ADOPTION OF AGRICULTURAL MECHANIZATION BUSINESS MODEL AND COMMERCIALISATION OF MEDIUM SCALE FARMERS IN NWOYA AND AMURU DISTRICTS, NORTHERN UGANDA

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DECLARATION

I declare that this dissertation is my original work and has not been submitted for any award in any other university, college or institution of learning.

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APPROVAL

This dissertation titled "Adoption of agricultural mechanization business model and commercialization of medium scale farmers in Amuru and Nwoya District, Northern Uganda" has been done under our supervision and is hereby submitted to Gulu University for examination with our approval as the candidate's supervisors.

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DEDICATION

This work is dedicated to the memory of my parents, Mr. Jones Kitongo and Mrs. Rose Kitongo whose legacy taught me the essence of hard work and commitment.

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LIST OF ACRONYMS AND ABBREVIATIONS

GDP:	Gross Domestic Product.
ICT:	Information and Communication Technologies.
MAAIF:	Ministry of Agriculture, Animal, Industry and Fisheries
NHPC:	National Housing and Population Census.
WDR:	World Development Report.

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ABSTRACT

This study investigated the modes of adoption of agricultural mechanization business models in relation to commercialization of medium scale farmers in Amuru and Nwoya districts in Northern Uganda. Specifically, the study sought to understand the most common agricultural mechanization business model in practice; established the level of commercialization; and assess the association between adoptions of agricultural mechanization model with commercialization; as well as the association between farming systems with commercialization. Agricultural mechanization business model was operationalized by value creation, value capture and value delivery while commercialization was exemplified by participation in the input market, output market and profitability. The study was conducted through cross sectional survey. Data was collected using questionnaire and interview techniques with 380 farm owners and employees who were randomly selected. Data was analyzed using descriptive and inferential statistics and presented in tables and figures. Findings indicate that agricultural mechanization business models have a significant influence on commercialization with value capture as the most common business model mode. The findings also show that the level of commercialization is just above average and that farming systems have a significant influence on commercialization. The study concludes that agricultural mechanization business models employed influence commercialization in terms of profitability and participation in the input and output market. It recommends that government, development practitioners and scholars should design agricultural mechanization business models that have a strategic balance between value creation, value capture and value delivery with strong emphasis on value capture. It also recommends that government and development agencies should create enabling environment that enhance market participation and profitability for farmers. Furthermore, the study recommends that farmer investment in agricultural mechanization should be guided by a business model for commercialization to occur. Finally, the researcher recommends that a study be conducted to examine the different mechanization business models and which one enhances commercialization most in other farmer environments in Uganda.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

Commercialization of agriculture generally involves the transition of farmers from subsistence production to market oriented production. Sokoni (2008) defined commercialization of smallholder production as a process involving the transformation from production for subsistence to production for the market. Studies done by Abera,(2009) indicate that less than 15% of Ugandan farmers are engaged in commercialized farming and that the key challenge of farmers is low productivity as a result of low access to markets, credit and technology.

Research done by Benson, Mugarura, and Wanda (2008) indicates that 12% of Ugandan smallholder farmers are net sellers of farm output with 66% as net buyers. This is in agreement with Nivievskyi, Cramon, and Zorya (2010) Oleg et al, (2010), whose findings indicated that most farmers in Uganda display low levels of output and input commercialization. Mechanizing agriculture specifically the use of tractors and tractor drawn implements agriculture could be nominated as a driver of commercialization with specific focus on the business model approach to commercialization. This study therefore focused on agricultural commercialization of the medium scale farmers exemplified by profitability input and output market participation. This was with respect to the mechanization business model employed.

1.1 Background

Globally the concept of business models rose to prominence in the 1990`s although its origin dates back to the 1950`s (Osterwalder, Mirza & Speller 2015).The literature on origin of agricultural mechanization and commercialization is not specific but it has its origin as far as

the industrial revolution in Britain and the green revolution in Asia (Osterwalder et al., 2015).The publication by Wirtz, Pistoia, Uilrich, and Gotel (2016) agrees with this. However the contribution of agricultural mechanization as a driver of commercialization is widely acknowledged (Nepal and Thapa, 2009; Sims, Hilmi, and Kienzle, 2016).In Uganda, the link between agricultural mechanization and commercialization dates itself to the colonial era that was characterized by the state control of Agriculture which included controls of the input and output markets with major focus on cash crops. Much as there has been wide documented evidence between agricultural mechanization and commercialization of agriculture, there is limited literature on agricultural mechanization business models and commercialization. It is on this basis that the study sought to examine the influence of agricultural mechanization business model on commercialization.

The study was guided by the firm competitiveness theory developed by Michael Porter work on the competitive advantage of nations (Porter, 1990), although its roots is much as old as the seminal work of Adam Smith in mid-1770`s (Smith, 1776).The theory states that competitiveness depends on long run productivity, whose increase requires a business environment that supports continual innovation in products, processes and management, Porter (1990). Commercialization theory is an alternative theory however the researcher could not use it because of its emphasis on technology commercialization. The competitiveness theory postulates that farms are like firms whose competitiveness depends on the competitive performance, potential, and process (Ajitabh & Momaya (2004); Buckley, Pass and Prescott, (1988)).As adapted for this study the competitiveness theory holds that agricultural mechanization business model influences commercialization of medium scale farmers. It holds that value creation, delivery and capture by a farm influences the input market participation, profitability and output market participation in a farming system which is part of the supportive business environment.

The Business model refers to how a company organizes to generate revenue and sustain itself (Osterwalder et al, 2015). Slywotzky (1996) defines the business model as the totality of how a company conducts its business from customer acquisition, offering differentiation market participation and revenue generation. For this study, the definition of the business model is adapted from Osterwalder et al, (2015) and Najmaei, (2015).Mechanization business model was characterized by value creation, value delivery and value capture. Commercialization of agriculture generally involves the transition of farmers from subsistence production to market oriented production, Pingali (2012).Govereh et al.,(1999) define agricultural commercialization as the proportion of agricultural production that is marketed. For the study, commercialization was defined as the transition from subsistence to market oriented production characterized by participation in the input and output market and profitability as adapted from Pingali and Rose grant, (1999) and Govereh et al. (1999).In the study therefore, commercialization has been characterized by input and output market participation and profitability.

Regarding agricultural mechanization business model, value creation is defined as creating perceived use value, Najmaei, (2015).According to the author, value is created through a business model by enacting opportunities in order to embrace opportunities for customers. Value creation is an important aspect of a business model and has direct influence on commercialization since the customer value created provides output which is key to enhance participation in the output market. Therefore, when no value is created, participation in output market is minimal which affects the level of commercialization. It was therefore critical to examine how value creation status would enhance commercialization. Value capture is defined as the exchange value, Najmaei, (2015).It has a direct influence on commercialization since it directly impacts on profitability. When little value is captured, it affects profitability which subsequently affects commercialization. Firms succeed in the

marketplace when their business models enable them to reduce the total costs of creating use value and increase their captured total exchange value (Luo, Liao & Zang, 2016).

Meanwhile, value delivery is the manner in which a business products such that it gives maximum value to the customer using it, Najamei (2015).It influences commercialization since it determines how one participates in both the input and output market which is critical for designing value delivery strategies. Hence where value delivery is poor, commercialization is likely to be low. Its association has not been measured hence why this study sought to use value delivery as a measure that would influence commercialization. Meanwhile Input market participation refers to the use of purchased inputs in agricultural production as a measure of commercialization. Sustainable commercialization of farmers requires integration in the input markets (Jebesa, 2019). According to (Jebesa, 2019), input market participation has a direct influence on commercialization. This is because the intensity of input use determines the output and subsequently market participation and profitability. Hence where input market participation is low, commercialization is likely to be low.

Output market participation is simply the ability to sell. According to Swanson and Timothy(2012), output market participations is only possible if there is surplus production hence a farmer is considered commercialized if they have surplus for sale to the market. Therefore, where output market participation is low, the level of commercialization is low. In relation to its link with agricultural mechanization business models, several authors observed that usage of tractors as a means for mechanizing agriculture has the capability to contribute to increased production, productivity, and profitability by improving the timeliness, quality, and efficiency of the operations (Altalb, 2015; Mandal, Biggs and Justice, 2017).This indicates that mechanization is key to determine farm outputs that influences market participation. However, literature does not clearly indicate if the mechanization business

model would influence profitability, input, and output market participation. In Uganda the categorization of farmers fall into small, medium, and large scale. This is often based on various factors such as land size, production capacity and economic indicators. In context of this study, medium scale farmers in Uganda represents those with substantial investment in mechanized agricultural activities and actively engage in market oriented production (MAAIF, 2020; UBOS, 2020).

Uganda has a predominantly agrarian economy, with most of its population engaged in agriculture (UBOS, 2021). Agricultural practices in Uganda were largely manual, with farmers relying on traditional tools for cultivation. However, over the years, there has been a gradual shift towards mechanization to improve efficiency and productivity.

The government of Uganda has recognized the importance of agricultural mechanization in enhancing food security and increasing farmers' incomes. Various policies and programs have been implemented to promote the adoption of modern agricultural machinery. For instance, the Ministry of Agriculture, Animal Industry, and Fisheries (MAAIF) has been involved in initiatives to provide farmers with access to tractors, plows, and other mechanized equipment (MAIF, 2020). Despite the efforts to promote mechanization, challenges persist. Limited access to credit for smallholder farmers, inadequate infrastructure, and the high cost of modern agricultural machinery remain barriers to widespread adoption. Additionally, there is a need for training programs to familiarize farmers with the operation and maintenance of these machines (Jayne, & Chapoto, 2010).

Northern Uganda has faced unique challenges due to a prolonged period of conflict, which affected agricultural activities. The aftermath of the conflict has seen efforts to rebuild the agricultural sector and transition towards commercialization. Commercialization in Northern Uganda involves a shift from subsistence farming to market-oriented agriculture. Farmers are

encouraged to produce surplus crops for sale in local and regional markets. This shift is often supported by government programs and non-governmental organizations (NGOs) that provide training, credit, and market linkages. To promote commercialization, there has been an emphasis on the development of agribusiness enterprises in Northern Uganda. This includes the establishment of processing facilities, storage infrastructure, and the creation of value chains that connect farmers to markets (Obare & Kyotalimye, 2010). Collaboration between the public and private sectors has played a crucial role in advancing agricultural commercialization. Private companies, including agribusinesses and input suppliers, have been involved in providing technical support, access to markets, and investment in the agricultural value chain (MAAIF, 2021).

Therefore, the scenario described above pointed out to the need to examine the influence of agricultural mechanization business model on commercialization of medium scale farmers. It raised the question of recommendations that would enhance commercialization of medium scale farmers in Nwoya and Amuru district.

1.2 Problem Statement

The level of commercialization in Uganda has considerably remained low Obare, 2017). Several authors observed that mechanized agriculture has the capability to contribute to increased production, productivity, and profitability by improving the timeliness, quality, and efficiency of the operations and overall commercialization (Altalb, 2015; Mandal, Biggs and Justice, 2017). However, the level of agricultural commercialization in Uganda is generally considered to be low. Several efforts have been employed by government under Plan for modernization of Agriculture through national agricultural advisory services and currently operation wealth creation but this has not translated into commercialization, (Zorya, Kshirsagar, Gautam,Odwongo and Sebudde ,2012).

Significant investments have been made in promotion of farm mechanization both by government and private sector players with little success yet studies have shown mechanization is indispensable for commercialization (Nepal and Thapa, 2009). Despite all investments in mechanized farming, research findings still indicate low level of commercialization with low levels of output and input commercialization and less than 15% of Ugandan farmers engaged in commercialized farming (Rada and Fugilie, 2019).

In view of the above literature, there is need to examine what influence agricultural mechanization business models have on commercialization. If this is not addressed, farmers and government will continue to invest in agricultural mechanization without achieving commercialization, yet farm mechanization is capital intensive. Therefore, the study sought to examine the influence of agricultural mechanization business models on commercialization of medium scale farmers in Amuru and Nwoya districts in Northern Uganda.

1.3 Purpose of the Study

The purpose of the study was to assess the influence of agricultural mechanization business model on commercialization of medium scale farmers in Amuru and Nwoya Districts, Northern Uganda.

1.3.1 Specific Objectives

i. To investigate the nature of agricultural mechanization business models adopted by medium scale farmers in Amuru and Nwoya Districts.
ii. To determine the level of commercialization of medium scale farmers in Amuru and Nwoya Districts.
iii. To assess the association between agricultural mechanization business model with commercialization of medium scale farmers in Amuru and Nwoya Districts.

iv. To assess the interaction effect of farming system on the level of commercialization of medium scale farmers in Amuru and Nwoya districts.

1.4 Research Questions

i. What is the extent of agricultural mechanization business models adopted by medium scale farmers in Amuru and Nwoya?
ii. What is the level of commercialization of the medium scale farmers in Amuru and Nwoya Districts?
iii. What is the effect of agricultural mechanization business model on commercialization of medium scale farmers?
iv. What is the effect of farming system on the level of commercialization of medium scale farmers in Amuru and Nwoya districts?

1.5 Scope of the Study

The scope of the study included the content, Geographical and Time scope.

1.5.1 Content Scope

The study focused on adoption of agricultural mechanization business model as an independent variable characterized by value creation, delivery and capture using tractor and tractor drawn implements while commercialization as a dependent variable was characterized by profitability and participation by the farmer in the input and output market.

1.5.2 Geographical Scope

The study focused on medium scale farmers in Nwoya and Amuru districts in Northern Uganda. The district is bordered by Lamwo district in the North East, the Republic of Southern Sudan in the North, and Gulu in the East. Nwoya district is boarded by Omoro

District in South East, Buliisa District in the South and West Nile districts in the West. The vegetation in the two districts is mainly of Savannah characterized by woody cover and grass layer. The two districts have been selected because they represent the districts in Northern Uganda with heavy presence of medium scale farmers undertaking mechanized agricultural practices

1.5.3 Time Scope

The study was conducted from June 2019 to December 2019.The study focused on medium scale farmers who had been active in Agricultural crop production for at least three consecutive years and were farming (2016 to 2019). This was because these were farmers had production records hence their level of commercialization could easily be determined.

1.6 Significance of the Study

This is one of the few studies that focused on adoption agricultural mechanization business model and commercialization of medium scale farmers in Amuru and Nwoya district in Northern Uganda. It has therefore generated useful material for reference to other researchers and practitioners.

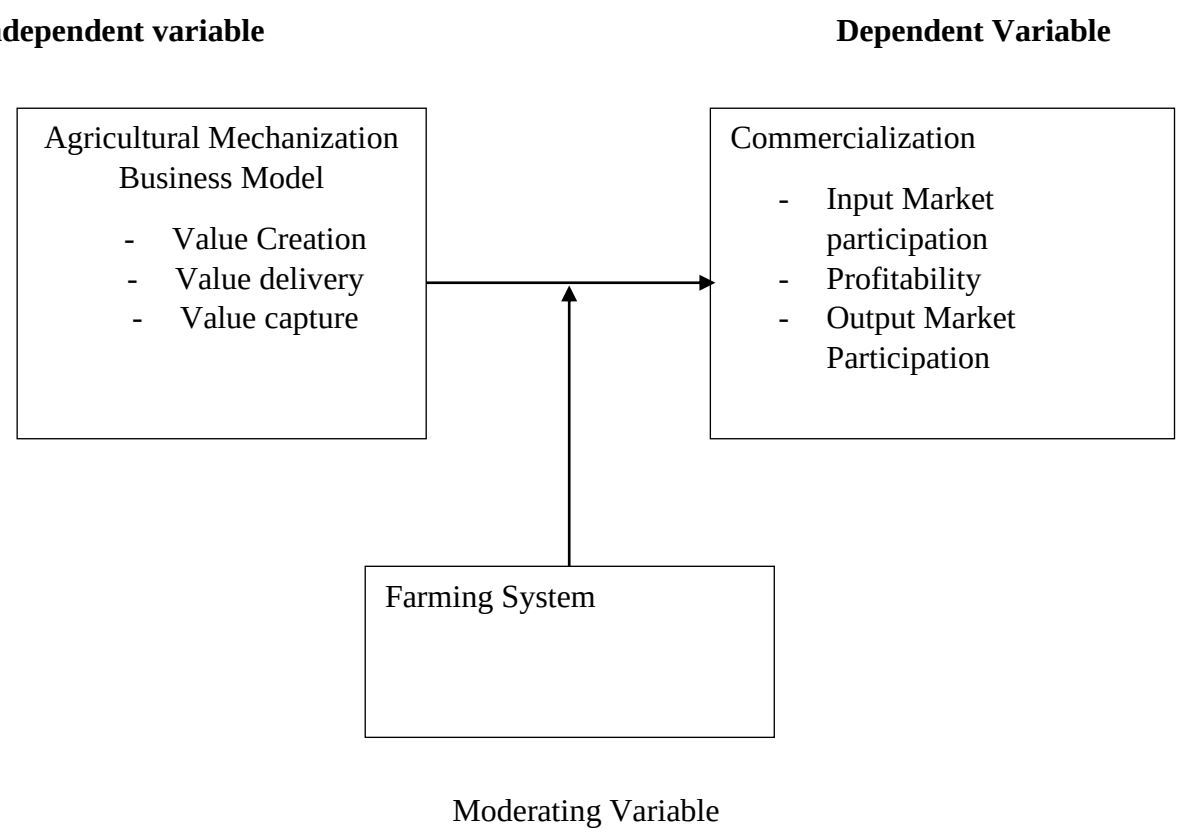
The study may also influence the farm management practices of medium scale farmers in Amuru and Nwoya districts in Northern Uganda. Henceforth in attempt to commercialize, the medium scale farmers will focus and devote efforts to specific aspects of commercialization generated by this study. Therefore, they should not follow and adapt models, rules and theories that are remote and not specific to their context, but they will base their practices and decisions on findings of the research that are specific to their context. The use of this context specific knowledge could improve on adoption of the right agricultural mechanization business model and investment in key areas that enhance farmer commercialization. This will

facilitate improvement in the level of commercialization and promote commercialization of agriculture in Uganda.

The study has suggested significant policy statements on agricultural commercialization. These recommendations could inform policy formulation on commercialization of agriculture in general because the recommendations have been originated through valid research data.

1.7 Conceptual Framework

To conceptualize the context of agricultural mechanization business models and commercialization of medium scale farmers, the framework illustrated below describes the relationship amongst the study variables.



Source: adapted from Pingali & Grant, (1995).

Figure 1.1: Conceptual Framework illustrating agricultural mechanization business model, commercialization, and farming systems.

Conceptual Explanation

Figure 1 above illustrates Agricultural mechanization business model as an independent variable measured by value creation, value delivery and value capture. Agricultural mechanization business model has been conceptualized to influence commercialization (dependent variable) measured by profitability, input, and output market participation. Farming systems was conceptualized as a moderating variable to influence the relationship between agricultural mechanization business model and commercialization of medium scale farmers.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews related literature on agricultural mechanization and commercialization of agriculture. It also highlights farming systems as spoken of by other scholars.

2.1 Theoretical Review

The study was on the influence of agricultural mechanization business model and commercialization of medium scale farmers in Amuru and Nwoya districts in Northern Uganda was guided by the competitiveness theory. This has been reviewed below.

2.1.1 Competitiveness Theory

This study was guided by the firm competitiveness theory developed by Michael Porter work on the competitive advantage of nations (Porter, 1990) although roots is much old as the seminal work of Adam Smith in mid-1770`s (Smith, 1776).According to Porter (1990), the theory states that competitiveness depends on long run productivity, which increase requires a business environment that supports continual innovation in products, processes and management. Porter, (1990) adds that the four underlining conditions driving the global competitiveness of country's companies are demand conditions, related and supporting industries, the firm's strategy, structure and rivalry.

The competitiveness theory emerged through a classical, neo classical and contemporary phase. The classical competitiveness approach focused at macro level and referred to international trade and nation's comparative advantage in production of commodities. The neo classical theories focused on micro level and specifically on effective competition (Clark, 1961) while the contemporary competitiveness theories have focused on both competitiveness of nations and enterprise competitiveness (Porter, 1990). Commercialization

theory is an alternative theory however the researcher could not use it because of the limitation application to technology and business models are not considered as technology. The competitiveness theory postulates that farms are like firms whose competitiveness depends on the competitive performance, potential, and process (Ajitabh and Momaya (2004); Buckley et al. (1988); Man et al. (2002)).The theory is concerned with productivity, firm innovation, market behavior, resource use, administration and business environment hence why is was chosen for this study.

As adapted for this study the competitiveness theory holds that agricultural mechanization business model influences commercialization of medium scale farmers. It holds that value creation, delivery and capture by a farm influence the input market participation, profitability and output market participation under a particular farming system. However, in adopting the competitiveness theory for this study the researcher is cognizant of its short comings in that this theory requires a shared vision by all involved by all people involved in the farm enterprise so that everyone has an idea on what they are trying to achieve. It also focuses on competitiveness in relation to other firms which could limit potential of a farm to commercialize optimally since the yard stick for measurement is other farms rather than own capability.

2.2 Adoption of Agricultural mechanization business model

The concept of business model evolved over time however the current conceptualization of business model refers to the way a firm as an economic unit creates, delivers and captures value for its customers (Najmaei, 2015).The author added that in order to understand a business, understanding its business model is key and to understand the business model we need to understand value creation, value delivery and value capture (Najmaei, 2015).Several business model definitions have been advanced.

According to Osterwalder et al., (2005), a business model refers to how a company organizes to generate revenue and sustain itself. Slywotzky (1996) defines business model as the totality of how a company conducts its business from customer acquisition, offering differentiation market participation and revenue generation. Teece, (2010) defines a business model as what defines a firm business in terms of what value it offers, how it produces this value offering and how it commercializes it in the market place. Najmaei, (2015) strongly agrees with this and states that a business model serves a recipe that guides executive on how they can lead their firms from opportunities to market place profits. The definition of business model as advanced by Teece, (2010) and Osterwalder et al., (2005) was adopted for this study. Therefore, Agricultural mechanization business model is considered the way in which farms use agricultural mechanization to create customer value, deliver value and capture value in its operations using tractor and tractor drawn implements and machinery. The study was specifically contextualized to how the adoption agricultural mechanization business model enhanced commercialization of the medium scale farmers in Amuru and Nwoya district in Northern Uganda.

Agricultural Commercialization may not be possible without mechanization (Nepal and Thapa, 2009). In a study conducted by Nepal and Thapa, (2009) in Eastern Nepal on the link between agricultural mechanization and commercialization, it was concluded that farm mechanization is the most influential factor in agricultural commercialization in Nepal. This was reinforced by Sims and Kienzle, (2017) on agricultural mechanization for sub Saharan Africa. The authors noted that agricultural mechanization is critical for increased output of higher value products while eliminating the burden associated with human labour.The authors recommended that mechanization plays a key role in enabling agri food systems and improving efficiencies. Therefore, the study by Sims and Kienzle, (2017) suggests that there

is a very strong link between agricultural mechanization business model and commercialization of farmer

The link between the adoption of agricultural mechanization business model and commercialization goes beyond current dominant view of agricultural mechanization whereby it is simply viewed as the use of farm machinery for land preparation and value addition. The link focuses more on how farms employing agricultural mechanization ensure that it creates, delivers and captures value for their farms. This then shifts the view of mechanization as a farm technology practice to mechanization as a farm operation guided by a business model. While writing on performance of entrepreneur firms Zott and Amit, (2007) posited that the right business model is instrumental in developing enduring value differential in the minds of customers between one`s firms offering and another. They added that firms not only differ in their adoption of business model but also translate these models into various market outcomes through different value creation and value capture activities.

Further, in the study conducted by Malinen & Pellikka, (2015) while reporting on business model and commercialization amongst small high technology firms, the authors noted that effective commercialization secure the survival of a venture and provide key benefits such as increase in turn over, profits and market share. They added that firms have to be able to create sustainable business models for new product commercialization to realize economic potential and value. Agricultural commercialization is not immune to this considering that mechanization can lead to an expansion of agricultural area, output and employment. The study therefore suggests business models could be a key influencer of commercialization.

Nepal and Thapa, (2009) while examining the link between agricultural mechanization and commercialization found that for farms that were commercialized, mechanization was the most influential factor indicating the significant role of mechanization and agricultural

commercialization. There is limited literature on agricultural mechanization business models and commercialization as most of the studies on business models have either focused on e commerce, information technology and small, medium enterprise and corporations. It's based on this that this study sought to examine the influence of agricultural mechanization business model and commercialization of medium scale farmers in Amuru and Nwoya district.

2.2.1 Value Creation

Value creation is defined as creating perceived use value and value capture is defined as exchange value (Bowman, (2013); Osterwalder (2015); Najamei (2015); or value appropriation (Lepak, Smith and Taylor, 2007).The most common modes of agricultural mechanization business model has not been studied by scholars hence the reason for limited literature on it. However, studies have been conducted in other related disciplines. In a study that examined business model innovations in least developed markets John, Kenneth and Jackson (2017) examined the most common modes of business models practiced by small and medium agribusinesses although the agribusinesses were restricted to cereals trade and processing. One of the key findings was that most small and medium agribusinesses in least developed markets believed that creating value for customers help sell products and services while creating value for shareholders at the same time. Altering value creation element of the business model is the most practiced among small and medium enterprises. This was followed by value delivery and the least business model practiced was value capture. The study concluded that the most understood and practiced business model was value creation.

Meanwhile in the study conducted by Najmaei, (2015) on business model, value creation, value capture and information technology, the author throughout his work acknowledged value creation and value capture as the most important business model modes that should be applied in information technology businesses to remain competitive and profitable.

Specifically, the author stated that firms do not only differ in their adoption of business model but also in translating these business models into various market outcomes through different value creation and value capture activities. Both Najmaei (2015) and Rachkara et al., (2017) agree on value creation as an important business model among firms. However while John et al,(2017) advance value delivery followed by value capture, Najmaei,(2015) advances value capture and does not make mention of value delivery. However, it is important to note that the three business model modes are interdependent and a firm needs to ensure all is practiced for sustainable business operations because all contribute to customer value. Najmaei, (2015) emphasizes that the ability to figure out and combine most critical and successful factors in a coherent and synergic way promotes the solidarity of the business and encourages the creation of maximum value for customers.

In analysis of constraints faced by the bottom of the pyramid producers, London, Anupindi and Sheth, (2010) indicated that productivity and transactional constraints affect business ventures. They added that productivity constraints inhibit value creation and transactional constraints inhibit value capture potential of producers. The findings further indicated that alleviating the constraints create value for producers and ventures. The consensus on value creation as important modes of the business model cannot therefore be understated. Throughout literature there is general consensus on value creation as the most common. However, these are based on studies in information technology, e-commerce and agro processing in small and medium enterprises. Literature on agricultural mechanization business model is lacking and specifically value creation. It is on this basis that the study sought to examine the influence of agricultural mechanization business model on commercialization of medium scale farmers in Amuru and Nwoya while specifically seeking to establish the most common agricultural mechanization business model used by medium scale farmers.

2.2.2 Value Delivery

Value delivery is the manner in which products and services are designed such that it gives maximum value to the customer using it, Osterwalder, (2015). According to Scheller and Hruby (2016) value delivery is flow of possession, ownership, and availability of economic resources between economic agents, value creation, and consumption, and a transfer of resources between agents' repositories. This is agreed upon by Najamei, (2015) who affirms that value delivery is the manner in which a business makes products such that it gives maximum value to the customer using it. Value delivery place in influencing commercialization is established in that any value delivery strategy determines how one participates in the input and output market and how one generates profitability. However while John et al, (2017) advance value delivery followed by value capture, most authors have a different opinion and advance value creation instead (Najmaei, (2015; London et. al., (2010); Osterwalder (2015)).

One key question would be regarding what value is delivered regarding agricultural commercialization.(Zhoul, Minde & Mtigwe, 2013)in their work on agricultural commercialization advanced that on the input side one may define commercialization as value of inputs acquired from market on output side agricultural production value while attaching a profit motive. Analyzing the work of the above author indicate that value delivery component of a business model focuses on the use agricultural mechanization business model to utilize equipment that would enhance value of input or utilize equipment's/ technologies that help create the desired products and services for customers.

Based on literature above, value creation and value delivery are very synonymous. According to the work of (Vladyslav & Oleksiy, 2018), value created is value proposition and it is what make customers move from one company to another, value delivered are the channels

through which a customer's gets to acquire the created or perceived value. Therefore, it is evident that value must be created before value delivery can take place. And the success of value delivery is dependent on the value created. Regarding the link with agricultural commercialization, the type of agricultural mechanization business model should be able to deliver the created value to customers otherwise would hinder input and output market participation and profitability. Notably, there is not much rich literature on value delivery in regard to the study subject and it was on this basis that this study sought to examine the influence of agricultural mechanization business models on commercialization and operationalized by value creation, value delivery and value capture.

2.2.3 Value Capture

Value Capture is widely understood in the context of profitability across literature. For instance, Najmaei, (2015) define value capture as the exchange value whileSjödin, Parida, Jovanovic and Visnjic (2020) define value capture as the process of securing profits from value creation and the distribution of those profits among participating actors such as providers, customers, and partners. Both define value capture from the transactional perspective. The authors further add that value capture processes involve activities that enable providers and customers determine how the additional value created should be distributed between provider and customer. Meanwhile Bowman and Ambrosini, (2010) in their work on how value is created, captured and destroyed; argued that value capture is determined by the perceived power relationships between buyers and sellers. From the definitions and arguments above, its stands out that value capture fits into commercialization in that it links to market participation and profitability. Hence when little value is captured, commercialization is also affected.

In the study conducted by Kholer on crowd sourcing based business model, the author argues that business model capture a share of value created as profit .Meanwhile, Dyer, Singh and Hesterly, (2018) advance that business model create and capture value when the elements that compose it improve on how consumers perceive a firm's products and better enable heterogeneous customers act on their willingness to pay. Chedbrough, Lettl and Ritter, (2018) in their work on value creation and value capture in open innovation agree that value is not only driven by the value created through the collaborative exchange process but also by the ability to capture the value created. The link between value capture and commercialization is clear throughout literature for instance in the work by Belcher and Schreckenberg, (2007) on commercialization of non-timber forest products by creating and capturing more value. Mattila, Yrjölä and Lehtimäki, (2019) agree that in commercialization, the profit model reflects the chosen value capture logic and added that the planned revenues, margins, cost structure, timing of cash flows and asset utilization reflect the dual purposes of creating and capturing value. This directly links with profitability which is a key component of commercialization. Therefore, based on analysis of the work of the authors, value capture element of the business model is key for profitability in commercialization, when less value is captured; it affects profitability which subsequently affects commercialization.

2.3 Level of Commercialization

Commercialization has been advanced as a means of improving farmers' income and reducing rural poverty in many developing countries (Nyangira, Kosura & Mwanga, 2019). It has also been considered as a major strategy of ensuring household food security. According to (Vladyslav & Oleksiy, 2018),agricultural commercialization is not restricted to specialization in cash production but it is also about the production of marketable staple food crops like cereals and that most analyses on agricultural commercialization make little difference between market-orientation (profit maximizing) and market participation (utility

maximizing), which are the two components of agriculture commercialization. Benard, Gabre-Mahdin and Taffesse, (2007) agree with this view adding that commercialization is not restricted to cash crops since traditional food crops are also frequently marketed to a considerable extent. In general terms, agricultural commercialization refers to the process of increasing the proportion of agricultural output and input, (Jaleta, Gabre-Mahdin and Hoekstra (2009); Martey, Altassan and Kuwanu (2012)

The main acknowledged thought of agricultural commercialization is that the farm households are considered to be commercialized when aiming at markets in their production decisions rather than being linked only to the amount of output they would possibly trade because of surplus production (Pingali 2015). That is to say, production decisions of commercialized farmers are based on market information, while production decisions of subsistence farmers are based on production viability and subsistence requirements and trading only the remaining surplus production once household consumption requirements are satisfied. (Zhoul et al, 2013) defined agricultural commercialization as the process of transformation of agriculture to market oriented production which tends to impact incomes, consumption and nutritional setup of the farm households. (Vladyslav & Oleksiy, 2018), definition is more than producing surplus output to the market and thus includes household's decision behavior on product choice and input use based on the principle of profit maximization. However, there is also the prevalence of commercialization in subsistence agriculture where farm households supply certain proportion of their output to the market from their subsistence level (Gebre, 2021).In his study commercialization is defined as the transition from subsistence to commercial production based on market signals which include profitability, input and output participation irrespective whether it is a cash crop or not.

Most authors approach defining commercialization in slightly different ways. While some authors view it as increasing the proportion of marketed output or increasing cash crop production (Nyangira, Kosura & Mwanga, 2019), others broadly view it as a transition from subsistence towards market oriented production (Pingali 2015). Okezie et al. (2008) in the analysis of cases majorly determined commercialization level by proportion of output marketed and mainly focused on crops (cash crops, food crops and horticulture). However, Braun and Kennedy (1994) and Jaleta et al., (2009) simplify the concept by narrowing down on the concept by omitting critical elements like production purpose and farmer's behavior in resource acquisition and allocation which Poulton, Tyler, Hazel, Kydd and Stockbridge(2008) view as more critical in defining the concept of commercialization. Hence based on the work on a number of authors Jaleta, et al., (2009); there is little distinction between market orientation and market participation of farmers and that market orientation and market participation are synonymous and thus most of the analysis of the determinants of agricultural commercialization is based on the analysis of the determinants of market participation which is input and output. It has also been noted that a number of authors advance commercialization to the process of increasing the proportion of agricultural output that is sold by the farmers (Jaleta et al., 2009; Pradhan et al., 2009).

Currently, Uganda has prioritized commodities for the purpose of commercialization under operation wealth creation and parish development model programmes. One issue of concern is the targeted commodity types for commercialization, whether to produce commodities for domestic or export markets. The second is whether smallholder commercialization should focus on enhancing the productivity and marketability of staple food crops or newly introduced high-value crops. The decision to produce for domestic market or export market depends on the nature of the targeted commodity (Poulton, 2017).All the above represent gaps in the concept of commercialization hence for the purpose of this study,

commercialization is understood as the transition from subsistence to commercial production based on market signals which include profitability, input and output aspect of production irrespective of the enterprise.

Agriculture is considered a leading sector for future economic growth and economic inclusion in the current National Development Plan yet despite having very favorable natural resource and climate conditions for production of a wide variety of crops and livestock; average total factor productivity has been negative for the last two decades (World Bank, 2018). This suggests that agricultural growth has been low and hence commercialization. Additionally, World Bank (2018) adds that National agricultural output has grown at only 2 percent per annum over the last five years, compared to agricultural output growth of 3 to 5 percent in other EAC members and 3.3 percent per annum growth in Uganda's population over the same period.

During the past two decades, a diverse array of initiatives was promoted the commercialization of agriculture in Uganda. The results have been quite mixed over time, along commodity lines, and in different locations. The current approach to commercialization in Uganda is based on the assumption that smallholders fail to perform, especially in recent years (World Bank, 2018). There are spatial differences in farm performance, but those differences are not very large, except when compared with northern Uganda. The key constraint to agricultural commercialization in Uganda is inadequate access of farmers to infrastructure and assets, both physical and human. Those with access to assets and closer to markets engage actively in the markets, while those lacking one or more of these essential ingredients largely do not (Mathew and Pingali, 2020).The authors acknowledge that there has been little progress in promoting commercialization in Uganda and hence level of agricultural commercialization is low and farmers display low levels of input and output

commercialization. This is in agreement with the literature on smallholder market participation in Africa (Oleg et al, (2010); Barret, (2007); Jaleta et al, (2009).All scholars agree that the level of agricultural commercialization in Uganda is low.

Challenges notwithstanding, Ugandan agriculture has enormous potential to transform the economy and make farming much more productive and profitable for Ugandan smallholder farmers (World Bank, 2018) since booming domestic and regional demand for higher-value foods arising from income growth, urbanization, and dietary shifts offer massive opportunities for Ugandan farmers. Therefore, developments in agricultural technology and ICT, and various successful agribusiness models that could be up scaled to enhance agricultural commercialization would be a growth driver, World Bank (2018). It is therefore based on this that this study sought to examine the adoption of agricultural mechanization business model on commercialization of medium scale farmers in Amuru and Nwoya district in Northern Uganda.

2.3.1 Input Market Participation

According to (Jebesa, 2019), commercialization can be measured along a continuum from zero (total subsistence-oriented production) to unity (100% production is sold). Strasberg et al. (2019), suggested a measurement index called household Crop Commercialization Index (CCI) which is computed as the ratio of gross value of all crop sales over gross value of all crop production multiplied by hundred. The advantage of using this approach is that it avoids the use of crude distinctions as commercialized and non-commercialized farms. However, this index had its limitations. For instance, consider the case when a farmer producing one units of any cereal crop and sells that all and another farmer producing ten units of the same cereal crop and sales only two units. The crop commercialization index will tell us that the first farmer is fully commercialized while the second is semi-commercialized. This is a

limitation especially in northern Uganda where it is likely to get farmers selling all their farm output However based on the work of several authors, critical aspects of commercialization evidently are input and output market participation and element of sales aimed at generation of revenue which is profitability(Strasberg et al., 2019; Jaleta et al., 2009).It is based on the above that this study adapted and measure commercialization in terms of input market participation, profitability and output market participation.

There is consensus in literature that smallholder agriculture commercialization occurs when farmers produce more output per unit of land by using improved technologies such as improved seed, fertilizer, produce greater surpluses and increase their market participation which results into commercialization. Hence according to Kaiyatsa (2019), it would be wrong to simply focus on one indicator such as market participation, given some farmers may sell produce out of distress which does not mean they are not commercial farmers. Therefore, market participation by smallholder farmers in input and output markets is considered commercial farming when all other key aspects of agricultural commercialization processes are met. In a study conducted by camara, (2017) in Guinea on market participation, the author advanced that market participation does not depend only on a well-functioning output market, but also on efficient and low-costs production factors in input market and profit making. Jaleta et al., (2009) is in agreement with the same thought and his findings indicated that market participation requires not only perfect output markets but also efficient and low-cost factor markets that can capture the true opportunity costs of inputs.

Viewing market participation from optimalisation lens, households participate in a given market only if participation is a choice and participation is expected to be profitable, Dejanvry and Sadoulet, (2010).This suggests a relationship between market participation and profitability. Market participation as defined by Barrett (2008) indicates how farm

households undertake the production of goods and services for consumption or specialize in producing those goods in which they have a comparative advantage. These farmers according to Barrett (2008) consume some and sell the surplus or excess for other goods and services that they desire but possess no such comparative advantage in producing. Commercialization entails market orientation which involves agricultural production decision destined for market based on market signals and market participation which involves produce offered for sale and use of purchased inputs. Most of the literatures on commercialization reflect the output side of commercialization. However, sustainable commercialization of smallholders also requires integration into the input markets (Pingali 2015). Based on the consensus in literature and gaps identified in previous studies, this study focused on input market participation as one of the measures of agricultural commercialization amongst medium scale farmers in Amuru and Nwoya district.

2.3.2 Profitability

It important to note that 69.4 percent of Uganda's population is still practicing subsistence farming, NPHC (2016).This means that these people must be brought into the money economy through modernizing and commercializing agriculture if Uganda is to achieve a middle income status. However, Smallholder agriculture sector in Uganda remains unprofitable and is characterized by low commercialization due to low uptake of improved farm inputs, weak links to markets, high transport costs, few farmer organizations, poor quality control and lack of information on markets, MAAIF (2010). Investments rates in Uganda are similar to others in Africa the country's profit rates are considerably lower. These results are consistent with the view that Ugandan firms display more confidence in the economy than their counterparts in other African countries. Thus, for given profit rates, Ugandan firms invest more. At the same time, increased competition has exerted pressure on

firms to cut costs. Many of those costs are not under the firms' control, however, so their profits have suffered. The medium scale farmers are not exceptional to this.

The scope and profitability of commercialized agriculture is an important component of medium scale farmers' demand for mechanization equipment. In a study done by Kraybill and Kodoido (2009) that involved assessment of profitability of commercial agriculture, the authors recommended that that government policy interventions aimed at promotion of commercialized crop production should endeavor to integrate labor-saving interventions in technology packages as they are key drivers for profitability. This suggests that adoption of agricultural mechanization business model could be a key determinant for profitability thus influencing commercialization. Study recommendations by Otsuka, (2013) indicate that to measure production efficiency in farming, both yield and profit function should be used. The profit function, unlike the production approach, combines both technical and allocated concepts in a profit relationship, and any errors in production decisions are translated into lower revenue for the producer and hence lower profit efficiency, Otsuka (2013). This takes into account output and profitability as an integral part of commercialization.

However, the question of profitability for Ugandan farmers remains a multifaceted topic especially where value chains are not coordinated and traders set prices which guarantee them profits without consideration of a farmer's investment. Northern Uganda is not immune to this practice and its situation is made more complex by the fact that it is far from the central trade hub of the country which increases transaction costs thus affecting profitability. From a national perspective, the Ugandan government framework of prosperity for all emphasizes that households should engage in commercialized agriculture and aims at generating annual income of Ugandan shillings twenty million. This suggests that the framework recognizes profitability as an integral part of commercialization. Therefore

commercialization shift requires that production and input decisions are based on profit maximization, reinforcing vertical linkages between input and output markets (Olwande, Smale and mathenge, 2015). Reviewing experience with commercial production of a range of crops across Africa, Poulton et al (2008) find that large-scale farms have, on balance, outperformed smallholders. Based on the viewpoints in literature that point out to profitability as integral part of commercialization, this study therefore used profitability as one of the measures of commercialization amongst medium scale farmers.

2.3.3 Output Market Participation

Commercialization is the outcome of a simultaneous decision-making behavior of farm households in production and marketing Zhoul*et al*., (2013). Commercialized agriculture According to Poulton et al., (2008) is defined as being production primarily for market. Zhoul*et al*., (2013)emphasized that commercialization entails market orientation (agricultural production destined for market based on market signals) and market participation (produce offered for sale and use of purchased inputs).Market orientation translates strongly into market participation indicating the strong need to intervene on improving household market orientation at the production level in order to promote commercial transformation of subsistence agriculture (Gebremedhin and Jaleta, 2010). Farmer market access is a vital component of market participation. A farmer can access the market either by selling to a buyer at the farm gate or physically transporting the produce to the market place using available means (Sebatta, Mugisha, Katungi, Kashaaru, and Kyomugisha 2014). Meeting the challenge of improving rural incomes will require a transformation of the low input-output farming systems to one that is highly commercialized (Zhoul*et al*., 2013). According to these authors, ability to sell is a component of output market participation. This differs with the view of Poulton, (2017) who attribute output market participation due to surplus.According to

Poulton, (2017),output market participations is only possible if there is surplus production therefore a farmer is considered commercialized if they have surplus for sale to the market. The concept of surplus is however debatable since measurement may be contextual. Access to agricultural market of a particular product enhances agricultural production which is positively linked to agricultural commercialization due to availability of surplus that can easily be marketed by the smallholder farmers (Poulton, 2017).Therefore, the decision whether to participate or not in output market, is based on the effective margin associated to participation.

Several authors agree that agricultural commercialization refers to the process of increasing the proportion of agricultural output that is sold by the farmers (Strasberg et al., 2019; Zhoulet al., 2013; Jaletaet al., 2009).Based on the literature reviewed, output market participation emerges as a strong measure for commercialization which informed output market participation as one of the measures of commercialization of medium scale farmers in Amuru and Nwoya districts.

2.4 Farming Systems

According to Collinson, (2019) the original approach to analyzing farming systems has evolved markedly. The scope of the analysis has expanded from the type of farm enterprises to emphasis on horizontal and vertical integration, on multiple sources of household livelihoods, and on the role of the community, the environment and support services (Collinson, 2019).Farming system represents an appropriate combination of farm enterprises and the means available to the farmer to raise them for profitability. It interacts adequately with environment without dislocating the ecological, socioeconomic balance on one hand and attempts to meet the national goals on the other.

According to Katungi et al (2001), farming system is a set of agro economic activities that are interrelated and interact with themselves in a particular agrarian setting. It is a mix of farm enterprises to which farm families allocate its resources in order to efficiently utilize the existing enterprises for increasing the productivity and profitability of the farm. Based on the above definitions, key components of a farming system therefore considers the mix of farm enterprises, the agro ecological conditions, its interaction with each other and the ability to influence production and profitability which are key aspects of commercialization.

In study conducted by Le Frileux, Morand, Fedele,and Decandia (2007) on influence of farming and feeding systems on composition and quality of goat and sheep milk, the authors found that there is a significant influence of farming system on quality of the dairy products and recommended that for commercialization of the products, farmers have to define the systems that allow them to optimize parameters of quality while finding a balance between level of intensification and output. The literature therefore emphasis that farming system has significant influence on output attained by farmers but does not mention if influencing output would also influence commercialization.

In a study done by Wanyama (2016), the author concluded that the availability and prudent use of agricultural mechanization along the value chain has the potential to enhance labour use and efficiency, provide greater precision and timeliness in farm operations, reduce postharvest loses, contributing to adding value to products and profitability. He added that the future strategies for development and increased adoption of agricultural mechanization should address the aspects on appropriateness of the mechanization in the smallholder agriculture context. This therefore suggests the context, which comprise of the farming system has relation with mechanization but does not define the nature of the relationship. All literature reviewed is silent on whether the mechanization business model used would be

influenced by the farming system. It is therefore based on this why the study sought to understand the moderating effect of farming systems on agricultural mechanization business model and commercialization. Analysis of the literature based on the content and context indicate that farming system significantly has high influence on the quality and quantity of output but little less on commercialization. This is because if one attains good output but does not participate in the output market then the level of commercialization will still remain low.

2.5 Summary of Literature

Notably, literature reviewed suggests that no other study has focused on agricultural mechanization business model as a solution to commercialization. However there are several studies on agricultural mechanization and commercialization with mechanization acknowledged as critical for commercialization, Thapa (2009).Literature also widely acknowledges that the level of commercialization is low. The link between agricultural mechanization business model and commercialization has been established. However, the level of commercialization of medium scale farmers in Amuru and Nwoya districts in not established in literature and hence that is why this study sought to establish the influence of agricultural mechanization business model on commercialization.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter discusses the methodology that was employed for the purpose of collecting data that was required to understand the phenomenon under study. This includes research design, study area, study population, sample size and sampling techniques, research instruments, data processing and analysis. These are discussed below.

3.1 Research Design

A research design has been described as the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure (Kothari, 2004). This research used descriptive survey research design which was cross sectional in nature. A cross-sectional study examines the relationship between variables of interest as they exist in a defined population at a single point in time (Mugenda and Mugenda, 1999). The cross-sectional design was selected to enable the researcher collect data at a single point in time since the researcher was limited in terms of resources (time and money). Descriptive research is used to describe characteristics of a population or phenomenon being studied (Nassali, (2005); Kothari, (2004), Mugenda and Mugenda, (1999).Therefore, interviews were conducted once with the respondents.

3.2 Research Approach

Research approaches are plans and the procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation (Kothari, 2004). The study used a mixed approach of quantitative and qualitative approaches with the study relying heavily on quantitative and less on qualitative approach. This design enabled

the study to be carried out at a particular time and the notion of combining quantitative and qualitative data in this research offered the promise of getting closer to the whole population in a way that a single method study could not achieve. Mugenda and Mugenda (1999) noted that quantitative research focus is on using specific definitions and carefully operationalizing what concepts and variables mean. Kothari (2004) observed that qualitative approach is concerned with qualitative phenomenon relating to or involving quality or kind. Interviews captured qualitative data while questionnaire was used to capture quantitative data.

3.3 Study Population

In context of this study, medium scale farmers in Uganda represents those with substantial investment in mechanized agricultural activities and actively engage in market oriented production (MAAIF,2020; UBOS,2020).The study focused on medium scale farmers in Nwoya and Amuru however exact number of medium scale farmers in Nwoya and Amuru districts was not known since they keep growing. The study focused on 385 respondents. The study sought to understand the relationships between agricultural mechanization business model and commercialization of mediums scale farmers targeting people owning or working for the farm enterprises. Owners and managers of the medium scale farmers were targeted as respondents in the study. The number of respondents was spread out equally between the two districts.

3.4 Sample Size

Kothari (2004) describe sampling as the process of taking a portion of a population as a representative of that population. The sample size of the study population was 385 respondents. The 385 respondents were drawn from the owners / managers of the medium scale farms actively involved in the farm operations. In the study, the sample size was

determined using a formula developed by Aguila and Ramirez (2013) for determining infinite population.

$$n = \frac{t^2 * P * q}{e^2} \qquad \text{Equation1}$$

Where, t= 1.96 (desired confidence level is 95% and value obtained from

p= 0.5 (percentage or presence of sample characteristic where prior values are not available).

q= 0.5 (1-0.5 since q = 1-p)

e = 5% margin of error i.e. 0.05 precision rate or acceptable error)

$$n = \frac{(1.96)^2 . (0.5) . (0.5)}{(0.05)^2}$$

$$n = \frac{0.9604}{0.0025}$$

$$n = 385$$

3.5 Sampling Technique

The sampling of the medium scale farmers and was carried out using random sampling technique from the distribution of the medium scale farmers while that of key informants was purposively sampled. This is justified by Kothari, (2004) who stated that "the selection of each item in a random sample from an infinite population is controlled by the same probabilities and that successive selections are independent of one another."

3.6 Data Sources

In this study, both primary and secondary data was collected. The primary data on agricultural mechanization business models and commercialization was collected using questionnaires and interviews while secondary data was collected from published information from journals, reports, published research work and articles.

3.7 Data Collection Methods

The researcher used interviewing method to collect qualitative data while survey method was used to collect quantitative data. Kothari, (2004) recommends the use of survey to collect quantitative data and use of interviewing to collect qualitative data. The methods were chosen since the study measured both qualitative and quantitative variables.

3.8 Data Collection Instrument

The researcher used questionnaire to collect data from the respondents. Questionnaires were administered to managers / owners of the farm. The questions were closed ended questions. The researcher also used interview guides to collect information. Semi-structured interviews were used for collecting data and therefore an interview guide was developed. The interview guide outlines the main topics to be covered and it serves as a guide for the interviewer (Bryman and Bell, 2003). Questions were designed in such a way that they were not leading the interviewees, since biasing interviewees' opinion would distort the results of the study. (Bryman and Bell, 2003). The instruments were chosen since the study measured both qualitative and quantitative variables hence the need to use questionnaire and interview guide (Kothari, 2004).

3.8.1 Questionnaires

Questionnaires were designed for the respondents and constituted closed-ended questions that were given to the respondents in the sample population. Close-ended questions were provided since they are simple to administer and analyze unlike the open-ended questionnaire. The questionnaire were pre-tested and validated through providing the questionnaire to selected medium scale farmers who were not part of the study. The researcher measured the variables using a 5-point Likert scale. Likert Scale is a psychometric scale commonly involved in research that employs questionnaires, (Kothari, 2004). The researcher used the five response categories ranging from Strongly Disagree, Disagree, Not sure, agree and strongly agree; which represented an Interval level of measurement.

3.8.2 Interview Guide

The interview guide was used to enhance clarification of possible ambiguities related to questions asked (Mugenda and Mugenda, 1999). The researcher carried out interviews and the data obtained was compared with data from the other instruments to ascertain correctness. Questions followed a logical order to ensure smooth conduction of interviews. The interview guide was be used to collect data from the key informants who were District Agricultural Officers and sub county officials of Amuru and Nwoya districts. A total of 8 interviews were conducted.

3.9 Procedure for Data Collection

The researcher used four research assistants to collect data. The research assistants were trained on how to administer the questionnaires. The researcher ensured that the research assistants translated the questionnaires in the local language for understanding without changing the context of the questions. The questionnaires and interview guide were pretested

before administration to respondents. The researcher sought introduction letter from Gulu University, Faculty of Business that introduced the researcher to the research participants.

3.10 Data Management and Quality Control

3.10.1 Validity of the Data

Validity means the degree to which a test measures that it is supposed to measure and, consequently, permits appropriate interpretation of scores (Polit and Beck, 2006). The concept of validity is that the validity for whom or for what. Since tests are designed for a variety of purposes, for the purpose of this study, the researcher was interested in content validity. Content validity is the degree to which a test measures an intended content area. It requires both item validity and sampling validity (Healy and Perry, 2000).

The content validity was determined by academic supervisor judgment. The researcher with the help of supervisors used a Content Valid Index (CVI) which is a scale developed by computing or rating the relevant items in the questionnaire by checking their clarity, their meaningfulness in line with all objectives stated dividing by the total number of items. After the computation the instrument was considered valid recommended by Lynn, (1986).

CVI = (Relevant Items)/(Total Number of Items)

3.10.2 Reliability Test

Reliability is the degree to which a test consistently measures whatever it measures (Healy and Perry, 2000). High reliability indicates minimum error variance; if a test has high reliability, then the effect of errors of measurement has been reduced (Joppe, 2000). To test for reliability, the researcher used a test-retest technique and internal consistency reliability test. Test-retest reliability is the degree to which scores are consistent over time (Joppe, 2000). The researcher considered reliability of constructs and anchor points. Cronbach alpha

values were used to indicate the internal consistency of the items in measuring the designated variables.

Value creation had a Cronbach alpha of 0.905 for 14 items, value capture had Cronbach alpha of 0.888 for 13 items, value delivery had Cronbach alpha of 0.839 for 11 items, output market participation had a Cronbach alpha of 0.900 for 8 items, profitability had Cronbach alpha of 0.881 for 11 items, input market participation had Cronbach alpha of 0.837 for 10 items and lastly farming system had Cronbach alpha of 0.795 for 9 items. In conclusion, all the items loaded at above 0.7 with the highest of 0.905 and lowest of 0.795.The internal consistency measure (Cronbach alpha values) are indicated below.

Table 3.1: Reliability Test

Constructs	Anchor Points	Cronbach's Alpha	N of Items
Value Creation	Five Point	.905	14
Value capture	Five Point	.888	13
Value Delivery	Five Point	.839	11
Output market participation	Five Point	.900	8
Profitability	Five Point	.881	11
Input market participation	Five Point	.837	10
Farming system	Five Point	.795	9

3.10.3 Missing Value Analysis

In most large studies, it is possible that all questions will not be responded to hence it is important to note the missing values. Through SPSS, the missing value analysis was used to

determine the percentage of the missing respondent's .Overall, 380 responses were recorded but one respondent was deleted because of incomplete response. Of the total number of cases, 314 respondents had no question that they did not provide an answer to while 65 cases had a question that an answer was not provided to, (Figure 3.1)**.** The results indicate the percentage of missingness is (0.146 %) which is below the recommended 0.5 %, Von (2004).

For cases that had missing values, the missing values were replaced by averages of the nearby points (Von (2004);Frane (1976); Batista and Monard, (2003).

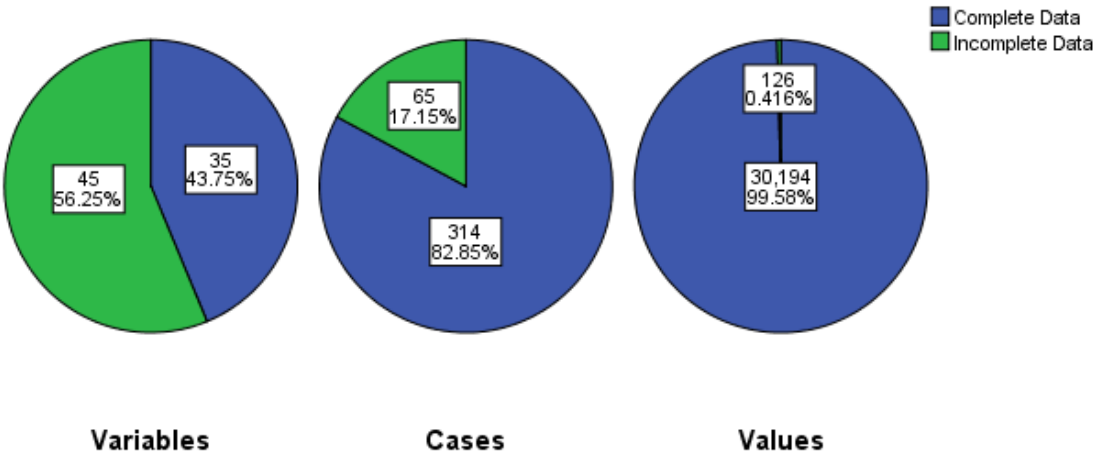


Figure 3.1: Overall Summary of missing values.

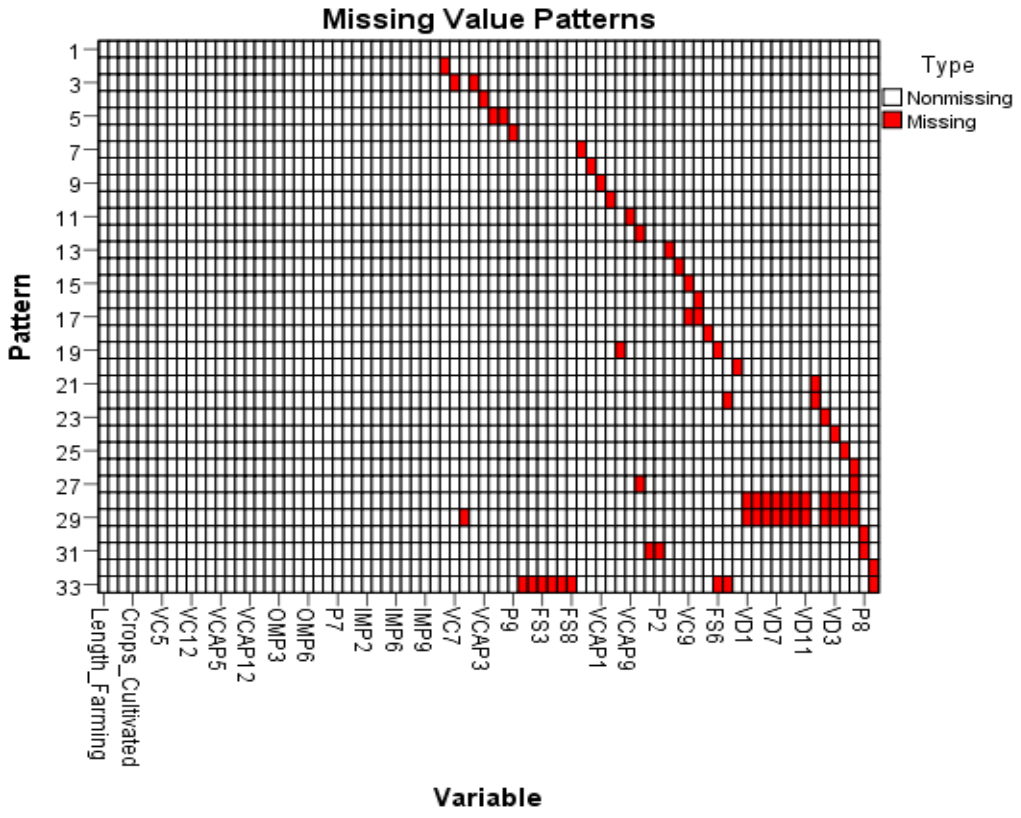


Figure 3.2: Missing value patterns

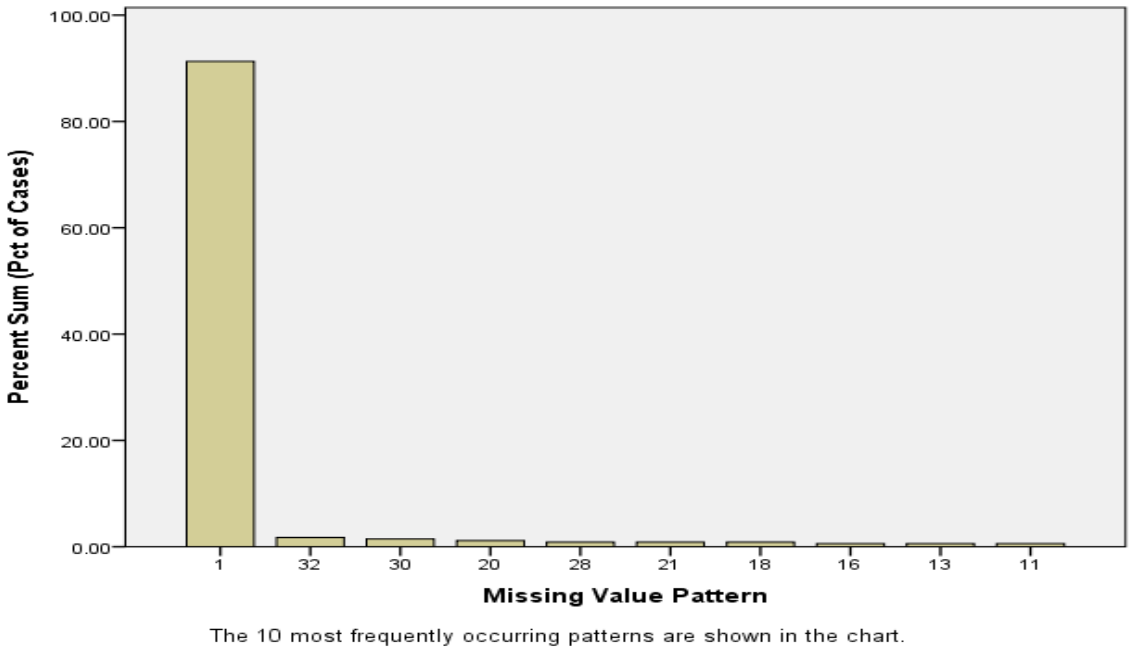


Figure 3.3: Missing variables

3.11 Data Analysis

Quantitative data was analyzed using descriptive statistics in the form of frequency tables, mean, standard deviation, and Pearson correlation. Descriptive statistics was used to analyze objective one and two while Pearson correlation and regression was used for objective three. In analyzing qualitative data, the responses were coded and grouped in to sub-categories and categories that later formed the themes in line with the different constructs of mechanization and commercialization. Repeated patterns and quotation from respondents were grouped, analyzed and supported by quotations with verbatim reporting.

3.12 Ethical Considerations

One of the ethical considerations was that respondents would choose whether to participate in the study or not after understanding the purpose of the study hence the need for informed consent. The researcher ensured there was informed consent by explaining the purpose of the study. Another ethical consideration was the need to protect the respondents by being discrete. The researcher protected respondents through anonymity in that the questionnaire and interview guides used codes. There was need that respondents had full knowledge about the researcher and why the study was being undertaken. The researcher hence obtained introductory letter from the university to aid in identification.

3.13 Limitations and Delimitations of the Study

As far as research is concerned, there would always be certain limitations and possible delimitations. The first limitation is that this research employed a cross-sectional survey research design yet other variables like profitability require time for a farmer to establish as it is dependent on output. To mitigate this, the researcher targeted respondents who had been in operation for a span of three years. This ensured that the data collected was not only for a

year. Secondly, the study was conducted on medium scale farmers in Amuru and Nwoya. Perhaps a study could be done on similar medium scale farmers in other locations since the context of Amuru and Nwoya are quite unique compared to other areas in northern Uganda.

Further, there was limited time in conducting the study coupled with the large sample of 385 respondents. To mitigate this, the researcher employed data collectors which ensured data was collected in time. The researcher also wanted to employ a simple random sampling technique in order to get a more probabilistic sample but could not employ due to the absence of sample frame as the population was infinite. The researcher therefore drew a random sample from the distribution of the infinite population.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, AND INTERPRETATION

4.0 Introduction

This study considered three major variables that include measures of agricultural mechanization business model, farming systems, and commercialization of medium scale farmers. Additionally, a number of demographics of the respondents were examined and this included age, gender, number of years in farming, number of acres accessed, number of acres under crop production and major enterprises cultivated. Each categorical group was examined in terms of the frequencies.

4.1 Description of Demographic and Household Characteristics of Respondents

The respondents were between the age of 40- 49, followed by the age of 30-39, 50-59, 20 – 29 respectively. Majority of the respondents were between the ages of 30 – 49 implying this is the most productive age. This means if you are to target medium scale farmers for commercialization then 30 – 49 would be the most appropriate. Majority of the respondents were male at 63.6% while 36.4% of the respondents were females. This implies most of the medium scale farmers in Nwoya and Amuru districts are male. Majority of the interviewed respondents were the farm owners / medium scale farmers with 83.6 % while the rest were employees at 16.4%.Finally, 50.1% of the respondents were from Amuru while 49.9% of the respondents were from Nwoya. The results are presented (Table 2) below.

Table 4.1 Demographic characteristics of the respondents

	Frequency	Percent
Age of respondent		
20-29	59	15.6
30-39	83	21.9
40-49	152	40.1
50-59	68	17.9
>60	17	4.5
Gender of respondent		
Female	138	36.4
Male	241	63.6
Designation on your farm		
Farmer	317	83.6
Input Dealer	62	16.4
Farm location		
Nwoya	189	49.9
Amuru	190	50.1
Total	**379**	**100**

4.1.1 Farmer experience in farming

Majority of the respondents had been in farming ranging from a periods of 3 to 15 years with those having farming experience of 3 years being the highest at 12.4 %, 5 years at 10.8 %, 8 years at 10.3 %, 6 years and 15 years at 9.2 %. Meanwhile few respondents had farming experience above 15 years with the highest farming experience recorded at 45 years with 0.3 %.This meant that they had the necessary information regarding the study.(see appendix 1)

4.1.2 Access to Land

Access to land was ranging from 8 acres to 2000 acres with majority accessing 100 acres at 9.8 % followed by 700 and 10 acres at 7.9 % respectively, 25 acres and 15 acres at 7.1 % .The least acres accessed was recorded at 1500 acres and 2000 acres at 0.3%.This suggests that land as a factor of production is not a challenge for the medium scale farmers.(see appendix 2).

4.1.3 Acres under Crop Production

The respondents had between 3 acres to 1500 acres under production with the major acres being 12 acres, 15 acres, 10 and 25 acres, 20 acres, 30 acres and 50 acres at 9.8 %, 9.2 %, and 7.9%, 7.4 %, 6.6 % and 5.3 % respectively. Only 0.3% of the respondents had acres under production ranging from 180acres to 1,500 acres. (See appendix 3).

4.1.4 Major Enterprises

The major enterprises cultivated by medium scale farmers were rice, Simsim and Soya beans, ground nuts millet and maize with the enterprise recording the highest number of farmers being rice (89 %) followed by simsim, soybeans (42 %) , groundnuts (8%) , maize (6 %) and millet , cassava at (4%) respectively. This implies rice offers more opportunity for commercialization of medium scale farmers in Nwoya and Amuru districts but does not mean one must grow rice in order to commercialize. Details of the major enterprises are indicated in the table below;

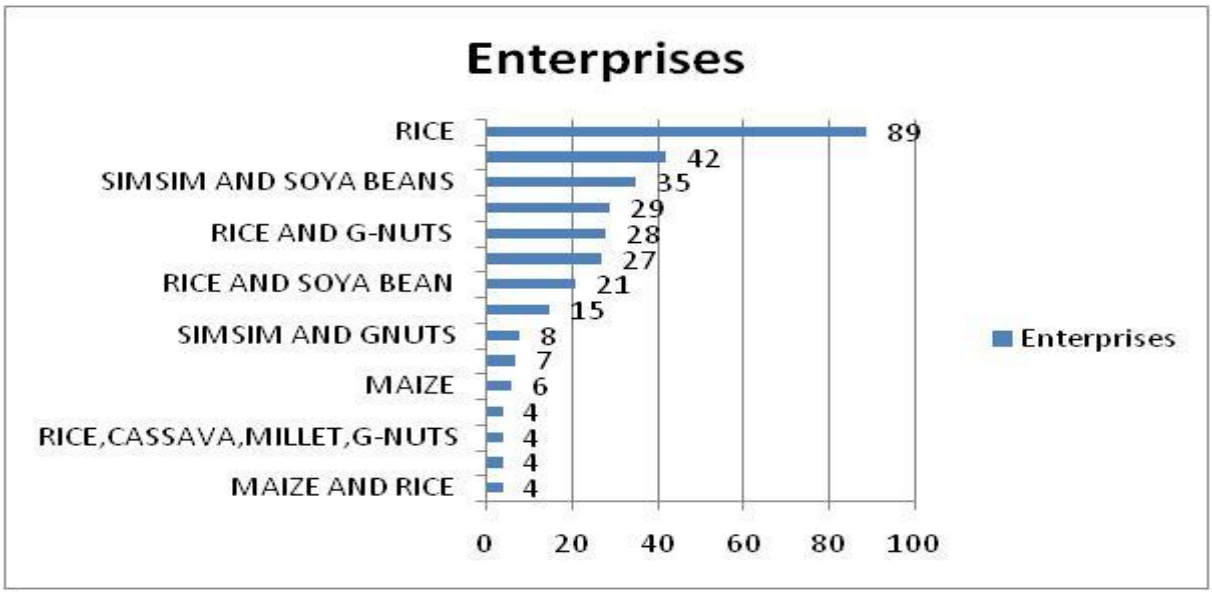


Figure 4.1 Major Enterprises of medium scale farmer in Nwoya and Amuru Districts

4.2 The adoption of agricultural mechanization business models

To determine the level of adoption of agricultural mechanization business model by medium scale farmers in Amuru and Nwoya Districts, the Exploratory Factor Analysis procedure for data reduction was to identify the number of items in the model as well as factor loadings for the different items used in the questionnaire. Using Principal Components Analysis Method, to extract Eigen values and Varimax Rotated Solution to generate factor loadings, the analysis extracted three components for Agricultural Mechanization Business Model named as value delivery, value creation, and value capture. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (0.888), Bartlett's Test of Sphericity (Chi-square = 1431.027, df = 703, Sig. = .000), and Eigen values (Cumulative % = 62.201) were considered adequate.

The mean and standard deviation scores show that in value delivery out of the 14 items used to measure adoption, the highest level of adoption were on advising farm employees on commodities that would yield higher returns on mechanization investment (mean = 3.23, std. dev. = 1.276), followed by having highly skilled staff who have sufficient knowledge of agricultural mechanization (mean = 3.2, std. dev. = 1.239) and use of different machines in the farm (mean = 3.06, std. dev. = 1.283). While the lowest level of adoption was on having strong brand name for the products/produce (mean = 2.16, std. dev. = 1.208). Generally it can be observed there is low level of adoption of agricultural mechanization business model by the farmers as indicated (Table 3) below.

Table 4.2 Descriptive Statistics on Agricultural Mechanization Business Model

	Component				
Measurement Items	**Value Delivery**	**Value Creation**	**Value Capture**	**Mean**	**Std. dev.**
We ensure timely operations for all our equipment's on the farm.	0.846			2.73	1.443
We use the latest technologies that offer more benefits in a cost-effective way.	0.78			2.94	1.506
We use machines that are used for primary processing (cleaning ,sorting , winnowing etc)	0.775			2.44	1.35
We are updated with technology that makes us competitive/ better in market place	0.742			2.84	1.438
The equipment's and implements we use offer wide range of services from land preparation, planting, spraying, weeding and harvesting.	0.741			2.52	1.329
We offer / hire multiple machine operations (ploughing, planting, spraying, harvesting etc.) as compared to one or single machine operation on the farm.	0.71			3.01	1.512
Our farm uses equipment's, machines and implements that ensure efficiency in operations.	0.687			2.49	1.438
We have a strong brand name for our products/ produce.	0.673			2.16	1.208
We use equipment's that add value to our products through processing.	0.647			2.58	1.381
We use new mechanization services, enhanced service characteristics, services, machine brand names or unique customer experiences may create additional value for farm products.	0.646			2.67	1.414
We have / hire different machines to use on our farm.	0.642			3.06	1.283
We advise farm employees on what commodities are likely going to yield the best returns to their mechanization investments	0.608			3.23	1.276
Our staff are highly skilled and have sufficient knowledge of agricultural mechanization.	0.588			3.2	1.239
We deploy processes and practices that achieve growth objectives for our business and also for the customers.	0.565			2.99	1.256
Our marketing strategy includes direct marketing, producer alliances and cooperatives.		0.84		2.31	1.457
We understand what is considered value to the customer, so much so that all our operations generate value for the customer.		0.811		2.55	1.501
We price our produce in a way that it reflects its value ie consider value for money.		0.763		2.86	1.099
We are have control over equipment's and implements used on the farm.		0.743		2.39	1.315
Occasionally we practice forward contracting with some customers		0.743		2.86	1.214
Information from our clients influence what technology / equipment to use on the farm.		0.723		2.44	1.481
We have the required skills and knowledge necessary		0.665		3.28	1.212

for our products and services.					
We work to enable stakeholders to access to well-constructed market where everything about mechanization is known in a transparent manner		0.64		2.69	1.626
We conduct primary processing for all our products before sale.		0.633		2.69	1.536
Our customers are always at the center of our thinking when it comes to values when it comes to the crops we grow			0.86	3.95	1.314
Our products are very satisfactory.			0.825	3.81	0.993
We have staff that know how to attend to customers.			0.798	3.75	1.257
Our core interest is to make a profit. This is the main drive for our business.			0.748	4.05	1.195
We sell to a variety of customers and markets.			0.734	4.02	1.358
Modern agricultural technologies give better results than the traditional practices.			0.715	3.95	1.438
The technology we use embraces food safety as key for our customers.			0.71	3.76	1.232
Our products are of high quality and it makes it easy to price effectively for all the things we do.			0.678	3.64	1.183
Our pricing strategy is very transparent and understandable to all existing and potential customers			0.643	3.61	1.046
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.					
a Rotation converged in 5 iterations.					
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.888				
% of Variance	38.738	13.296	10.167		
Cumulative % of Variance	38.738	52.0234	62.201		

In examining the extent of agricultural mechanization business model employed through interviews, the qualitative findings revealed that there is generally low level of agricultural mechanization business model among medium scale farmers. This was witnessed across numerous respondents interviewed revealing the same. To affirm this status of finding, one of the respondents was quoted saying:

> *"My farming is done in such a way that I employ both the modern mechanized farming practices but I still use majorly the traditional farming methods because it is what I can ably afford."*

This finding is further supported by majority of respondents observing that; a lot of money is spent on paying local population to work on their farms using traditional tools like hand hoes, pangas, among others, with fewer amounts spent on mechanized agricultural practices. One respondent noted that

> "*I spend most of my money to buy traditional farming tools and to pay the local people to work on my farm. I have on few occasions used tractors to farm my land and I usually rely on local people other than machines for harvesting".*

This points out to low level of value creation and overall low level of mechanization business model among the medium scale farmers. This qualitative finding therefore reaffirms and agrees with the quantitative findings that the level of adoption is low.

4.3 Commercialization of medium scale farmers

To determine the level of commercialization of medium scale farmers in Amuru and Nwoya Districts, the Exploratory Factor Analysis procedure for data reduction was also used to identify the number of items in the model as well as factor loadings for the different items used in the questionnaire. Using Principal Components Analysis Method, to extract Eigen values and Varimax Rotated Solution to generate factor loadings, the analysis extracted three components for commercialization named as input market participation, profitability and output market participation. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (0.864), Bartlett's Test of Sphericity (Chi-square = 1431.027, df = 703, Sig. = .000), and Eigen values (Cumulative % = 66.822) were considered adequate.

The mean and standard deviation scores show that in input market participation, out of the 13 items used to measure commercialization, the highest level of commercialization were on

having sufficient skills and funds to work on the farm (mean = 3.29, std. dev. = 1.568), followed by having higher price the value of items being sold (mean = 3.27, std. dev. = 1.281), and producing to quality and standards required by the market (mean = 3.15, std. dev. 1.255). While the lowest level of commercialization was on having access to input both on credit and cash (mean = 2.61, std. dev. = 1.34). Generally it can be observed there is moderate level of commercialization by the farmers as indicated in (Table 4) below.

Table 4.3 Descriptive Statistics on level of commercialization of medium scale farmers

Measurement Items	Input Market Participation	Profitability	Output Market Participation	Mean	Std. dev.
We are comfortable with the distance between our location and the nearest input (seeds, fertilizer, and pesticides) market.	0.857			3.13	1.594
We have consistency (in terms of quantity, quality and timeliness) in production of what is required by the market.	0.832			3.12	1.463
We deliver products/ produce to the market timely/ when it is demanded.	0.822			2.74	1.58
The providers (seeds, fertilizer, and pesticides) provide the right information necessary for our business to invest in inputs.	0.797			2.7	1.517
We make a balance sheet at the end of every financial year	0.782			2.74	1.589
We can access inputs (seeds, fertilizer, and pesticides) on credit and cash basis.	0.771			2.61	1.34
We know our profit margin for all the items sold from our farm.	0.749			2.95	1.518
We make production (what, when, where, how and for who to produce) decisions basing on what the market wants	0.681			3.06	1.454
We have sufficient skills, funds to use on the farm	0.665			3.29	1.568
The revenue we get is only enough to cover costs of the farm.	0.665			2.7	1.292
The value of what we sell attracts high prices.	0.66			3.27	1.281
Our decision to sell is based on price and not immediate problems to be solved	0.569			3.13	1.568
We produce to the standards / quality required by the market.	0.533			3.15	1.255
We have many options on where to sell our products/ produce.		0.889		3.39	1.334
Our production processes cost less compared to other firms		0.859		3.54	1.096
We sell products to the market at viable / good		0.774		3.24	1.311

prices.					
Cost of transporting produce to the market is affordable		0.706		2.92	1.338
This farm business makes money from its operations/ products sold		0.699		3.59	1.216
We can afford (seeds, fertilizer, and pesticides) when needed		0.666		3.3	1.266
We spend less and get more after sale of farm products.		0.637		3.8	1.219
Prices for our products are better compared to other similar products		0.584		3.57	0.993
We access inputs(seeds, fertilizer, and pesticides) that increase our farm productivity level			0.788	3.35	0.972
We register a positive income from farm operations			0.742	4.02	1.272
We source the best quality input ((seeds, fertilizer, pesticides) we know of from the market.			0.726	3.06	1.168
The input market offers us variety of agricultural seeds,fertilisers and pesticides)			0.72	3.55	1.059
Extraction Method: Principal Component Analysis.					
Rotation Method: Varimax with Kaiser Normalization.					
a Rotation converged in 7 iterations.					
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.864				
% of Variance	43.903	15.917	7.003		
Cumulative % of Variance	43.903	59.82	66.822		

The qualitative findings from the interviews are in support of the quantitative results. From the thematic analysis of the data obtained through interviews on the level of commercialization of medium scale farmers, the qualitative results indicate that; commercialization was moderate. Most of the participants interviewed observed that their outputs are placed in the market and that close to half of their outputs are reserved for consumption and seeds for the upcoming season. To back this up, one of the respondents had this to say,

> *"Some of our farmers here are commercialized but I would not say they are highly commercialized. Most of them have just started being commercialized but we are*

hopeful if the market prices remains good, then they will progress further. Besides, most of the farmers reserve some of their outputs for consumption and seeds for the following season".

This result points out to the medium scale farmers having moderate level of commercialization. This has been found to be common among most of the participants during the interview process.

In addition, the qualitative results reaffirm commercialization to be moderate among the medium scale farmers as another respondent observed that;

> *"Our major aim is to sell and make profits. I as well keep some for home consumption or seeds. I sell most of what I offer to the market while bearing in mind my family consumption needs."*

This therefore adds to the fact that commercialization level of medium scale farmers in Nwoya and Amuru districts is actually moderate as depicted from both the qualitative and quantitative results.

4.4The association between agricultural mechanization business model with commercialization of medium scale farmers

4.4.1 Correlation analysis

Pearson Product Moment Correlations coefficient used to determine the strength and the direction of relationship between variables are shown in table 5 below. Observably, the zero-order correlations indicate strong and positive relationships amongst the value creation, value capture, and value delivery (these are the constructions of agricultural mechanization model), and the correlation coefficients are significant at 99% confidence level. Also, we observe significant positive relationships amongst the output market participation, profitability, and input market participation (these are the measures of commercialization of medium scale

farmers), and the correlation coefficients are significant at 99% confidence level. More so, the bivariate correlations show that farming system has significant positive relationship with value creation (r = .752**, p < .01); value capture (r= .759**, p < .01), value delivery (r = .689**, p < .01), output market participation (r = .594**, p < .01), profitability (r = .720**, p < .01), and also input market participation (r = .698**, p < .01). There is also significant positive relationship between value creation and output market participation (r = .798**, p < .01), profitability (r = .792**, p < .01), and input market participation (r = .827**, p < .01). Value capture also has significant positive relation with output market participation (r = .746**, p = .01), profitability (r = .782**, p < .01), and input market participation (r = .823**, p < .01). We also observe significant positive relationship between value delivery and output market participation (r = .734**, p < .01), profitability (r = .788**, p < .01), as well with input market participation (r = .739**, p < .01). The results are indicated (Table 5) below.

Table 4.4: Correlation Analysis

Correlations

		1	2	3	4	5	5	6
Value creation(1)	r	1						
Value capture(2)	r	.857**	1					
Value delivery(3)	r	.730**	.760**	1				
Farming system(4)	r	.752**	.759**	.689**	1			
Output market participation(5)	r	.798**	.746**	.734**	.594**	1		
Profitability(6)	r	.792**	.782**	.788**	.720**	.826**	1	
Input market participation(7)	r	.827**	.823**	.739**	.698**	.777**	.832**	1
	N	379	379	379	379	379	379	379

4.4.2. Regression analysis

To assess the effect of the independent variables (agricultural mechanization models, farming systems) on the dependent variable (commercialization) we used a hierarchical regression analysis procedure. Consequently, three models were generated. In model the effect of demographic variables was controlled for. Specifically, results show a significant positive

effect for years of farming with commercialization (β = .028, p < .01); a significant positive effect between access to number of acres and commercialization (β = .001, p < .01); as well as a significant positive effect between number of acres under crop production with commercialization (β = .001, p < .05). In model 2 we observe that there is a significant positive effect between value creation and commercialization (β = .356, p < .01); there is a significant positive effect between value capture and commercialization (β = .187, p < .01); and we also observe a significant positive effect between value delivery and commercialization (β = .418, p < .01). In model 3 we observe that farming system does not significantly influence commercialization. All the measurement subjected to 95% levels of confidence. The results are as indicated (Table 6) below.

Table 4.5: Regression Coefficients

Variables	**Model 1**	**Model 2**	**Model 3**	**Collinearity Statistics**	
				Tolerance	**VIF**
(Constant)	3.537**	.520**	.504**	Na	Na
Years in farming	.028**	.015**	.015**	.955	1.047
Access to No. of acres	.001**	.001**	.001**	.509	1.777
No. of acres under crop production	.001*	.001*	.001*	.567	1.765
Value creation		.356**	.352**	.230	4.344
Value capture		.187**	.184**	.222	4.506
Value delivery		.418**	.415**	.356	2.809
Farming system			.011	.363	2.753
R	.345	.914	.915	Na	Na
R^2	.119	.836	.836	Na	Na
Adjusted R^2	.112	.834	.833	Na	Na
ΔR^2	.119	.718	.000	Na	Na
F change-statistics	16.836	543.563	.084	Na	Na
Sig	.000	.000	.000	Na	Na
Sig F Change	.000	.000	.772	Na	Na

Overall, the quantitative results from the regression table revealed that agricultural mechanization business model adopted and farming system significantly influence commercialization of medium scale farmers (Adjusted R Square = .833, Sig. = .000).

This result is further backed up by the qualitative findings while determining the effect of adoption of agricultural mechanization business model on the level of commercialization of medium scale farmers in which case, responses indicated that there was a significant effect. This was repeated across all key informants interviewed. It was common to find respondents saying that they were able to reach their current state because of the way in which they used agricultural mechanization and type of equipment they used. One respondent particularly had this to say;

> *"I use agricultural mechanization in the right way otherwise, I would not be called a commercialized farmer in this area. I also ensure the conditions around me are good for mechanization for example I ensure I remove trees and level my land for tractors to work well and at the end of it all I realized more than enough output for sale."*

This therefore attest to the fact that agricultural mechanization business model have a significant effect on the level of commercialization of medium scale farmers as reported across most of the participants interviewed.

CHAPTER FIVE

DISCUSSION OF RESULTS

5.0 Introduction

This study investigated the influence of agricultural mechanization business model and farming system on commercialization of medium scale farmers. This section therefore, discusses the major findings from the study. The findings were identified in line with the objectives and purpose of the study.

5.1 The extent of Agricultural mechanization business model adopted

The first objective of the study was to understand the extent of agricultural mechanization business model adopted by medium scale farmers in Amuru and NwoyaDistricts. The findings identify three components of agricultural mechanization business model being adopted named as value creation, value capture, and value delivery. This finding is in line with findings by Najmaei (2015) from a study conducted on business models and information technology who indicated that value capture and value creation is one of the most important parts of the business model employed. Considering that mechanization involves technology use, the views from this study is therefore in agreement with views of Najmaei (2015).

The finding is also in line with Rachkaraet. al., (2017) who revealed that value creation was the most common followed by value delivery and value capture in their study of agribusinesses in Northern Uganda. However, the study by these authors was in the grain aggregation market. The discrepancy between the study findings and that of Rachkara et al., (2017) suggests that the business model adopted greatly depends on the type of business. Therefore, business owners should endeavor to identify the business model to be employed and desist from copying what is working for another business because concept differs.

The study revealed low level of value creation as a model of agricultural mechanization and this finding is in total agreement with Anupindi (2010) who found out that value creation is often ignored among modern farmers and that explains why they are always disadvantaged in the agricultural value chain.

The results on value creation revealed above average level of mechanization as a model and this align with Ritter, (2018) in his work on value creation and value capture in open innovation in which he observed that value is not only driven by the value created through the collaborative exchange process but also by the ability to capture the value created and lumpsumly accounts for wider adoption.

5.2. The level of Commercialization

The study was set out to establish the level of commercialization of medium scale farmers in Amuru and Nwoya Districts and the results revealed that the level of commercialization is just above average. In other words, it is moderate. This finding is in agreement with Kraybill and Kodoido (2009) who observed that profitability of commercialized agriculture is an important component of medium scale farmers' demand for mechanization equipment. In a related situation the study agrees with Jaleta et al., (2009) who observed that the level of commercialization increases with the magnitude of profitability. Study done by which involved assessment of profitability of commercial agriculture specifically, profitability had the highest mean score, and this was followed by input market participation and output market participation subsequently. The findings indicate that there is average participation in the input and output market and average profitability. This suggests that the level of commercialization being just above average present a great risk of the farmers falling back to subsistence level in the event of a significant shock on the farm enterprises. This agrees with low level of commercialization presented in a study by Thapa (2009).Further, in relation to the average mean scores, the findings suggest that profitability is a key indicator for

commercialization. This implies being profitable is a motivation for one to participate in the input and output markets. This is evidenced by the high significant positive relation between profitability and output market participation and significant positive relationship between profitability and input market participation.

The findings on the level of commercialization is in disagreement with literature by number of authors that agricultural commercialization is still low and most farmers display low levels of input and output commercialization (Zorya et al.; Oleg et al.; (2010); Jaleta et al ,(2009);World Bank (2018)).However these authors focused on smallholder farmers, findings from this study revealed the level of commercialization for medium scale farmers is not very significantly different since the level of medium scale farmers is just above average. Findings correlate with World Bank, (2018) that indicated that Uganda national agricultural output has grown at only 2 percent per annum and that the country has had negative total factor productivity over the last five years compared to other East Africa countries. This therefore represents a slow pace in commercialization of agriculture in the country. Therefore, for agriculture to grow there is need to put more emphasis on market participation and profitability. The findings also indicated high significant positive relationship between profitability and output market participation and significant positive relationship between profitability and input market participation. This suggests that to achieve full farmer commercialization, profitability should be considered most. This is in agreement with the views of DeJanvry et al, (2010) that households participate in a given market only if participation is a choice and participation is expected to be profitable.

These findings are in agreement with the views of Nepal & Thapa, (2009) that farm mechanization is the most influential factor in agricultural commercialization in Nepal. Much as the context was in Nepal, findings from this study allude to it that mechanization is also

the most influential factor in agricultural commercialization in Northern Uganda looking at the significant positive relationship between the study variables. Further, the findings in relation to farming systems agree with the views of Morand et al., (2007) that there is a significant influence of farming system on quality of the dairy products and recommended that for commercialization of the products, farmers have to define the systems that allow them to optimize parameters of quality while finding a balance between level of intensification and output. This is also in agreement with Wanyama et al., (2016) who holds the same view.

5.3 The effect of agricultural mechanization business model on commercialization

The study was also set out to determine the effect of agricultural mechanization business model on commercialization. Findings from the hierarchical regression analysis indicated that agricultural mechanization business model have a significant effect on the level of commercialization with the business model adopted explaining the variation in the level of commercialization by up to 72%. This finding is in agreement with Thapa, (2009) in Eastern Nepal on the link between agricultural mechanization and commercialization, it was concluded that farm mechanization is the most influential factor in agricultural commercialization. The findings therefore reveal that commercialization can be achieved under any farming system using agricultural mechanization business model as long as the right agricultural mechanization business model is employed. Hence therefore the kind of agricultural mechanization business model to be employed in a particular farming system is the most important factor to be considered for commercialization not the farming system in which one operates.

The same study finding further agrees with the views of Sims and Keinzle (2017) who widely acknowledged a business model as the most influential factor for commercialization because

of its strong link between input and output market participation and profitability. These findings therefore suggest that one can only commercialize when they are adopting agricultural mechanization and this finding is in line with the views of Poulton (2017) that output market participations are only possible if there is surplus production hence a farmer is considered commercialized if they have surplus for sale to the market.

Since the study findings revealed that mechanization significantly affects commercialization of medium scale farmers, it is in agreement with Wanyama (2016), who concluded that the availability and prudent use of agricultural mechanization along the value chain has the potential to enhance labour use and efficiency, provide greater precision and timeliness in farm operations, reduce postharvest loses, contributing to adding value to products and profitability.

The finding on the effect of agricultural mechanization business model and commercialization of medium scale farmers revealed a significant effect which is in line with the finding of Kienzle, (2017) on agricultural mechanization for sub Saharan Africa. The authors noted that agricultural mechanization is critical for increased output of higher value products while eliminating the burden associated with human labour. He further added that agricultural mechanization improves livelihoods and incomes which increase access to input supply chains, renewed business opportunities and integration into modern food supply chains.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.0Introduction

This section presents the conclusion, recommendation and areas for further research. The conclusion summarizes the results derived from the study. It is based on the questions answered by the study, purpose of the study and draws this in light with the objectives. The recommendations present the possible solutions based on the findings of the study. Lastly, this section ends with areas of further research.

6.1Summary of Findings

The purpose of the study was to examine the adoption of agricultural mechanization business model on commercialization of medium scale farmers in Amuru and Nwoya district. Data analysis and interpretation of responses from the respondents revealed the following;

a) The farmers do not have much experience in commercial farming; Most of the farmers cannot access enough acres of land.
b) Among the components of agricultural mechanization business model, value capture rated best followed by value delivery and value creation respectively.
c) Among the constructs of commercialization, farmers are more concerned with profitability, followed by input market participation and output market participation.
d) Agricultural mechanization business model have a significant effect on commercialization of medium scale farmers.
e) Finally, findings also revealed that farming system does not have a significant effect on the level of commercialization of medium scale farmers in Amuru and Nwoya districts.

6.2Conclusion

The study examined adoption of agricultural mechanization business model and commercialization of medium scale farmers in Nwoya and Amuru district, Northern Uganda. The study was intended to examine the influence of agricultural mechanization business model on commercialization. This was in relation to the problem that agricultural commercialization in Uganda and specifically northern Uganda has been low. The study specifically established the most common agricultural mechanization business model employed the level of commercialization of medium scale farmers, the influence of agricultural mechanization business model on commercialization and farming systems and the moderating effect of farming systems on commercialization.

The research highlights that among the components of the agricultural mechanization business model, value capture has been rated the highest by medium-scale farmers in Amuru and Nwoya districts. This elaborates the significance that farmers place on the economic returns derived from mechanization initiatives. The prioritization of value capture suggests a keen awareness among farmers of the financial implications and benefits associated with adopting mechanized practices. Value delivery and value creation, while important, were rated slightly lower in comparison.

In view of the above findings, the study concludes that agricultural mechanization business model has a significant influence on commercialization of medium scale farmers. Therefore, the type of business model employed when using agricultural mechanization will influence farmer participation in the input, output market and profitability. This is because of the significant positive relationship between value creation, value delivery and value capture and indicators of commercialization. This explains why most mechanization interventions have not translated directly to commercialization since it is not about the kind of mechanization

technology employed but it is about the kind of business model employed when mechanizing agriculture by medium scale farmers. Therefore, business model is key for enhancing commercialization of agriculture.

In terms of commercialization, the study reveals that medium-scale farmers are primarily concerned with profitability. This emphasis on profitability elaborates the economic motivations driving farmers' decisions and actions in these districts. Input market participation and output market participation were also identified as important constructs, with profitability being the foremost concern. This insight into farmers' priorities provides a nuanced understanding of the factors influencing commercialization in the study area.

The research establishes a significant relationship between the components of the agricultural mechanization business model and the commercialization of medium-scale farmers. This suggests that as farmers adopt and integrate mechanized practices, there is a discernible impact on the level of commercialization. The findings emphasize the role of mechanization in shaping the economic dimensions of farming activities and the subsequent commercialization outcomes for medium-scale farmers.

Finally the study concludes that much as there is a significant positive relation between agricultural mechanization business model, commercialization under the moderating effect of farming system, commercialization is not influenced by farming system thus one can commercialize under any farming system provided they use the right agricultural mechanization business model.

6.3Recommendations

It has been argued in this report that farming businesses employing agricultural mechanization should ensure a strategic balance between the different business model modes. The report has also argued that businesses should desist from copying business models but

design a business model that fits their context. Further, the type of business model used for the agricultural mechanization services determines whether a farmer will be commercialized or not and commercialization can be achieved under any farming system as long as the right agricultural mechanization business model is employed. The study has also shown that the most common agricultural mechanization business model employed is value capture. Additionally, the study has shown that the level of commercialization is just average and further that there is a significant positive relationship between the business model employed and commercialization. Farming system was found to have effect on commercialization. Overall, the study revealed that agricultural mechanization business model has a significant influence on commercialization of medium scale farmers.

It is against this background that recommendations below are made. Despite its limitation the use of this context specific knowledge could improve on adoption of the right agricultural mechanization business model and investment in key areas that enhance farmer commercialization. Basing on generalizations of findings of this study the researcher recommends that any intervention on commercialization of agriculture involving agricultural mechanization by government, development practitioners and scholars should design business models that have a strategic balance between value creation, value capture and value delivery. This is because the study has shown that it is not only about adoption and use of agricultural mechanization technologies but commercialization greatly depends on the kind of business model employed.

The study also recommends that for the level of commercialization to improve with agricultural mechanization, government should put in place enabling policies that enhance market participation and profitability for farmers. On the other hand, development practitioners should put in mechanism that enhances market participation and profitability in

programs targeting livelihoods improvement. This means a shift from the current practices would have to be considered. This is because the study revealed that profitability and participation in the input and output markets are key for commercialization and agricultural mechanization business models have influence on this.

For farming business, the study recommends that any commodity can enable farmers commercialize in any farming system as long as its profitable and the farmers exhibits high level of participation in the input and output market. Therefore, interventions in any farming system rather than focus on commodities should focus on how farmers can participate more in the input and output market and how farmers can be more profitable by employing the right agricultural mechanization business model. Farmers should structure their businesses in a way that when making investment decisions in agricultural mechanization they consider how that technology will translate into profitability and how the technology will enhance their participation in the input and output markets.

6.4 Areas of further Research

During the study, the researcher discovered that investigating the particular types of mechanization business models that enhance commercialization would add more knowledge to what has been done by this study. This did not necessitate restructuring of the study conducted hence the researcher suggests perhaps other scholars interested in this topic would examine the different types of agricultural mechanization business models employed in Northern Uganda and its contribution to commercialization of both smallholder and medium scale farmers.

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APPENDICES

Appendix 1: Questionnaire

AGRICULTURAL MECHANIZATION BUSINESS MODEL AND COMMERCILISATION OF MEDIUM SCALE FARMERS IN NWOYA AND AMURU DISTRICTS, NORTHERN UGANDA

Dear Respondent

This research is being done on behalf of JacklineKitongo Lesley, a student at Gulu University pursuing a Master's Degree in Business Administration (MBA). This questionnaire aims at collecting data for the master thesis being conducted in pursuit of purely academic purpose. I therefore kindly request you to provide me with responses to the sets of questions included here in the questionnaire. All information and messages got shall be kept confidential, therefore feel free to share.

Questionnaire number _____Location of Farm (District)._____

Interviewer's Name _____ Date of interview _____

PART A: DEMOGRAPHIC AND HOUSEHOLD CHARACTERISTICS

1) What is your designation on the farm?

2) Age in years 1.) Below 20 (**2)** 20 to 29 (**3)** 30 to 39 **(4)** 40 to 49 (**5).** 50 to 59 **(6).** Above 60

3) Gender 1) Male 2) Female

8) How long have you been farming (Years)? _____

9) How many acres of land can you access _____

10) How many acres are under crop production currently? _____

11) Major Enterprise / Enterprises

PART B: AGRICULTURAL MECHANISATION BUSINESS MODEL

In each of the statement below indicate whether you strongly agree, agree, not sure, disagree and strongly disagree in regards to agricultural mechanization business model

SA – Strongly Agree A – Agree NS – Not Sure D – Disagree SD – Strongly Disagree

Agricultural Mechanization Business Model

Value creation		**SD**	**D**	**NS**	**A**	**SA**
1	Our farm uses equipment's, machines and implements that ensure efficiency in operations.					
2	We ensure timely operations for all our equipment's on the farm.					
3	Whatever we do, we ensure that it addresses the needs of our customers like purity, quality and form.					
4	We use the latest technologies that offer more benefits in a cost effective way.					
5	Our staff are highly skilled and have sufficient knowledge of agricultural mechanization.					
6	We advise farm employees on what commodities are likely going to yield the best returns to mechanization investments					
7	We deploy processes and practices that achieve growth objectives for our business and also for the customers.					
8	We own all the tractors, and additional implements use on the farm.					
9	We have good relationship with employees, clients, suppliers and financiers of our business.					
10	The equipment's and implements we use offer wide range of services from land preparation, planting, spraying, weeding and harvesting.					
11	Information from our clients influence what technology / equipment to use on the farm.					
12	We work to enable stakeholders to access to well-constructed market where everything about mechanization is known in a transparent manner					
13	We understand what is considered value to the customer, so much so that all our operations generate value for the customer.					
14	Our pricing strategy is very transparent and understandable to all existing and potential customers					

Statements on Value Capture		SD	D	NS	A	SA
1	Our products are very satisfactory.					
2	Our products are of high quality and it makes it easy to price effectively for all the things we do.					
3	We capture value by monetizing and pricing services appropriately.					
4	We offer / hire multiple machine operations (ploughing, planting, spraying, harvesting etc.) as compared to one or single machine operation on the farm.					
5	Modern agricultural technologies give better results than the traditional practices.					
6	Our marketing strategy includes direct marketing, producer alliances and cooperatives.					
7	We use new mechanization services, enhanced service characteristics, services, machine brand names or unique customer experiences that create additional value for farm products.					
8	We are updated with technology that makes us competitive/ better in market place					
9	We use equipment's that add value to our products through processing.					
10	We conduct primary processing for all our products before sale.					
11	The technology we use embraces food safety as key for our customers.					
12	We have a strong brand name for our products/ produce.					
13	We sell to a variety of customers and markets.					

	Statements on Value Delivery	SD	D	NS	A	SA
1.	We have / hire different machines to use on our farm.					
2.	The crops we farm enable the use of tractors from land preparation, planting, weeding to harvesting.					
3.	The crops we grow are only those with minimum manual labor.					
4.	We have staff that know how to attend to customers.					

5.	Our customers are always at the center of our thinking when it comes to values of the crops we grow					
6.	We have the required skills and knowledge necessary for our products and services.					
7.	We use machines that are used for primary processing (cleaning ,sorting , winnowing etc.)					
8.	Our core interest is to make a profit. This is the main drive for our business.					
9.	We have control over equipment's and implements used on the farm.					
10.	We price our produce in a way that it reflects its value ie consider value for money.					
11.	Occasionally we practice forward contracting with some customers					

PART C COMMERCIALISATION:

In each of the statement below indicate whether you strongly agree, agree, not sure, disagree and strongly disagree in regards to Commercialization

SA – Strongly Agree A – Agree NS – Not Sure D – Disagree
SD – Strongly Disagree

Commercialization		**Response**				
	Output Market Participation	**SD**	**D**	**NS**	**A**	**SA**
1	We produce to the standards / quality required by the market.					
2	We make production (what, when, where, how and for who to produce) decisions basing on what the market wants					
3	We have consistency (in terms of quantity, quality and timeliness) in production of what is required by the market.					
4	We deliver products/ produce to the market timely/ when it is demanded.					
5	Our decision to sell is based on price and not immediate problems to be solved					
6	Wesell products to the market at viable / good prices.					
7	Cost of transporting produce to the market is affordable					
8	We have many options on where to sell our products/ produce.					

	Profitability	**SD**	**D**	**NS**	**A**	**SA**
1	Our production processes cost less compared to other farms					
2	Prices for our products are better compared to other similar products					
3	We have sufficient skills, funds to use on the farm					
4	We know our profit margin for all the items sold from our farm.					
5	We make a balance sheet at the end of every financial year					
6	This farm business makes money from its operations/ products sold					
7	We spend less and get more after sale of farm products.					
8	The value of what we sell attracts high prices.					
9	We get enough revenue to continue running the farm.					
10	The revenue we get is only enough to cover costs of the farm.					
11	We register a positive income from farm operations					

	Statements on Input market participation	**SD**	**D**	**NS**	**A**	**SA**
1	Wesource the best quality input ((seeds, fertilizer, pesticides) we know of from the market.					
2	We access inputs (seeds, fertilizer, and pesticides) timely always when needed.					
3	We access inputs(seeds, fertilizer, and pesticides) that increase our farm productivity level					
4	The input market offers us variety of agricultural seeds,fertilisers and pesticides)					
5	We can afford (seeds, fertilizer, and pesticides) when needed					
6	We are comfortable with the distance between our location and the nearest input (seeds, fertilizer, and pesticides) market.					
7	The providers (seeds, fertilizer, and pesticides) provide the right information necessary for our business to invest in inputs.					
8	We can access inputs (seeds, fertilizer, and pesticides) on credit and cash basis.					
9	We know where to get inputs (seeds, fertilizer, and pesticides) needed for our farm.					
10	We can influence the market to provide the inputs we need.					

PART D FARMING SYSTEMS:

In each of the statement below indicate whether you strongly agree, agree, not sure, disagree and strongly disagree in regards to farming systems

SA – Strongly Agree A – Agree NS – Not Sure D – Disagree
SD – Strongly Disagree

	Statements on farming systems	**SD**	**D**	**NS**	**A**	**SA**
1	The physical features in the environment (trees, grass, and drainage) favor mechanized farming.					
2	All the land available can be cultivated.					
3	The land terrain in the area support mechanized agriculture.					
4	The infrastructure (road / transport, storage facilities) available facilitates access to markets.					
5	The presence of weeds, pests, pathogens and disease have minimal impact on our production.					
6	The production areas are accessible.					
7	Government policies support mechanized and commercial farming.					
8	The types of crops grown enable mechanization and commercial production.					
9	We practice good crop agronomic practices on our farm.					

Thank you for giving me your time

Appendix 2: Interview Guide

AGRICULTURAL MECHANIZATION AND COMMERCILISATION OF EMERGING FARMERS IN NWOYA AND AMURU DISTRICTS, NORTHERN UGANDA.

Dear Respondent

This research is being done on behalf of Jackline Kitongo Lesley, a student at Gulu University pursuing a master's degree in business administration (MBA). This questionnaire aims at collecting data for the master thesis being conducted in pursuit of purely academic purpose. I therefore kindly request you to provide me with responses to the sets of questions included here in the questionnaire. All information and messages got shall be kept confidential, therefore feel free to share.

Interview number _____

Interviewer's Name _____ Date of interview _____

Agricultural Mechanization

1. What are the common modes of agricultural mechanization practiced by medium scale farmers in Amuru and Nwoya?
2. What informs the decision to mechanize agriculture? Why those reasons.
3. Do you think it is economically viable for medium scales farmers to mechanize their farming operations? Explain why?
4. What agricultural technology do you use? And why are you using the technology?
5. How did you know about the technology you are using? How have the technology influenced your agricultural production?

Commercialization

1. What would make one a commercialized farmer?
2. Would you say medium scale farmers in Nwoya and Amuru are commercial? Why do you say so
3. What do you sell to the market? Why do you sell? What determines your agricultural products sales decision? (I.e. How much? When? And where?)
4. Who are your major buyers? How have you come to know about them? How do you maintain relationship with them?
5. Which crop(s) do you produce? And why do you produce them? How much did you produce in the previous season? Out of the last season's production, how much did you sell?
6. What determines your production decisions?