Annually [ ]	1. Farming [ ] 2. Marketing [ ] 3. Social welfare [ ] 4.Training [ ] 5. Advisory services [ ] 6. Others………………… 4.5.2. How often do you meet? 1. Weekly [ ] 2. Monthly [ ] 3. Quarterly [ ] 4. Annually [ ] 4.5.3. Do you grow potatoes as a group? 1. Yes [ ] 2. No [ ] 4.5.4. Do you sell your potatoes as a group? 1. Yes [ ] 2. No [ ]

| 4. To transport produce to market [ ] 4.1.4. If no, what are your reasons for not taking loan? ………………………………… …………………………............ | spend to transport it? [………] | 2. Every two seasons [ ] 4.3.3.2. Which kind of record do you keep? 1. Production [ ] 2. Marketing [ ] 3. Production & marketing [ ] 4.3.3.3. If no, what is your reason for not keeping records…………………….. | | 4.6.5. Does belonging to a farmer group has positive influence on your potato farming? 1. Yes [ ] 2. No [ ] 4.6.6. If yes, does it make your profit to increase? 1. Yes [ ]   2. No [ ] |

5. Information on farmer's behaviour

On a scale of 1 to 5 where 1- Strongly agree, 2- agree, 3-neutral, 4- disagree, 5- strongly disagree, please indicate in what way you agree with the following statements of agripreneurial behaviour (Tick appropriately √)

Risk-taking statement	Level of agreement				
	1	2	3	4	5
1. I store potato produce and sell during the lean period					
2. I try new seed varieties					
3. I try new production practices (apical cuttings)					

4. I invest in irrigation					

Proactiveness statement	Level of agreement				
	1	2	3	4	5
1. I identify market opportunities ahead of other potato farmers in this potato farming					
2. I try and use new production techniques before other potato farmers					
3. I find solution of how to control pests and diseases before they attack the crop					
4. I look for where to sell potato produce before planting potato tubers					

Innovativeness statement	Level of agreement				
	1	2	3	4	5
1. I look out for new potato variety to grow for the demanding market					
2. I use locally available materials to control weeds, pests and diseases affecting potato crops					
3. I use crop rotation as a means of controlling pests and diseases					

Information seeking behaviour statement	Level of agreement				
	1	2	3	4	5
1. I use mobile applications to access information on potato farming					
2. I have family and friends who share information with me concerning potato farming					

3. I search for information from social media platforms on potato farming (Facebook, WhatsApp etc.)					

Cosmopoliteness statement	Level of agreement				
	1	2	3	4	5
1. I seek for more information outside my community to improve potato farming					
2. I collect information from successful potato farmers outside the community in order to increase profitability					
3. I attend agricultural shows and field days outside the community to gain more knowledge on potato farming and management					

Decision making ability statement	Level of agreement				
	1	2	3	4	5
1. I grow certified seeds					
2. I follow good agricultural practices					
3. I insure my potato farm					

6. Information on competitive advantage

6.1.2. Do you store potato? 1. Yes [ ] 2. No [ ] 6.1.3. Which kind of storage facility do you use? 1. Concrete floor [ ] 2. Diffuse light [ ] 3. Cold store [ ] 4. Traditional [ ] 5. Others…………….	6.2. Do you clean potato after harvesting? 1. Yes [ ] 2. No [ ] 6.2.1. Give reasons for your answer above………………..... 6.3. Do you grade potato according to different sizes? 1. Yes [ ] 2. No [ ] 6.3.1. Give reasons your answer above………………………….	6.4. Do you sort potato to remove bad ones? 1. Yes [ ] 2. No [ ] 6.4.1. Give reasons for your answer above………………….. 6.5. Which variety do you produce for market? ………………………………… 6.5.1. Give reasons for your answer above…………………… …………………………………	6.6. Do you engage in other farming activities apart from potato farming? 1. Yes [ ] 2. No [ ] 6.6.1. If yes, which farming activity? 1. Crop [ ] 2. Livestock [ ] 3. Poultry [ ] 4. Crop & Livestock [ ] 5. Crop & Poultry [ ] 6. Poultry & Livestock [ ] 7.Crop,Poultry & Livestock [ ]	6.6.2. Which crop…….. 6.6.2.1. How many acres [ ] 6.6.3. If livestock, how many are they [ ] 6.6.3.1. If poultry, how many are they [ ] 6.6.4. Do you use the income generated from selling them to support potato farming? 1. Yes [ ] 2. No [ ]

7. Information on challenges facing small scale potato enterprises

Rank the most four challenges from highest to lowest which affect your potato farming (Rank appropriately√)

S/no	Constraint statement	Rank
1.		
2.		
3.		
4.		

8. 1. Information on cost of production in 2018

S/no	Activity	Quantity per season	Unit cost (KES) per season	Total cost (KES) per season	2018
1.	Labor cost for land preparation				
2.	Cost of purchasing seed				
3.	Transport fare for seed				
4.	Cost of fertilizer				
5.	Transport fare for fertilizer				
6.	Cost of chemicals				
7.	Transport fare for chemicals				
8.	Labor cost of planting				
9.	Labor cost for applying chemicals				
10.	Labor cost of harvesting				

8.2. Information on potato profitability in 2018 production season

8.2.1. Number of bags planted per season? [.......]	8.2.2. Number of bags of potato produced per season: [.....]	8.2.3. Number of bags consumed per season: [.........] 8.2.4. Number of bags used as seed per season: [........]	8.2.5. Number of bags sold per season [.........] 8.2.5.1. Average weight per bag in KG [.........] 8.2.5.2. How much did you sell 1 bag per season [.............]	8.2.6. What is the average price per bag in KES during season of high demand? [...........]	8.2.7. What is the average price per bag in KES during season of low demand? [.............]	8.2.8. How much did you make per season? [...............]

Thank you for your time and cooperation

Appendix B: Multivariate probit results

Sorting	Coef.	Std.Err	z	P>/z/	95% Conf.Interval	
Age	-0.00657	0.00858	-0.77	0.444	-0.02339	0.010247
Gender	0.078876	0.18038	0.44	0.662	-0.27466	0.432415
Education	-0.03228	0.029731	-1.09	0.278	-0.09055	0.025994
Hszi	0.017288	0.040718	0.42	0.671	-0.06252	0.097094
Experience	-0.00803	0.012494	-0.64	0.520	-0.03252	0.016457
Loan	0.54632	0.237095	2.3	0.021	0.081622	1.011017
Training	0.10413	0.255232	0.41	0.683	-0.39612	0.604376
Farmer_group	0.120354	0.234549	0.51	0.608	-0.33935	0.580061
Storage	-0.43556	0.195986	-2.22	0.026	-0.81968	-0.05143
Mean_Risk	0.130614	0.068181	1.92	0.055	-0.00302	0.264247
Mean_Proactive	-0.13746	0.080978	-1.7	0.090	-0.29617	0.021256
Mean_Innovative	0.083914	0.068105	1.23	0.218	-0.04957	0.217397
Mean_Information	-0.27033	0.068267	-3.96	0.000	-0.40413	-0.13653
Mean_Cosmpolite	-0.05979	0.090722	-0.66	0.510	-0.23761	0.118018
Mean_Decision	0.054515	0.087369	0.62	0.533	-0.11672	0.225754
_cons	1.720936	0.739744	2.33	0.020	0.271064	3.170808
Grading	**Coef.**	**Std.Err**	**z**	**P>/z/**	**95% Conf.Interval**	
Age	0.003429	0.008311	0.41	0.680	-0.01286	0.019718
Gender	-0.08364	0.175215	-0.48	0.633	-0.42705	0.259776

	Coef.	Std.Err	z	P>/z/	95% Conf.Interval	
Education	-0.02655	0.027258	-0.97	0.330	-0.07998	0.026874
Hszi	0.050958	0.041061	1.24	0.215	-0.02952	0.131436
Experience	-0.01141	0.01174	-0.97	0.331	-0.03442	0.011598
Loan	-0.02342	0.220551	-0.11	0.915	-0.45569	0.408849
Training	0.051708	0.254592	0.2	0.839	-0.44728	0.550699
Farmer_group	-0.54984	0.232738	-2.36	0.018	-1.006	-0.09368
Storage	-0.82007	0.187518	-4.37	0.000	-1.1876	-0.45254
Mean_Risk	-0.08386	0.069026	-1.21	0.224	-0.21915	0.051427
Mean_Proactive	-0.08761	0.076449	-1.15	0.252	-0.23745	0.062224
Mean_Innovative	-0.27106	0.06735	-4.02	0.000	-0.40306	-0.13905
Mean_Information	-0.10392	0.066654	-1.56	0.119	-0.23456	0.026719
Mean_Cosmpolite	-0.12852	0.092924	-1.38	0.167	-0.31065	0.053608
Mean_Decision	0.202952	0.090017	2.25	0.024	0.026522	0.379382
_cons	2.113396	0.737878	2.86	0.004	0.667181	3.55961
Differentiation	**Coef.**	**Std.Err**	**z**	**P>/z/**	**95% Conf.Interval**	
Age	-0.01298	0.008777	-1.48	0.139	-0.03018	0.004224
Gender	-0.0036	0.179145	-0.02	0.984	-0.35472	0.347514
Education	-0.07966	0.030037	-2.65	0.008	-0.13854	-0.02079
Hszi	-0.02926	0.042195	-0.69	0.488	-0.11196	0.053445
Experience	0.007355	0.012539	0.59	0.557	-0.01722	0.031932
Loan	-0.05117	0.231422	-0.22	0.825	-0.50475	0.402412

	Coef.	Std.Err	z	P>/z/	95% Conf.Interval	
Training	0.249159	0.267391	0.93	0.351	-0.27492	0.773235
Farmer_group	0.740813	0.248766	2.98	0.003	0.253241	1.228384
Storage	0.313206	0.195452	1.6	0.109	-0.06987	0.696285
Mean_Risk	-0.04844	0.070485	-0.69	0.492	-0.18659	0.089708
Mean_Proactive	0.256715	0.079275	3.24	0.001	0.101339	0.412091
Mean_Innovative	0.057542	0.06912	0.83	0.405	-0.07793	0.193015
Mean_Information	-0.04256	0.066515	-0.64	0.522	-0.17292	0.08781
Mean_Cosmpolite	0.18253	0.093378	1.95	0.051	-0.00049	0.365548
Mean_Decision	0.046405	0.089985	0.52	0.606	-0.12996	0.222772
_cons	-0.05749	0.735025	-0.08	0.938	-1.49811	1.383134

Diversification	Coef.	Std.Err	z	P>/z/	95% Conf.Interval	
Age	0.008688	0.008366	1.04	0.299	-0.00771	0.025084
Gender	0.170309	0.169538	1	0.315	-0.16198	0.502598
Education	0.030696	0.027543	1.11	0.265	-0.02329	0.084679
Hszi	-0.00808	0.040326	-0.2	0.841	-0.08712	0.070959
Experience	-0.01596	0.011885	-1.34	0.179	-0.03926	0.007333
Loan	-0.44434	0.217111	-2.05	0.041	-0.86987	-0.01881
Training	0.35095	0.24742	1.42	0.156	-0.13398	0.835883
Farmer_group	-0.30865	0.232616	-1.33	0.185	-0.76457	0.147268
Storage	0.26841	0.188829	1.42	0.155	-0.10169	0.638507
Mean_Risk	-0.00589	0.065941	-0.09	0.929	-0.13513	0.123349

Mean_Proactive		-0.10165	0.074895	-1.36	0.175	-0.24844	0.045143
Mean_Innovative		0.183724	0.065041	2.82	0.005	0.056247	0.311202
Mean_Information		0.192712	0.063554	3.03	0.002	0.068148	0.317277
Mean_Cosmpolite		0.00932	0.084785	0.11	0.912	-0.15686	0.175496
Mean_Decision		-0.20551	0.084572	-2.43	0.015	-0.37127	-0.03976
_cons		-0.30125	0.66971	-0.45	0.653	-1.61386	1.011355

Number of obs	267					
		Wald	chi2(60)	=		181.53
Log likelihood	=	-524.986 Prob	> chi2	=		0

/atrho21   .5746087 .1244743   4.62 0.000   .3306435 .8185738

/atrho31   -.338721 .1153901   -2.94 0.003   -.5648814 -.1125607

/atrho32 -.2673873 .1195634   -2.24 0.025   -.5017273 -.0330474

rho21   .5187359 .0909799   5.70 0.000   .3190989 .6742929

rho31 -.3263351 .1031016 -3.17 0.002   -.5115902 -.1120877

rho32 -.2611921 .1114066 -2.34 0.019   -.4634745 -.0330353

Likelihood ratio test of rho21 = rho31 = rho32 = 0:
chi2(3) = 33.4597   Prob > chi2 = 0.0000

Appendix C: Seemingly Unrelated Regression results

Entrepreneurial behaviour	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Age of respondent	0.02117	0.004179	5.07	0.000	0.01298	0.029359
Education level	0.00254	0.018103	0.14	0.888	-0.03294	0.038022
Access to loan	-0.04003	0.116634	-0.34	0.731	-0.26863	0.188567
Access to training	-0.02312	0.127911	-0.18	0.857	-0.27382	0.227577
Access to farmer group	0.05421	0.129602	0.42	0.676	-0.19981	0.308226
Farming experience	-0.27119	0.134719	-2.01	0.044	-0.53524	-0.00715
_cons	2.300143	0.285203	8.06	0.000	1.741156	2.85913

Gross profit	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Age of respondent	-0.01955	0.002984	-6.55	0.000	-0.02539	-0.01370
Education level	0.020482	0.012318	1.66	0.096	-0.00366	0.044624
Access to loan	-0.17904	0.079897	-2.24	0.025	-0.33563	-0.02244
Access to training	0.272765	0.088677	3.08	0.002	0.098961	0.446568
Access to farmer group	-0.20166	0.088412	-2.28	0.023	-0.37494	-0.02837
Farming experience	0.893649	0.092693	9.64	0.000	0.711974	1.075323
Risk taking	0.057056	0.030674	1.86	0.063	-0.00306	0.117176
Proactiveness	-0.04294	0.027571	-1.56	0.119	-0.09697	0.011102
Innovativeness	0.031287	0.027688	1.13	0.258	-0.02298	0.085554
Information seeking	-0.01307	0.024733	-0.53	0.597	-0.06154	0.035408

Cosmpoliteness	-0.00388	0.029966	-0.13	0.897	-0.06262	0.054849
Decision making	0.018862	0.032995	0.57	0.568	-0.04581	0.083530
_cons	2.569015	0.223836	11.48	0	2.130304	3.007725

Equation	Obs	Parms	RMSE	R-sq	chi2	P
eb	267	6	0.819403	0.1005	29.82	0.000
Trans_Profit	267	12	0.555722	0.4119	186.81	0.000

Correlation matrix	of residuals:					
	eb Trans_Profit					
eb	1					
Trans_Profit	0.0244 1.0000					
Breusch-Pagan test	of independence: chi2(1)	=	0.159,	Pr	=	0.6898

Appendix D: Research permit

Appendix E: Published paper