

**CONTRIBUTION OF MECHANIZED AGRICULTURE IN
CORN PRODUCTION IN DODOMA: THE CASE OF KONGWA
DISTRICT COUNCIL**

By

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**Dissertation Submitted in Partial Fulfillment of the Requirements for the
Degree of Master of Arts in Development Studies of the University of Dodoma**

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CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by University of Dodoma a dissertation titled: *Contribution of Mechanized Agricultural Equipments in Corn production in Dodoma; the Case of Kongwa District Council*, in partial fulfillment of the requirements for the degree of Master of Arts in Development Studies of the University of Dodoma.

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DEDICATION

The work is dedicated to the late Alman Kisumbe, my father and Lucy Mgongolwa my mother who introduced me to the academic circle.

ABSTRACT

The study intended to assess the contribution of mechanized agricultural equipments in Corn production in Dodoma, the case of Kongwa District Council. The following specific objectives guided data collection: to examine the status of mechanized agricultural equipments and inputs for corn production, to examine its contribution in corn production and to explore the challenges facing farmer groups in managing and using mechanized agricultural equipments for corn production in the study area.

A sample of 8 out of 24 farmer groups was selected for the study through stratified sampling procedures. Both random and purposive sampling procedures were used to draw a sample of 58 respondents. Questionnaires, interviews, Focus Group Discussion and Observation methods were employed for data collection. SPSS was employed for data analysis in which results were presented, discussed and conclusion drawn.

Generally, it was found that despite the council's efforts in enhancing agricultural mechanization, food production has not improved. The noted challenges for the failure included draught: lack stakeholders participation, inaccessibility of extensions services, in availability of improved seeds, unavailability of spare parts, lack of training to group members, lack of established reporting system and conflicts among group members.

Hence, it was recommended inter alia: formation of farmer groups by members with the focus on self reliance, involvement of stakeholders, provision seed varieties conducive to the climate, implementation of priorities as identified by professional and establishment of mechanisms for efficient utilization of extension officers.

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ABBREVIATIONS AND ACRONYMS

AGITF	Agricultural Input Trust Fund
AGRA	Growing Africa's Agriculture
FAO	Food and Agricultural Organization
FARA	Forum for Agricultural Research in Africa
GDP	Gross Domestic Product
GNP	Gross National Product
JICA	Japanese International Cooperation Agency
LGAs	Local Government Authorities
MADS	Masters of Arts in Development Studies
MAF	Ministry of Agriculture, Food and Cooperatives
MAFP	Monitoring African Food and Agricultural Policies
MKUKUTA	Mkakati wa Kukuza Uchumi na Kupunguza Umaskini Tanzania.
NAIVS	National Agriculture Input Voucher System
NEPAD	New Partnership for Africa's Development
NGOs	Non Governmental Organization
SSA	Sub Saharan Africa
UDOM	University of Dodoma
URT	United Republic of Tanzania
WB	World Bank

CHAPTER ONE

BACKGROUND TO THE STUDY

1.0 Background

Agriculture is a predominant economic activity and plays a central role in Africa's development in form of economic growth, increased incomes, improved living standards, poverty alleviation and enhanced food security (FAO, 2011). The sector employs more than two-thirds of the economic active workforce, accounts for about 32% of the continent Gross Domestic Product (GDP) and it is a major source of foreign earning {Alliance for a Green Revolution in Africa}(AGRA, 2013 and Yu and Nin-Pratt, 2011).

During 1960s to 1970s, Africa experienced a decline in food per capita production (Yu and Nin-Pratt, 2011 and FAO, 2009). As a result, a number of chronically undernourished people rose from 173 million in 1990-92 to some 200 million in 1997-1999. Of these, 194 million (34% of the population) were in Sub-Saharan African countries (SSA) (NEPAD, 2000). During the 20th century, Agricultural performance in Africa lagged behind other developing regions like Asia and Latin America.

During this period, the value of aggregate agricultural output increased by 2.4% annually in Sub-Saharan Africa compared to 2.8% in Latin America and 3.6% in Asia. On the other hand, population growth in African countries was 2.6% per year compared with 2% in Asia and 2.2% in Latin America. In the face of these demographic trends, Africa will simply have to run faster than the rest of the developing world to keep up with its growing population (Haggblade and Hazell, 2010). The decline in agricultural production resulted from among others climatic

changes, overreliance on rain fed agriculture and low adoption of technology (AGRA, 2013).

Efforts to reverse the situation started in mid the 1980s and this making use of mechanized agriculture and improved seeds. FAO (2009) points out that after a decade of decline, growth in agriculture and in the economy as a whole has outpaced population growth in many countries. For the past ten years, most of African countries recorded steady cereal yields increase. However, the yield levels remain low compared to other countries of the world (AGRA, 2013). The average cereal yields remained at around one-third to one-half of the world's average (1.1–1.5 metric tons per hectare versus 3.2 metric tons per hectare) between 2000 and 2010. This increased production resulted from expanding areas of cultivation rather than agricultural intensification.

Tanzania's economy, like other Sub-Saharan countries, is predominantly agricultural-based, with relatively low levels of manufacturing and value addition of the produced commodities. The sector employs about 75% of the active workforce, contributes a quarter to GDP and about 34% of the foreign exchange earnings {Monitoring African Food and Agricultural Policies}(MAFAPA, 2013). Agriculture is dominated by small-holder subsistence farmers who utilize about 85% of the land to cultivate not more than 2.0 hectares using the hand hoe as the dominant tool. About 70% of Tanzania's crop area is cultivated by hand hoe, 20% by ox plough and 10% by tractor. Moreover, it is predominantly rain fed (Coulson and Diyamett, 2012).

The Government of Tanzania from time to time has been taking steps to address problems hindering improvement in agricultural production. The earlier efforts

included issuance of political and government declaration to stir up peoples' commitment towards participation to realize the pre-determined agricultural production levels. Such declarations included: - political commitment on agriculture commonly referred to as "Siasa ni Kilimo pronounced in 1972" literally meaning "politics is agriculture", a caution to increase food security to citizens referred to as "Kilimo cha Kufa na Kupona-pronounced in 1974/75" literally meaning "produce or perish", irrigation in agriculture in 1978 (ESRF 1995 and Mvena, 1999) and establishment of socialist village; referred to as "Ujamaa village" in which members of the community were to collectively own farms. However, all the declarations and efforts accompanied therein did not contribute much to agricultural production improvement. All these showed success during the inception, but did not last long.

More recently, Tanzania has adopted "Kilimo Kwanza" literally meaning "Agriculture First" which is a strategy to introduce "the Tanzanian version of Green Revolution". In order to realize its targets, the government has embarked on introducing mechanized agriculture and provision of subsidized agricultural inputs (fertilizer and improved seeds). In collaboration with private sector, a total of 1859 power tillers were imported from 2005/2006 - 2009/2010 to meet increased demand for agricultural mechanization (URT, 2010).

Moreover, through the District Agriculture Sector Development Program implemented under the Agriculture Sector Development Program, 3,562 power tillers and 169 tractors were provided to farmer groups in 2009/10 and 2010/11 (World Bank, 2012). In this process, Local Government Authorities play pivotal roles in purchasing and distributing tractors and power tillers to various farmer groups in their respective areas of jurisdictions. Moreover, being the part of the

government which delivers services directly to the community, they provide agricultural supervision and extension services in their respective areas. The focus of the entire process is to enhance improved agricultural production through shifting from hand hoe into engine propelled machine.

Provision of tractors, power tillers and subsidized agricultural inputs target small scale farmers estimated to constitute about 70% of all those involved in agriculture (Malhotra, 2013). Corn/maize is the dominant food staple in the country in most cases undertaken by small scale farmers (Pauw and Thurlow, 2010). The government efforts are expected to be reflected in improved corn production, a farming activity which is undertaken by majority small scale farmers. Therefore, the proposed study intends to identify the contribution of mechanized agriculture in corn production in central Tanzania, the case of Kongwa District Council.

1.1 Statement of the Problem

In 2009 Tanzania embarked on implementation of Agriculture First (Kilimo Kwanza), a green revolution initiative to improve agricultural productivity, enhance food security and contribute to poverty alleviation efforts in the country (URT, 2009). In order to realize targets set therein, the government introduced agricultural mechanization. In this process, in addition to more than 15 000 tractors stock of 2009/2010, 7% was added to it reaching a total of 8,556 tractors compared to 7,998 tractors in 2009/10. Also, power tillers in use increased from 42% in 2009/10 to 66% in 2010/11 (MAFAP, 2013). Moreover, the National Agriculture Inputs Voucher System which was launched in 2007 was scaled up in 2009 to facilitate improved agricultural productivity by increasing availability of both improved seed varieties and fertilizers at 50% subsidized price (WB, 2012 and Malhotra, 2013).

Also, more specifically, in 2009/2010 and 2010/2011, under the Agriculture Sector Development Program, a total of 3,562 power tillers and 169 tractors were purchased and distributed to farmer groups by the respective local government authorities (Malhotra, 2013).

Despite these efforts, agriculture's annual growth rate has largely been stagnant over the past 10 years, following persistent low and declining productivity (Mashindano et. al, 2011). The growth rate in agriculture averaged 4.3% over the period 2000-2010, well below the MKUKUTA target of 10% by 2010 (URT, 2012). Moreover, its contribution to GDP declined from 29% in 2001 to 24% in 2010 (URT, 2012). This implies that the 7% increase in the stock of tractors made 2009/2010, purchase and distribution of 3,562 power tillers and 169 tractors from 2009/2010 to 2010/2011 and agricultural inputs at 50% subsidized price had either no contribution in improving agricultural production in the country or else, it made some contribution to boost production which otherwise could have been much below this level.

On the basis of the above facts, little is known regarding the causes of the mismatch between increased agricultural mechanization and the level of agricultural production in the country. It is not clear on whether or not the maintained constant but yet, unsatisfactory level of agricultural production over years has been made possible by introducing mechanization. Bearing in mind, majority of the farmers engage themselves in corn production and the government's efforts are directed towards enhancing farmer groups, therefore, the proposed study intended to assess the contribution of mechanized agriculture in corn production in Dodoma Region: the case Kongwa District Council.

1.2 General Objective

The general objective of this study was to assess the contribution of mechanized agriculture in corn production in Dodoma: the case of Kongwa District Council.

1.2.1 Specific Objectives

The study intended to achieve the following specific objectives:-

- a) To examine the status of mechanized agricultural equipments and agricultural inputs for corn production supplied to farmer groups in the study area.
- b) To examine the contribution of mechanized agricultural equipments and inputs in corn production in the study area.
- c) To explore the challenges facing farmer groups in managing and using mechanized agricultural equipments for corn production in the study area.

1.3 Research Questions

The study was guided by the following research questions:-

- a) What is the status of mechanized agricultural equipments and inputs supplied to farmer groups in the study area for corn production?
- b) What is the contribution of mechanized agricultural equipments and improved agricultural inputs for corn production in the study area?
- c) What challenges do farmer group members face in managing and using tractors/power tillers and agricultural inputs in corn production in the study area?

1.4 Significance of the Study

The findings added to the existing body of knowledge on the contribution of mechanized agriculture in corn production which enables decision makers to come up with informed policies.

Moreover, it highlights areas for further studies on agricultural improvement and it is a partial requirement for an award of master degree in development studies awarded at the University of Dodoma.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The section presents current literature review in which their findings comparatively analyzed to appreciate the current state of knowledge. Also, it contributed in the development of Conceptual Framework, showing the main variables of the study. Moreover, it was on the basis of it that research gap was identified. This part comprises of operational definition; theoretical review; empirical review and conceptual framework governing the study and research gap.

2.1 Defining Mechanized Agriculture

Mechanized agriculture refers to the application of agricultural engineering principles and technologies to agriculture, using mechanical systems, in food, fiber, fuel and fur processing, and also, in the production, processing, handling and storage of agricultural product (Adamade and Jackson, 2014). It is the replacement of human and animal labour by mechanical devices in farming activities. In its broadest sense, embracing the manufacturing, distribution and operation of all types of tools, implements, machines and equipment for agricultural land development, farm production and crop harvesting, and primary processing (Akinbamowo, 2013).

Therefore, in this study mechanized agriculture refers to the use of machines such as tractor and power tillers in agricultural production.

Local governments are the level of government that are closest to the people and therefore responsible for serving the political and material needs of the people and

communities at a specific local area. Such areas could be a rural or an urban setting, a village, a town, a suburb in a city or municipality, town or district depending on the size (URT, 2002).

In this study, local government means the district council and its extended arm to ward and village level.

2.3 Theoretical Review

2.3.1 Modernization Theory

The Theoretical Framework that guided the study based on Modernization Theory. The theory was for the first time propounded in 1950 by Walter Rostow on the concept of economic growth. He argued that within a society, sequential economic steps of modernization can be identified. The theory is a description and explanation of the processes of transformation from traditional or underdeveloped societies to modern societies. Historically, modernization is the process of change towards those types of social, economic and political systems that have developed in Western Europe and North America from the seventeenth century to the nineteenth and have then spread to other European countries and in the nineteenth and twentieth century's to the South American, Asian, and African continents (Armer and Katsillis, 2001).

In the view of this theory, development was viewed in terms of economic indicators: it was synonymous with capital formation and industrialization. The argument was: development of the third world countries could be possible through further integration in the world market, which in turn would lead to injection of capital, technology and values. In this process, the state had to play a central role in

this process of transformation, together with enlightened (civilized) individuals such as entrepreneurs, Politicians and modernizing agents (Chachage, 1987). The developed countries were argued to help developing countries to move from poverty.

Rostow's (1960) on the basis of Western economic development emphasized the importance of new values and ideas favoring economic progress along with education, entrepreneurship and certain other institutions as conditions for societies to "take off" into self-sustained economic growth (Armer and Katsillis, 2001). In order for modernization to take place, underdeveloped societies are expected to undergo similar changes to those developed countries passed through. The primary source of change is focused on innovations which include adopting and adapting new ideas, techniques, values and organizations from developed countries by the way of changing traditional norms and related structures (Valenzuela and Valenzuela, 1978). The Rostowian theory identifies the development stages as follows:-

2.3.1.1 Primitive Society Stage

The economy at this stage is highly dominated by subsistence activities. Output in most cases is consumed by producers. In cases of trading, exchange of goods for goods (barter trade) is the dominant trading system. Agriculture is the most important industry and production is labour intensive using only limited quantities of capital. Technology is limited, and resource allocation is determined very much by traditional methods of production (Valenzuela and Valenzuela, 1978).

2.3.1.2 Transition Stage (Precondition for Take-off)

The characteristics of the stage are:- specialization which in turn generates surplus for trading, emergency of transport infrastructures to support trade, emerging of entrepreneurs as a result of incomes, savings and investment growth and external trade taking place mainly in primary products. Also, private sector participation is encouraged at this stage. It is the stage whereby community produces beyond subsistence level (Armer and Katsillis, 2001).

2.3.1.3 Take-off Stage

At this stage, industrialization increases and the economy switch from agriculture to manufacturing sector. Growth is concentrated in a few regions of the country and within one or two manufacturing industries. The level of investment reaches over 10% of Gross National Product (GNP) and saving increases. The economic transitions are accompanied by the evolution of new political and social institutions that support industrialization. The growth is self-sustaining as investment leads to increasing incomes in turn generating more savings to finance further investment (Matunhu, 2011). Change in values and a norm are the conditions for "take-off" (Chachage, 1987).

2.3.1.4 Drive to Maturity Stage

At this stage, the economy diversifies into new areas and there is less reliance on imports. Technological innovation at this stage provides a diverse range of investment opportunities. The economy is producing a wide range of goods and services and there is less reliance on imports. Moreover, urbanization increases and technology is used more widely (Valenzuela and Valenzuela, 1978).

2.3.1.5 Period of Mass Consumption

The economy is geared towards mass consumption, and the level of economic activity is very high. Technology is extensively used, but its expansion slows. The service sector becomes increasingly dominant. Urbanization is complete. Multinationals emerge. Income for large numbers of persons transcends basic food, shelter and clothing. Economic growth is caused by improvements in the quantity and quality of the factors of production that a country has available i.e. land, labour, capital and enterprise. Conversely, economic decline may occur if the quantity and quality of any of the factors of production falls. According to modernity, policies intended to raise the standard of living of the poor often consist of disseminating knowledge and information about more efficient techniques of production. For instance, the agricultural modernization process involves encouraging farmers to try new crops, new production methods and new marketing skills (Armer and Katsillis, 2001).

Attempts of modernization in developing countries led to the introduction of hybrids, the green house technology, genetically modified (GMO) agricultural produce, use of industrial fertilizers, insecticides, tractors and the application of other scientific knowledge to replace traditional agricultural practices. In this attempt, modernization focused to replace traditional agriculture practices with something more recent (Smith, 1973 as quoted by Matunhu, 2011). Agriculture societies can, therefore, be regarded as modern when they display the above characteristics.

The theory is relevant to the study as it shows prerequisite elements and components for developing countries to realize development. In its five development stages,

Rostow recommended the following: adoption of technology, training, specialization, saving and involvement of private enterprise and industrialization. These are important components of the study as it deals with mechanized agriculture; hence, adoption of technology, training, saving, industrialization and involvement of other stakeholders are prerequisites for mechanized agriculture to contribute to improved corn production.

However, challenges on the theory were raised by dependency theory which came as a critical reaction to the conventional approaches to economic development explained by modern theory. The challenges raised by dependency theory on modernization include:-

Firstly, assistance to developing countries enforced rigid international division of labour. In attempt to help developing countries to develop as provided by the theory, the capitalist system enforced a rigid international division of labor which is responsible for the underdevelopment of many areas of the world (Ferraro and Hadley1996). The dependent states supply cheap minerals, agricultural commodities and cheap labor, and also serve as the repositories of surplus capital, obsolescent technologies, and manufactured goods. These functions orient the economies of the dependent states toward the outside: money, goods and services do flow into dependent states, but the allocation of these resources is determined by the economic interests of the dominant states and not by the economic interests of the dependent state. This division of labor is ultimately the explanation for poverty, and there is little question but that capitalism regards the division of labor as a necessary condition for the efficient allocation of resources. Matunhu, (2011) perceives this relationship between developed and developing countries as exploitative one.

Secondly, modernization degraded African initiatives. It contributed to degrading African initiatives for survival and development, which in turn promoted the foreign ones, hence lost path of development. Matunhu, (2011) argues that in that process, Africa's endogenous development path was discarded in favour of an 'external driven development path' which was and is still manipulated by the metropolis. There has to be a paradigm shift if Africa is to reclaim its right to chart a new way to development.

Thirdly, exploitation of developed countries caused poverty of developing countries. Economic growth of developed countries is a result of interaction with developing countries often lead to serious economic problems in the poorer countries (Ferraro, 1996). In this respect, poor countries export primary commodities to the rich countries who then manufacture products out of those commodities and sell them back to the poorer countries. The "Value Added" by manufacturing a usable product always costs more than the primary products used to create those products. Therefore, poorer countries would neither be earning enough from their export earnings to pay for their imports nor capable to save for future investment. This is contrary to modernization theory which emphasizes on saving for investment.

Underdevelopment of third world countries results from economic set up of the world. Ferraro and Hadley (199) distinguish between undevelopment and underdevelopment. Undevelopment refers to a condition in which resources are not being used whereas underdevelopment refers to a situation in which resources are being actively used, but used in a way which benefits dominant states and not the poorer states in which the resources are found. Therefore, these countries are not poor because they lagged behind the scientific transformations or the enlightenment

values of the European states. They are poor because they were coercively integrated into the European economic system only as producers of raw materials or to serve as repositories of cheap labor, and were denied the opportunity to market their resources in any way that competed with the dominant states.

Fourthly, the influence of Western culture and education on dependency in which elites in developing countries maintain a dependent relationship, because their own private interests coincide with the interests of the dominant states. These elites are typically trained in the dominant states and share similar values and culture with the elites in dominant states. Thus, in a very real sense, a dependency relationship is a "voluntary" relationship. One needs not argue that the elites in a dependent state are consciously betraying the interests of their poor: the elites sincerely believe that the key to economic development lies in following the prescriptions of liberal economic doctrine (Ferraro and Hadley, 1996).

Fifthly, assistance to third world countries led into increased financial vulnerability and dependency. According to Gwynne 1990 as quoted by Kay and Gwynne (2000), the vast increase in capital mobility and its availability in the world economy since the 1970s in the name of modernization, led into more and more dependent of developing countries on foreign capital. This greatly increased their exposure and vulnerability to changes in world capital markets and substantially reduced their room for policy maneuver. In the aftermath of the debt crisis the international financial institutions were by and large able to dictate economic and social policies to the indebted countries, especially the weaker and smaller economies through structural adjustment programs.

Lastly, transfer of obsolete technology in name of modernizing to developing countries. Most of the technology transfers to the developing countries are obsolete. For example, according to Uche, (1994), Mr. Summers, chief economist of the World Bank, in a December 12, 1991 issued internal memorandum to his colleagues in which he suggested that the World Bank should encourage "more migration of the dirty industries" in the Industrialized Less Developed countries. Therefore, summer's memo is a complete nullity of the programmes of the World Bank, International Monetary Fund (IMF) and other similar institutions of the West in the development of Africa and the Third World countries. The true agenda of such institutions is to re-colonize Africa and, if need be, the destruction of its environment, people and natural habitat by the most powerful and industrialized nations of the world.

2.3 Empirical Review

This part comprises reviewed literature on:- agricultural production situation, challenges facing the agricultural production in Tanzania, agricultural mechanization experience and outcomes in other countries; establishment of extensions services in Tanzania; Ujamaa village; local government reform; Kilimo kwanza and agricultural mechanization in Tanzania and National Agricultural Input Voucher Scheme (NAIVS 2009–2012).

2.3.1 Agricultural Production Situation

Sub-Saharan Africa faces critical challenges with more than 40 percent of its population living on less than one US dollar per day and one in three people being undernourished. Yet, agriculture remains the largest employer of labour in Africa

and responsible for over half of export earnings and has the potential to play the major role in the continent's development. Agriculture underpins the livelihoods of over two thirds of Africa's poor and assumes even greater importance in the continent's poorer countries. Unfortunately agricultural productivity especially in SSA has been stagnating for many years. Low levels of land and labour productivity have meant that per capita agricultural production has fallen over the last four decades.

Although agricultural research has generated many technologies with the potential to address this situation, their impact on productivity, livelihoods and quality of life has been disappointing. Among the many reasons for poor agricultural performance is the way in which research has been undertaken. In order to address the problem, the Forum for Agricultural Research in Africa (FARA) has promoted the integrated agriculture research for development approach based on an innovation systems framework. This brings together multiple actors along a commodity value chain to address challenges and identify opportunities to generate innovation. The network enables to generate knowledge, technology and products, and enhance the use of these for agricultural production improvement (Adekunje *et al.*, 2012).

Agriculture plays an important role in poverty reduction, particularly in poorer countries such as Tanzania where the majority of people depend on agriculture for their livelihood. Growth in agricultural value added had the largest impact on poverty reduction in Asia in the 1970s and 1980s (Policy Forum, 2009). A well prepared and implemented agricultural development plan is likely to contribute effectively into poverty reduction because majority of the poor people are in rural areas engaging with farming activities.

In Tanzania, agricultural production is perceived as a backbone or an engine of economic growth and poverty reduction, contributing to over 50% of the total exports and has multiple linkages with industries and provides employment to over 80% of poor people in rural areas and accounts for 75% of rural household incomes (URT, 2005). Agriculture has persistently registered a lower growth rate compared with industry and services: while agriculture grew at an average of 4% between 1998 and 2009, industry and services grew at an average of 8.3 and 7% respectively, during the same period. Average growth of GDP between 1998 and 2009 was 6.4%. This pattern of economic growth shows that one of the main reasons why economic growth in Tanzania over the past decade has not been associated with poverty reduction, especially in rural areas. The fact is that agriculture which supports over 70% of the population has been growing relatively slowly compared to other major sectors (Mashindano *et al.*, 2011).

Exclusive data for agricultural production in 2007 show that for more than half of the harvested land area is allocated for cereal production of which maize is the leading staple food crop in the country. Despite the efforts undertaken to improve agricultural production, in 2007 Tanzania remained the net importer of cereals. Among all the cereal products produced in the country, maize yields were typically among the lowest (0.88 tons per hectare) compared to 1.99 and 1.18 tons per hectare for rice and wheat respectively. The low production of maize/corn is associated with the farming practices of small holder farmers who rely on traditional technologies and produce mainly for subsistence. Despite increase in production of rice and wheat in the same period, it failed to meet consumer demands. Therefore, the country continued to import maize, wheat and rice to meet the citizens demand (MINAG, 2004 as quoted by Pauw and Thurlow, 2010).

In Tanzania, food production has remained low, failing to meet household and national requirements. Furthermore, the dependency on agriculture as the mainstay of the economy has made the country's economy more vulnerable to both external and internal shocks, given the lack of other important productive sectors such as manufacturing (Kiratu, Märker and Mwakolobo, 2011).

2.3.2 Mechanized Agriculture Experience and Outcomes in other Countries

In order to arrest challenges facing agricultural production, Asian countries undertook green revolution that enabled it to feed more than 3 billion people, lowered the price of food for the urban and rural poor, created employment, and spurred the rapid economic growth now being witnessed in the region. The Asian countries managed to put in place policies that led to rapidly rising agricultural productivity. These included support for the development and release of high-yielding varieties of rice and wheat, heavy investment in irrigation and expanded investments in extension, research and development; and access to credit for farmers, all of which had more than doubled yields. The major catalyst was access to credit to purchase required inputs (Asenso-Okyere and Jemaneh, 2012).

Moreover, to expand agricultural production for small scale farmers, the use of power tillers in agriculture is a common phenomenon particularly in Asian countries. For example, Nepal for the first time started to use power tillers for agricultural production in the 1970s. In the initiation stages, power tillers which most of them were imported from Japan with the assistance from JICA were found inefficient and high cost for both power tillers and spare parts, hence, they were abandoned. The power tillers came again into popular use by paddy farmers after various scientists undertaking series testing in farm field on its use, type of seeds

and fertilizer for quality agricultural production. As a result, sales of import of Chinese power tillers to Nepalese farmers increased for more than 600 in three years. In later years, other efforts to enhance sustainable use of power tillers included training local individuals to undertake repairs and encouraging the NGOS to supply spare parts (Biggs, *et al.*, 2002).

Moreover, in case of African countries, power tillers were re- introduced in Nigerian agriculture and Ghana in 2001 by Watershed Initiatives by importing few units for Sawah rice production technology. The countries used the Indian made and model power-tiller VSTSHAKTI 130 DI a single-axle (two-wheel) tractor with 10 kW (13 hp) rated power, diesel engine of 2400 rpm rated crankshaft speed. The engine is single cylinder horizontal 4 strokes, water cooled and hand cranking type. The field performance evaluation of the model was carried out in different rice fields. The study revealed that the power tiller is efficient for the operation in terms of work rate, quality of work done, fuel, economy and ease of management on farmer's small farm holding. On the basis of the findings, the study recommended the use of VST SHAKTI power tiller for Sawaha rice cultivation in Nigeria and Ghana (Ademiluyi and Oladele, 2008).

2.3.3 Challenges Facing the Agricultural Production in Tanzania

There are numerous challenges facing the sector which include but not limited to:- lack of access to productive land, discrimination, particularly on the basis of gender; lack of labor to help on the farm, remoteness combined with poor roads, difficulties in accessing inputs and lack of access to credit, markets and extension advice. These challenges hit most the marginal farming households. For them in turn lead into difficulties for accessing adequate health care and education for their children and

themselves because they have to remain working in the fields (Kiratu, Märker, and Mwakolobo, 2011).

Other challenges which impact agriculture negatively include:- fluctuation of prices of agricultural products leading into reduced production, reliance on rain fed agriculture, lack of proper functionality of Zonal agriculture institutions that could be conducting research and publishing findings for consumption by policy makers and farmers, inability of district councils to rely on published research findings when preparing the district agricultural plans; lack of capacity for agricultural output value addition and arrangements by international companies to have intermediary boards for exports which lead into serious problems between them and farmers (Coulson and Diyamett, 2012).

Moreover, on top of these challenges, Tanzania's agricultural markets are not well integrated with international markets. It was on the basis of it that although there was international food crisis of 2007-2008, nonetheless, the sector in the country was not hit hard (Kiratu, Märker and Mwakolobo, 2011). Also, the introduction of agriculture market structure and pricing systems such as Warehouse Receipt Systems contributed in de-linking producers with external market and lowered the price of agricultural products. This type of marketing system enriches business's owners at the expense of the farmers. The study found that in the community where the marketing system is implemented, farmers experience more hardship today than 10 years back (Mashindano *et al.*, 2011). Also, the sector remains hampered by widespread underinvestment. As a result, it continues to operate largely at subsistence levels, and its potential to bring commercialization to a larger scale remains for the most part unrealized (World Bank, 2012).

Moreover, infrastructure plays a significant role in improving agricultural productivity and food security, particularly in terms of transporting food from surplus to deficit areas in the country. The findings revealed that transportation network in the sampled districts are poorly developed. Apart from waterways (Lake Victoria in Mwanza and Lake Tanganyika in Rukwa) and very limited all-weather road networks, the districts have only seasonal roads, if any.

2.3.4 Efforts Employed to Improve Agricultural Production in Tanzania

The efforts to improve agricultural production started prior to the 1980s where the government of Tanzania played an active role in the mechanization of the sector. During this period of time, the government imported tractors, managed state farms, implemented tractor hire schemes and provided credit to the farmer groups to purchase tractors. However, such increased intervention of the government was not successful due to poor management, weak infrastructure, poor equipment maintenance and difficulty in obtaining spare parts (MAFC, 2011 as quoted by WB, 2012).

The efforts were frustrated during structural adjustment programs of the 1980s where the government disengaged itself from direct commercial activities, opening doors for the private sector to operate and distribute tractors. During that period few public programs remained operational including those for financing tractors and others provided tractors through government supported agriculture programs. Agriculture Inputs Trust Fund (AGITF) is one such example. AGITF is a facility that was created by the government in 1994 to provide wholesale lending for input and equipment loans to cooperatives. Loans of up to TZS 35 million (US\$22,000) were provided for the purchase of new tractors and implements at an interest rate of

10 percent over a 5 years period (MAFC, 2006). In the past five years, AGITF has provided loans worth TZS 23.3 billion for the purchase of 671 tractors. Similarly, Tanzania Investment Bank, a wholly owned Government Bank, also has an agriculture window which has focused on subsidized loans to farmers' cooperatives for the purchase of tractors and power tillers. In addition, through the District Agriculture Sector Development Program implemented under the Agriculture Sector Development Program, 3,562 power tillers and 169 tractors were provided to farmers in 2009/10 and 2010/11. The program cost TZS 28.4 billion and was implemented with a cost sharing arrangement in which the groups contributed 20 percent (WB, 2012).

Since independence, the government of Tanzania has been undertaking various efforts to improve agricultural production which in turn could contribute in poverty reduction. The early efforts focused on mobilization of the community to fully participate in agriculture. Stirring up people's commitment was one of the strategies to achieve it. The government issued declarations such as: - Siasa ni kilimo-1972 (politics is agriculture); kilimo cha kufa na kuona-1983(do or die agriculture), Ujamaa village and irrigation in agriculture in 1978 (ESRF, 1995). More specifically, the following efforts were undertaken by the government to improve agricultural production.

2.3.4.1 Ujamaa Village

In 1967, Tanzania embarked on the implementation of socialism commonly referred as "Ujamaa" strategy. It focused on:- freedom, equality and unity. It was during this period in which Ujamaa villages were established. There was an emphasis that there must be equality because only on that basis will men work cooperatively, there must

be freedom because the individual is not served by society unless it is his, and there must be unity because only when society is unified can its members live and work in peace, security and well being (Ibhawohn and Dibua, 2003).

It was argued that rural agriculture could be improved through three stages. The first was a preparatory stage where apart from building Ujamaa villages, the peasants could start clearing land, cultivating and growing crops.

The second stage intended to bring together the peasants' efforts through communal farming to get surplus produce. In the first and second stages family and individual farms were allowed. It was anticipated that this stage could show the peasants the importance of communal farming in terms of harmonization of labour for high returns.

The third and final stage was that of mass consumption, where after enjoying the production returns, the peasants could abandon family farming and maximize communal agricultural production (HAKIARDHI, 2011). However, issues of individualistic behaviors were overlooked as there were no efforts undertaken to change people's attitudes towards individualism which later led into few people swindling the communally owned resources.

2.3.4.2 Establishment of Extension Services in Tanzania

Agricultural and livestock extension services were introduced in the country in the 1960s (URT, 2013). In 1988, the government launched the National Agricultural and Livestock Extension Rehabilitation Project (NALERP) based on the training and visit (T & V) system as an approach to improve agricultural extension. The basic features of the T & V system include: professionalism, single line of

command, concentration of efforts, time bound trends, field and farmer orientation, regular and continuous training, and linkage with research (Benor & Baxter, 1984 as quoted by Rutatora and Mattee, 2001). The T & V system focused on improving agricultural production through field visit, training and linkage with research to scientifically solve agricultural problems. The recommendations by NALERP on extension services when implemented together with current government efforts to mechanize agriculture by providing tractors and power tillers to farmer can significantly contribute into improved agricultural production.

2.3.4.3 Local Government Reforms

In order to improve service delivery, public service was reformed starting with Public Service Reforms followed by Civil Service Reform in the 1990s. The civil service reform which focused on New Public Management was subsequently followed by the local government reform. Local government reform aimed at transferring some of political, financial and administrative powers to local government. It also focused on changing central-local relation from that of command into negotiation between the two (URT, 1998). Decentralization was meant to realize Article 146 of the Constitution of United Republic of Tanzania of 1977. The article provides for the purpose of establishing local governments in the country, that is to transfer powers to the people and local governments were required to establish conducive environment for people's participation in planning and implementation of development plans (URT, 2008). Therefore, on this basis actual provision of services including agricultural services to communities is entrusted in the hands of local government authorities. Local government being institutions that are closest to the people are expected to create opportunities for

community participation so that service delivery address the felt needs of the community. This is perceived to improve allocative and production efficiency (World Bank, 2001).

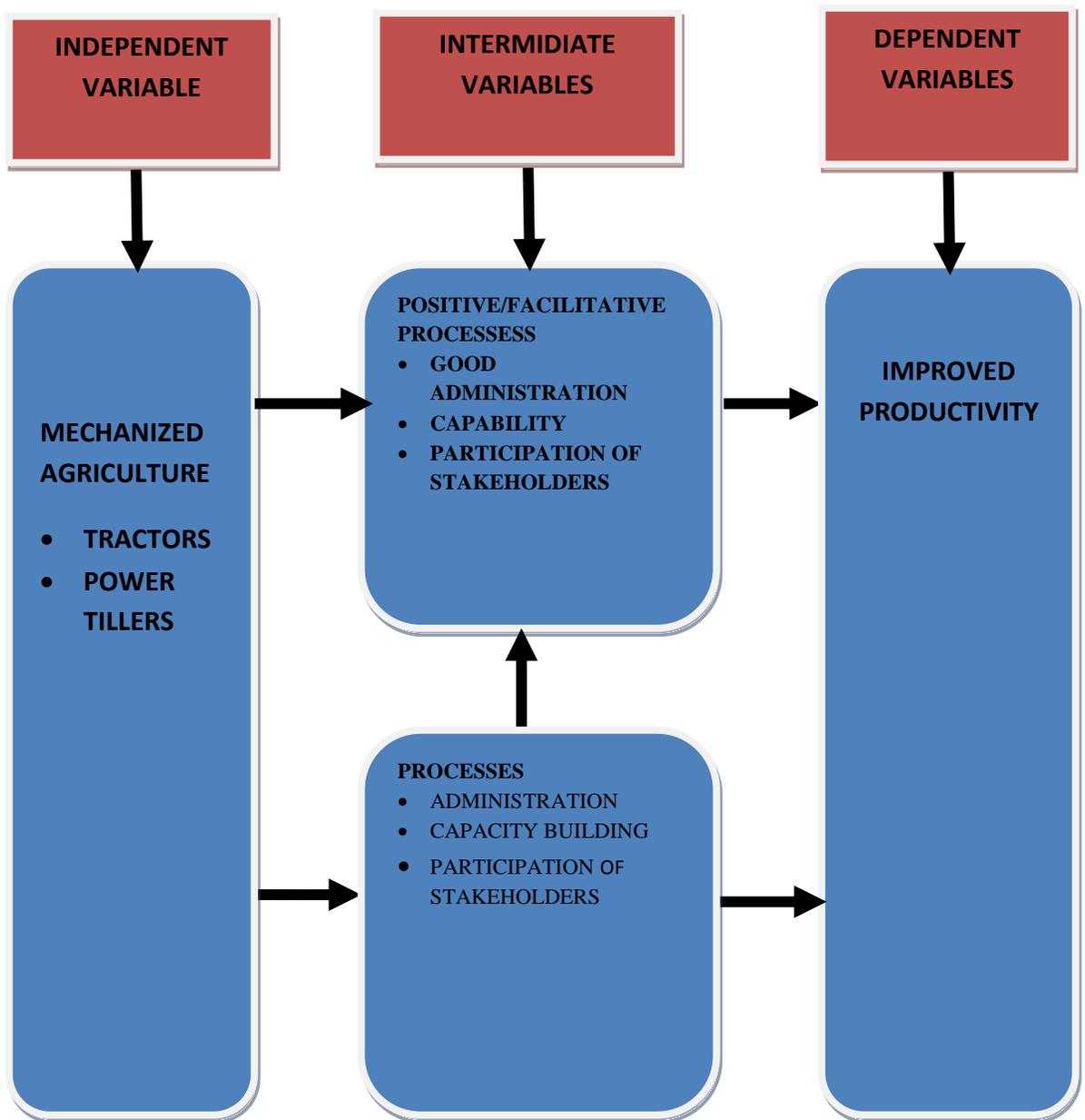
2.3.4.4 National Agricultural Input Voucher Scheme (NAIVS 2009–2012)

In 2009, Tanzania with the support of World Bank embarked on implementation of the National Agricultural Input Voucher Scheme (NAIVS). The scheme focused on subsidizing fertilizer and seeds by 50%, hence, alleviating the farmers' inability to apply fertilizer and improved seeds which have been a great impediment to improved agricultural production and maintainance of food security. The study by REPOA on farmers' awareness on National Agricultural Input Voucher Scheme found that there was a high level of awareness of the community on the scheme. Also, the study recommended more efforts on criteria for targeting farmers, affordability and strengthening extension support services (REPOA, 2013). However, the study did not explore the impact of the scheme in improving agricultural production. Moreover, the findings did not indicate the relationship between the scheme and tractors/power tillers.

2.4 Conceptual Framework

The study was guided by the conceptual framework shown in figure 2.1. The conceptual framework shows the inter linkage of different aspects and actors into the efficient use of mechanized agricultural instruments for improvement of corn production in the study area. The framework comprises of independent, intermediate and dependent variables as illustrated.

Figure 2.1: Conceptual Framework for the Contribution of Mechanized Agriculture for Productivity Improvement



Source: Researcher, 2014

2.4.1 Independent Variables

According to Kothari (2004) independent variables are the variables that can be changed in an experiment. The variable which is antecedent to the dependent variable is termed as an independent variable. In this study mechanized agriculture is the independent variables which comprise: tractors and power tillers.

2.4.2 Intermediate Variables

Intermediate variables come between the independent and dependent variables. They show the linkage between the two variables as shown in Figure 2.1 above. The intermediate variables for this study refer to the “process” in which the agricultural mechanization is managed to the realization of the targets (improved productivity). The process here includes management of mechanized agricultural instruments, capacity building to use the equipments and involvement of actors in enhancing mechanized agricultural equipments to bear the expected results.

The process can either be facilitating (positive) or hindering the effective use of mechanized agricultural equipments. In case of facilitative process, there will be effective and efficient management of human, financial and physical resources; enhanced capability of equipment users and effective stakeholders’ participation. Stakeholders here refer to local government (agricultural extension staff) private sector which distributes agricultural inputs under NAIVS at subsidized price, markets and Research institution for improving agricultural production, NGOs and FBOs. On the other hand, in the case hindering/negative process the following features prevail:-poor management of human, financial and physical resources; inadequate capabilities and inadequate stakeholders’ participation.

2.4.3 Dependent Variable

Dependent variable in this case is either improved or poor productivity depending on the process. In case of positive/facilitative process, productivity will be improved. In this study, with the facilitative process in the use of mechanized agricultural equipments, corn production improves. On the other hand, in case where the process of using mechanized agricultural equipments is negative/not facilitative, it will result into poor productivity. In this respect, it implies that the use of mechanized agricultural equipments does not lead into improved corn production.

2.5 Research Gap

There are numerous researches related agricultural performance and its contribution to the national economy in Tanzania. Some of the findings in this area include that of Rutatora and Mattee (2001) who highlighted the focus of establishment of extension services in the country (focusing on training, visit and linkage with research). There is also that of Adalakunje et. al (2012) who linked poor performance in agriculture with the way research is undertaken. Likewise, Mashindano *et al.* (2011) linked poor performance in agricultural sector with failure to alleviate poverty in the country. Nevertheless, Pauw and Thurlow (2010) perceived that low productivity of maize as attributed by the use of hand hoe because in most cases the crop is produced by small scale farmers. Furthermore, Ademiluyi and Oladele (2008) concluded that Indian power tillers used in rice cultivation in Nigeria and Ghana are efficient while Biggs *et al.* (2002) reported that after a series of field research and community participation, Nepal modified power tillers to suit the environment and URT (2010) reports about the introduction of tractors/power tillers to improve agricultural production in the country.

On the basis of the above research findings, little is documented regarding the contribution of mechanized agriculture in corn production in Dodoma region, the case of Kongwa District council. Therefore, the proposed study intended to bridge the knowledge gap.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This part comprises of methods and techniques that were used in data collection, organization and analysis. It is organized in the following parts: area of study, the population for the study, the sample, sampling techniques, sources of data, methods of data collection and data analysis.

3.1 Area of the Study

The study was carried out in Kongwa District Council, Dodoma region. The council was purposively selected because it is among the leading councils in corn production in Dodoma region. It is on this basis that the government has established international market for corn in the area. Moreover, as a result of government efforts to improve agriculture, mechanized equipments are provided to farmer groups by the local government authorities. Nevertheless, the private sector has been involved particularly in distributing agricultural inputs under NAIVs at subsidized prices.

3.2 Research Design

Research design is a conceptual structure within which research is conducted. It constitutes the blueprint for the collection, measurement and analysis of data (Kothari, 2004 and Cooper and schindler, 2006). The study used a descriptive research design under which a cross-sectional strategy was employed. It is the strategy which enables the study to be carried out once and represents a snapshot of one point in time (Cooper and schindler, 2006). It gathers information to answer the

research questions of interest at only one point in time. The strategy was opted due to time limit within which the researcher had to accomplish the study.

3.3 Population of the Study

Population refers to the total number of items about which the information is desired (Kothari, 1990). In this study, population includes: local government employees, political leaders and farmer group members who own tractor/power tillers. They have roles to play directly or indirectly regarding the decision for acquisition, supply, supervision and use of mechanized agricultural equipments in the council. Moreover, they have the knowledge and experience on the contribution of the equipments in corn production. The study could not cover the entire population due to some limitation of accessibility, time and resources. Therefore, a representative sample was drawn for the study.

3.4 Sampling Procedures and Sample Size

Both probability and non probability (purposive) sampling methods were employed for the study.

3.4.1 Probability Sampling

Generally, probability sampling is a sampling method commonly known as random or chance sampling in which every item of the universe has an equal chance of inclusion in the sample (Kothari, 2004). The probability sampling enables to draw a representative sample whose statistics/characteristics represent population parameters, hence the findings can be generalized to the entire population from which the sample is drawn. As the study comprised various groups of people with

various experience and roles regarding mechanized agricultural equipments, stratified sampling procedures were employed to ensure that responses from different stratum were drawn into the sample.

3.4.2 Stratified Sampling

It refers to probability sampling in which non heterogeneous groups are categorized into the respective homogeneous strata. The population is subdivided into several sub population that are individually more homogeneous than the total population (Kothari, 2004). It is a probability sampling in which population of the study is divided into two or more relevant groups or significant strata based on one or number of attributes (Saunders, Lewis and Thornhill, 2003).

The population was stratified into the following strata:- District agricultural employees, grassroots employees (WEOs, VEOs, Agricultural extension and community development officers), grassroots leaders (councilors and village chairpersons), members of the farmer groups supplied with tractors or power tillers at 80% price paid by the council and few private owners of power tillers. The sampling procedures were employed to ensure that respondents from each stratum were drawn into the study to capture responses from each of these as they have different experiences and roles on mechanized agricultural equipments.

Out of the 22 wards of kongwa district council, there were 24 farmer groups distributed in 13 wards supplied with tractors and power tillers. The 80% of the price was paid by the Kongwa district council and 20% of the price was to be paid by the members of the respective farmer group. The following are the wards which had farmer groups supplied with either a tractor or power tiller: - Kongwa, Ugogoni,

Machenje, Ibwaga, Mtanana, Sagara, Senjeli, Kibaigwa, Zoisa, Hogoro, Chamkoroma, Iduo, Ngomai, Mlali, Kinangali and Chiwe.

In order to draw a representative sample, the 13wards were clustered into their respective divisions. They were clustered into 3 divisions namely:- Kongwa, Zoisa and Mlali. Table 3.1 shows clustered wards into divisions. It also contains villages in which farmer groups are established.

Table 3.1: Clustered Wards into Divisions

Division	Ward	Village	Farmer Group Name	Number of Farmer Groups	
Kongwa	Kongwa	Kongwa	Mamboleo	1	
	Ugogoni	Machenje	Chapakazi	1	
		Ibwaga	Muungano	1	
		Mautya	Ushirika	1	
	Mtanana	Mtanana	Mapinduzi	1	
	Sagara	Sagara B	Huruma	1	
		Msingisa	Msingisa Youth Development Group	1	
	Sejeli	Mbande	Mbande	Twende Jitume	1
			Mbande	Jitegemee	1
			Msunjulile	Uzalishaji mali na kujitegemea	1
Kibaigwa	Ndugurumi	Umoja ni Nguvu	1		
Zoisa	Zoisa	Zoisa	Mahaghaila	1	
	Hogoro	Mkutani	Nguvu Kazi	1	
		Mkutani	Changamoto	1	
		Mlanje	Kaza mwendo	1	
		Banyibanyi	Muungano	1	
		kinangali	Juhudi	1	
	Chamae	Nia Njema	1		
Mlali	Chamkoroma	Tubugwe Juu	Uvumilivu	1	
	Iduo	Suguta	Mwangaza	1	
	Ngomai	Ngomai	Ushirika wa mazao	1	
	Ngomai	Ngomai	Mkonongo	1	
	Mlali	Mlali Lyegu	Mshikamano	1	
	Chiwe	Chiwe	Tumaini	1	
	Total Number of power tillers distributed by Kongwa				24

Source: Kongwa District Council, 2009

On the basis of the clustered wards, 32% of farmer groups in each division were taken into the sample. Therefore, 4 farmer groups were drawn from Kongwa division, 2 farmer groups from Zoisa and another 2 farmer group drawn from Mlali division. This made a total of 8 farmer groups included into the study. The procedures for selection of specific farmer groups were made on the basis of clustered sample as shown in Table 3.1.

3.4.3 Random Sampling

Random sampling was applied to select farmer groups clustered in divisions and agricultural officers at the local government headquarter. Random sampling is a probability sampling in which all elements in the population have an equal chance of been selected into the sample (Kothari, 2004). The list of names of farmer groups was prepared for each division. On the basis of the list of names of farmer group per division, pieces of papers containing names of farmer groups were prepared. The pieces containing the names of farmer groups for a division were folded and put into the container. They were thoroughly mixed and one piece of paper was taken from the container into the sample. The exercise was repeated until a sample of seven farmer groups was selected in the council.

In Kongwa division the following groups were selected:- “Ushirika” at Mautya village in Ugogoni ward; “ Mapinduzi” at Mtanana village in Ugogoni ward; “Jitegemee” at Mbande village in Sejeli ward and “*Umoja ni Nguvu*” at *Ndurugumi* in Kibaigwa ward. In Zoisa division the following were selected into the sample:- “Changamoto” at Mkutani in Zoisa ward; “Juhudi” at Kinangali village in Hogoro ward and “ushirika wa mazao” at Ngomai Village, Ngomai ward in Mlali division.

Moreover, in selecting names of farmer group members, from the list of each farmer group members, pieces of papers were prepared containing their names. The papers were put into a container and thoroughly mixed. Thereafter, one piece of paper was drawn after each thorough mixing. The exercise proceeded repeatedly until the required sample from all 8 farmer groups was drawn. From each farmer group 6 members were taken into the sample making a total of 48 respondents. The process aimed at ensuring that there was an equal chance for selection of population in the sample, hence capable to generalize the findings.

Moreover, on the basis of list of agricultural department employees (seniority list), names were written in small pieces of paper, thoroughly mixed in a container and thereafter one piece of paper was drawn after another. The exercise was undertaken repeatedly until the desired sample of 4 persons was drawn.

3.4.4 Non Probability Sampling

Non probability sampling refers sampling method in which items in the population have no equal chance of being selected into the sample. It goes by different names such as deliberate, purposive and accidental and judgment sampling. Therefore, the study employed purposive required sample.

3.4.5 Purposive Sampling

Purposive sampling was employed to select key informants for the study which included councilors in selected ward, agricultural extension employees, WEO, VEOs, village chairpersons and private owners of power tillers in selected villages in which farmer groups were drawn into the sample. They provided resourceful information to answer research questions. Purposive sampling is a non probability

sampling which refers to sampling procedures where the sample for the study is deliberately selected by the researcher. In this respect, elements of the population have no equal and known chances of being selected into the sample (Kothari, 2004).

3.5 Sample Size

Sample size refers to the number of items to be selected from the population to constitute a sample. The size of the sample should neither be excessively large, nor too small. It should be optimum in the sense that it should fulfill the requirements of efficiency, representativeness, reliability and flexibility (Kothari, 2004). A sample of 65 respondents out of 146 populations was expected to be drawn comprising farmer group members owning tractor/power tiller owners, local government officials and political leaders of ward and villages in selected areas and private owners of power tillers. However, the actual collected responses from both interview and questionnaires were 58 responses as summarized in Table 3.2. This amounted to about 89% (returned) response rate.

Table 3.2: Sampling Design: Respondent's Categories, Sample Size and Sampling Techniques

S/N	Category of respondents	Predicted Sample	Actual Drawn sample	Sampling techniques	Data collection method
1	Head of Department of Agriculture	1	1	Purposive sampling	Interview guide
2	Councilor,	4	3		
3	Agricultural officers	4	4		
3	Village chairpersons	5	3		
3	Agricultural extension executive officers	4	2		
5	Members of farmer Group owning tractors/ power tillers	45	43	Simple random sampling	Questionnaire
7	Private owners of Tractors/power tillers	2	2	Purposively selected	Interview guide
	Total	65	58		

Source: Field Data, 2014

3.6 Unit of Analysis

Unit of analysis refers to specific entity that is being analyzed. It is about what or who is being studied. Unit of analysis in social science includes: individuals, groups, organization, social artifacts and social interactions (Babbie, 2001). In this study, unit of analysis included: local government officials, farmer group members owning mechanized agricultural equipments, political leaders at ward and village level and private owners of agricultural equipments. These have roles to play directly or indirectly regarding the decision for acquisition, supply, supervision and use of mechanized agricultural equipments and its impacts in corn production.

3.7 Methods of Data Collection

In order to enhance the researcher to assess the contribution of mechanized agricultural equipments in corn production, both primary and secondary data were collected for the study.

3.7.1 Primary Data

Both qualitative and quantitative approaches were employed to collect primary data. Primary data refer to data that are collected afresh and for the first time by the researcher to answer the research questions (Kothari, 2004). In this study the researcher employed various methods and tools/instruments to collect both qualitative and quantitative data. The different methods, tools and types of data collected complimenting each other, contributed to enhance the validity and reliability of data which in turn helped to interpret and better understand the complex reality of a given situation and the implications of quantitative data.

3.7.2 Types of Primary Data, Methods and Tools of Data Collection

There are different methods and tools/instruments for collecting quantitative and qualitative primary data. The types of collected data, methods for collection and respective tools employed for the same are elaborated as follows:

3.7.2.1 Quantitative Data

It refers to data expressed in quantities such as financial and numerical data. The data are collected by employing quantitative approach (Creswell, 2003 and Greener,

2008). Quantitative data can be collected through the use of quantitative surveys and questionnaires (Mack *et al.*, 2005).

In this study questionnaire method was used to collect data from 43 respondents belonging to 8 farmer groups. Out of these farmer groups, seven groups owned power tillers and one group owned tractor. Both of these mechanized agricultural equipments were supplied by the Kongwa district council at 80% price paid by the council and 20% paid by the members of the farmer groups.

The method was opted due to dual reasons: it saves time by administering to a larger number of respondents at a time, and with the questionnaires respondents are assured of their anonymity and hence have freedom to express their views. In this study, both open and close ended questions were included in the questionnaire.

Lirket scale was employed in designing some of the questions in the questionnaire in order to collect data on respondent's preferences or degree of agreement with the statement. It is commonly used to measure attitude, providing a range of responses to a given question or statement. Typically, there are 5 categories of response, from (for example) 1 strongly disagree to 5 strongly agree, although there are arguments in favour of scales with 7 or with an even number of response categories (Jamieson, 2004). The scale was employed to collect respondents' perception on the contribution of mechanized agricultural equipments in food production, perception on the agricultural extension officers' visiting rate to farmer groups and the degree of effectiveness of the rules governing the farmer groups.

3.7.2.2 Qualitative Data

A qualitative approach is concerned with subjective assessment of attitudes, opinions and behaviours. The research in such a situation is a function of researcher's insights and impressions (Kothari, 2004). The approach collects data on perception, feeling and thinking of the people (Greener, 2008). In this study, the following methods were used to collect qualitative data for the study: interview, Focus Group Discussion and observation. *Mark et al.* (2005) emphasized that these are commonly used methods in qualitative data collection.

An interview is a purposeful discussion between two or more persons which helps to get valid and reliable data that are relevant to the research questions (Saunders, Lewis and Thornhill, 2009). The study used semi structured interview method to collect the data. The method allows flexibility in data collection as the interviewer in addition to prepared questions, can seek clarification and elaboration by probing (May, 2001).

The interview guide tool was prepared and employed to collect data from local government employees, leaders at ward and village level and private owners of the power tillers (*see appendix A*). This was opted to enhance in-depth interview with key informants who clarified some aspects collected through questionnaires.

Moreover, Focus Group Discussion (FGD) was conducted among farmer group members to obtain information about the contribution of mechanized agricultural equipments in improving food production in the study area. FGD is an interview style designed for small groups (Saunders, Lewis and Thornhill, 2003). In this study three farmer groups comprising 5 to 8 members were formed, and in these groups respondents discussed about the topic. Among these two groups were owning power tillers. The groups are "Umoja ni Nguvu" (Ndurugumi) which was poorly

performing and Ushirika wa Mazao”(Ngomai) perceived comparatively to be performing better. Also, another FGD was conducted with Ushirika” at Mautya village farmer groups in Ugogoni ward which owned a tractor.

A checklist was prepared and used to guide the discussion. It enhanced enriching the information through discussion and clarification of the issues. The researcher intervened only where the discussion went astray.

Observation method was employed to collect additional information regarding the mechanized agricultural equipments. Observation refers to the systematic observation, recording, description, analysis and interpretation of people’s behaviour (Saunders, Lewis and Thornhill, 2003).

The checklist tool was prepared and employed in data collection. The non participant observation focused on the status and operating conditions of both farmer group tractors and power tillers. Non participant observation aimed at enriching information on the existing situation of the equipments. The method was adopted to avoid biased responses by the respondents. The use of multi methods and respective tools for primary data collection was meant for data triangulation.

3.7.2.2 Secondary Data

Secondary data are the data that were collected and compiled for other purposes. It is the data which is obtained from written documents or collected by other people for some other objectives but useful in the ongoing study (White, 2002). In achieving the objective of the study, secondary data were also collected to compliment primary data.

In order to collect secondary data, documentary review was carried out regarding policy, research, publication, articles and books on agricultural mechanization; use of mechanized agricultural equipments; inputs that contribute into making mechanized equipments to yield expected results and other related literature.

Documentary review refers to reassessing secondary data which include documents such as notices, minutes of meetings, administrative and public records and reports to shareholders as well as non-written documents such as tapes, video recording, pictures films, television books, journals and articles (Saunders, Lewis and Thornhill, 2003).

These, multiple methods and tools of data collection were employed for data collection in order to enhance increased accuracy of research findings and data triangulation which enhanced reliability and validity of the findings.

3.8 Reliability and Validity

Reliability is the extent to which results are consistent and an accurate representation of the total population. In cases where the results of the study can be produced under similar methodology, then research instrument is considered to be reliable (Mugenda and Mugenda, 2003). In order to ensure reliability of the data, the study collected data from various respondents with the use of different data collection methods and tools to cross check veracity of the information.

Validity refers to the degree in which results obtained from analysis actually represent the phenomenon under the study. In research process, there are both internal and external validity. On the one hand, internal validity of the study depends on the degree to which extraneous variables have been controlled in the

study. On the other hand, external validity has to do with representativeness of the sample with regard to population from which the sample has been drawn. It is the degree to which research findings can be generalized to population (Mugenda and Mugenda, 2003).

In order to ensure validity, instruments for data collection: questionnaire, interview guide and checklist were translated into Kiswahili and questions clarified. Also data triangulation was made by comparing data collected through various methods and tools.

3.9 Ethical Issues

Ethics are norms or standards of behavior which guide moral choices about our behavior and relationship with others. The goal of research is to ensure that no one is harmed or suffers adverse consequences from research activities (Cooper and Schindler, 2006). In this study, informed consent was sought from Kongwa district council and thereafter, from the respective respondents. This aimed at getting approval to undertake research from the authority and individual consent to participate in the research. Moreover, confidentiality and anonymity was guaranteed and observed in data collection and presentation. It entailed avoiding victimization by their respective leaders that could possibly result from the type of opinions raised during data collection. On top of it, wording research questions took into account ethical consideration.

3.10 Data Analysis Design

Data analysis refers to the computation of certain measures along with searching for patterns of relationship among data groups. It is usually made in accordance with

the outlines laid down in the research plan (Kothari, 1990). The study mainly applied qualitative analysis. The Statistical Package for Social Sciences (SPSS) was employed to justify arguments. It was run to compute frequency, percentage and facilitate the arrangement of data in pie charts, histogram and tables for interpretation.

The computed data were arranged in relation to their respective specific objectives. Thereafter, the interpretation was made relating quantitative, qualitative and secondary data. In the presentation correlation among data were interpreted.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.0 Introduction

This chapter focuses on data presentation, analysis and discussion of the findings. Data were analyzed both quantitatively and qualitatively. The quantitative data were summarized in tables, pie charts and figures. The analysis meant to show correlations among various research variables. The quantitative data were supported in some cases with respondents' views, opinions, feelings and experiences (qualitative data) gathered through interview and FGD methods.

Data presentation and analysis was guided by research objectives and research questions. The discussion of research findings was informed by theoretical and conceptual framework presented in chapter two.

4.1 Data Presentation and Analysis

The study intended to assess the Contribution of Mechanized Agricultural Equipments in improving food production. In order to realize this objective, the study was centered on the realization of three specific objectives which included: to examine the status of mechanized agricultural equipments and inputs for corn production in the study area, to examine the contribution of mechanized agricultural equipments and inputs in corn production in the study area and to explore challenges in managing and using mechanized agricultural equipments and inputs for food production in the study area.

The following research questions enhanced collection of data for realization of the specific objectives: What is the status of mechanized agricultural equipments and inputs for corn production in the study area? What is the contribution of mechanized agricultural equipments and improved agricultural inputs for corn production in the study area? And what challenges do farmer group members face in managing and using tractors/power tillers and agricultural inputs in food production in the study area? The realization of the specific objectives contributed towards the realization of the general objective of the study.

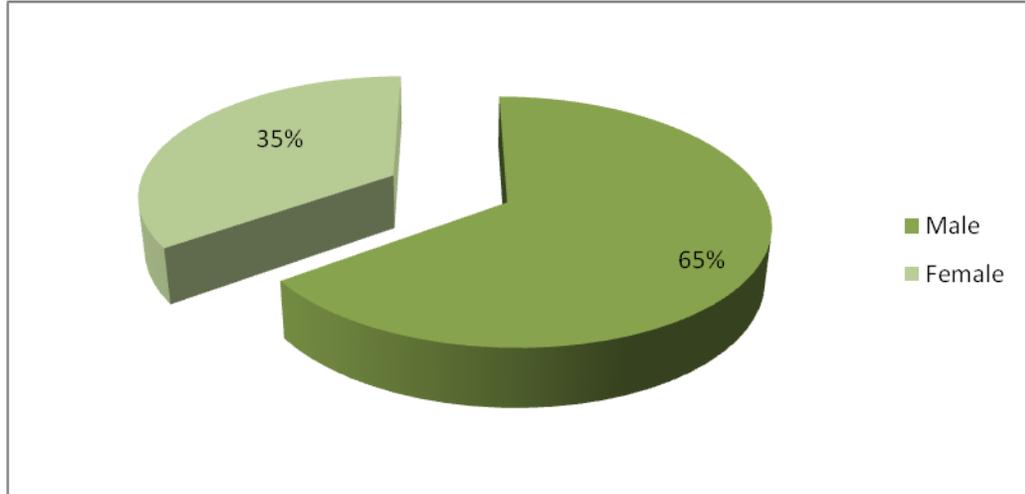
4.2 Preliminary Information of Respondents

There were three types of respondents' preliminary information which were used to describe the respondents of the study. The information included distribution of respondents by sex, age and marital status. Each of these is elaborated in the subsequent parts in relation to owning mechanized agricultural equipments and its impact in contributing to improved food production.

4.2.1 Distribution of Respondents by Sex

Figure 4.1 presents distribution of respondents by sex as reflected by data collected through questionnaires.

Figure 4.1: Distribution of Respondents by Sex



Source: Field Data, 2014

The findings revealed that about 65% of all the respondents were males and about 35% of the respondents were females. Therefore, it was noted that farmer groups were more male dominated compared to female counterparts. The findings correspond with the interview from local government staff, grassroots leaders and FGD held to farmer group members which confirmed that *“in most of the farmer groups, male constituted the majority of the members in farmer groups”*. This corresponds with the findings by Care Tanzania (2010), which revealed that *“it was easier for a man to become a member of a farmer group than a woman. Women have limited decision making powers over the use of money say to pay compulsory fee to the group. Other hindering factors include cultural practices and education level. In other cases where a man is a member of farmer group then automatically it is perceived that he represents his wife”*.

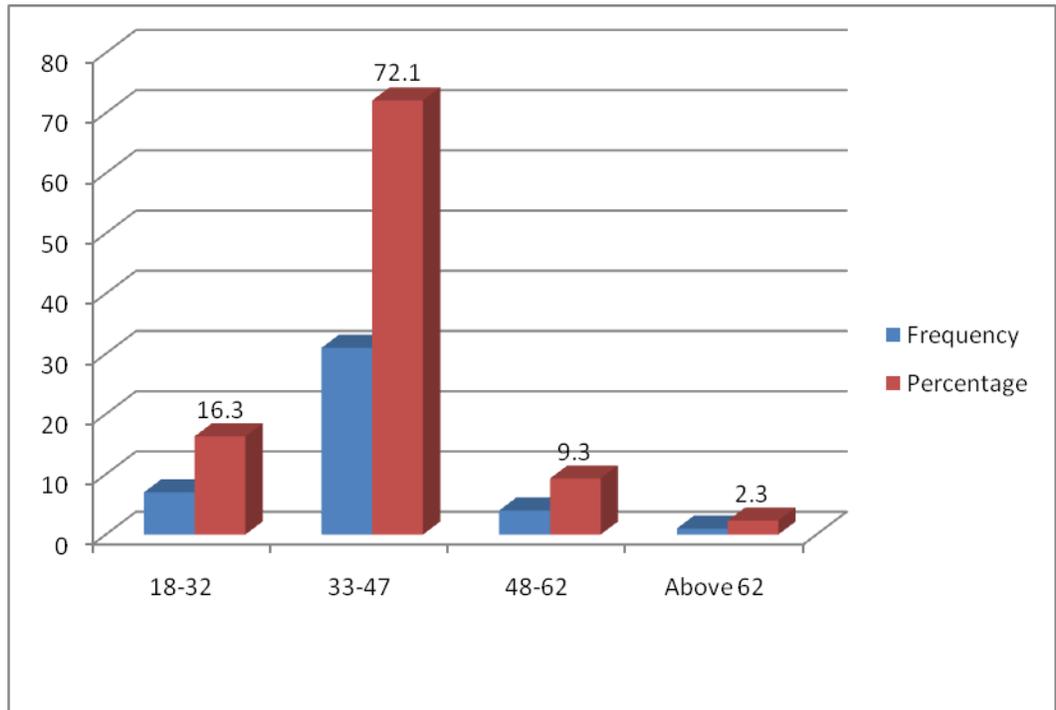
On the basis of these findings, it creates doubt that farmer groups might not bring about the intended impacts as they leave out women who are the majority in

farming activities and who have the role of ensuring food availability and security for the family in general and their children in particular. This concurs with USAID (2011) and Johnsons-Welch et al. (2000) who pointed out that women manage household consumption and food preparation. Therefore, when women's productivity in agriculture is improved and income increased, the benefits amplify across the families and generation. Women tend to devote a larger fraction of their income to their children health and nutrition, laying foundation for their children's lifelong cognitive and physical development.

4.2.2 Distribution of Respondents by Age

Figure 4.2 summarizes findings on age distribution of the respondents' views collected through questionnaires. The age of members of the farmer groups has impact in improving corn production in the study area.

Figure 4.2: Distribution of Respondents by Age



Source: Field Data, 2014

According to the findings in figure 4.2, around 72% of all the respondents were aged between 33 to 47 years. Moreover, around 16% were of the age between 18 and 32 and around 9% were of the age between 48 and 62. Nonetheless, around 2% of the respondents were of the age above 62.

On the basis of the above figure, majority of the members of the group are aged between 33-47 years. In this country majority of primary school leavers complete their education in an average of 16 years and majority of them have no chance to proceed with secondary education. Even those who continue with secondary school, majority of them after completing form four at the age of 20 do not continue with advanced level. This implies that the youths who are more energetic and productive

part of the society are marginally involved in farmer groups. The National Youth Development Policy of Tanzania defines youth to include people aged between 15 to 35 years old (URT, 2007). This raises doubt on the attractiveness of the sector and policy provision for allocation of land to youth generation in the society. This corresponds to findings by Brooks *et al.* (2013) during Focus Group Discussion with 32 young rural Africans who in answering the best ways to earn their living in their communities, they rarely mentioned agriculture as the best job. Moreover, the same study summarizes land ownership by age group in Malawi, Tanzania, Uganda and Nigeria as depicted in Table 4.1.

Table 4.1: Land Ownership by Age Group

Age Group	Malawi		Tanzania		Uganda		Nigeria	
	Proportion of individuals who own land at least one plot	Average land size owned (HA)	Proportion of individuals who own land at least one plot	Average land size owned (HA)	Proportion of individuals who own land at least one plot	Average land size owned (HA)	Proportion of individuals who own land at least one plot	Average land size owned (HA)
15-19	4.31%	0.37	1.10%	0.56	5.02%	0.54	1.63%	0.53
20-24	25.63%	0.42	10.88%	0.81	13.19%	0.65	1.74%	0.60
25-29	38.00%	0.48	26.12%	1.04	30.26%	0.63	3.13%	0.68
30-34	39.20%	0.54	38.05%	1.10	43.37%	0.72	3.10%	0.41
35-39	43.56%	0.60	46.80%	1.16	50.76%	0.83	3.68%	0.51
40-44	45.28%	0.65	56.49%	1.35	60.18%	0.96	4.52%	0.60
45-49	49.23%	0.71	58.81%	1.26	62.63%	0.99	5.68%	0.51
50-54	51.24%	0.73	59.64%	1.39	64.35%	1.01	5.16%	0.58
55-59	50.56%	0.68	64.62%	1.36	69.70%	1.16	6.54%	0.45
60+	50.35%	0.63	61.56%	1.19	67.87%	0.91	7.70%	0.43
Average	33.39%	0.57	32.64%	1.20	33.06%	0.85	3.77%	0.52

Source: World Bank LSMS-ISA Data, 2012

The Table 4.1 confirms that despite differences in these countries, generally, increase in proportions of individuals who own land is direct linked with the age. As one grows older is likely to acquire a big position of land. It implies that mechanism to allocate land to youth for agriculture is not in place. The land is either purchased or inherited both of which are made possible at later years of life.

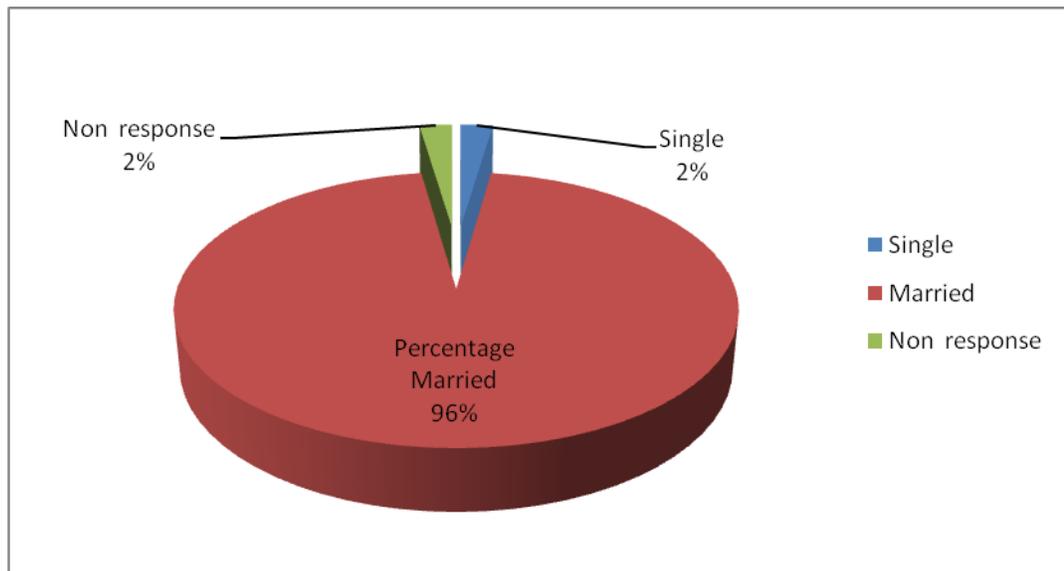
The follow up question in FGD on factors inhibiting efficient use of power tillers, it was revealed by members that “most of group members could not manage to drive power tillers in cultivation as much effort was required due to the nature of equipments: which most of the members lacked due to old age”.

Therefore, efforts to improve agricultural production in the country should encourage youth’s involvement, and policy should set mechanisms of allocating land to them and making the sector attractive. Ahaibwe, Mbowa and Lwanga (2013) concluded that if agriculture is made more remunerative and rewarding in terms of income and profitability, the youth would indeed be attracted to the sector.

4.2.3 Distribution of Respondents by Marital Status

Figure 4.3 sums up distribution of respondents by marital status

Figure 4.3: Distribution of Respondents by Marital Status



Source: Field Data, 2014

According to the findings, around 96% of the total respondents were married, 2% single and another 2% of the respondents did not respond to this part.

Therefore, on the basis of the findings, it is evident that the majority of the farmer group members are married. This implies that people who have family responsibilities struggle to seek for the means of improving the well being of their families. This corresponds to the findings by Aihabwe, Mbowa and Lwanga (2013) which revealed that marital status and gender influence the probability of youth's participation in agriculture. The probability of taking up agriculture by the married female youths increases by close to 9.0%. This could be attributed to the cultural tendencies where married women are inclined to providing food for their families as their husbands engage in non-agricultural activities to earn cash income. Compared to the unmarried female youths, the probability of participating in agriculture reduces by 12.0 percent and 3.0 percent for the married and unmarried male youth respectively. On the other hand, the findings reflect that the majority of youth's people in the study area who were single do not engage much in agriculture.

4.2.4 Respondent's Education Level

Table 4.2 recaps the summary of respondents regarding their education level. This was expected to have impact on farmer group management, adaption and adoption of technology, conflict resolutions and ability to appropriately keep books of accounts for the group which would contribute into minimizing conflicts among members.

Table 4.2: Respondent's Education Level

Responses	Frequency	Percentage
Informal Education	4	9.3
Primary Education	30	69.8
Secondary Education	9	20.9
Total	43	100.0

Source: Field Data, 2014

The findings revealed that around 70% of the total respondents were standard seven, 21% had attained secondary school education and 9% of the respondents had informal education. In FGD it was revealed that the majority of the 21% were the employees of Local government at grassroots level. It was pointed out that although villages had secondary graduates, most of them migrated in towns and a few of them who resided in villages do not prefer to engage in farmer groups in particular and agriculture in general. The findings relate with those of Ahaibwe, Mbowa and Lwangwa (2013) who found that rural-urban migration is more biased towards educated people.

On the basis of these findings, there should be deliberate efforts to encourage secondary and college graduates' involvement in farmer groups and farming in general. Basing on the fact that over 70% of the farmer groups had either primary or informal education, there is an apparent need of equipping them with skills to adapt and adopt mechanized agricultural technology, management skills that would minimize conflicts and training on how to appropriately record and keep books of account.

4.3 The Status of Mechanized Agricultural Equipments and Agricultural Inputs for Food Production in the Study Area

Examining the status of mechanized agricultural equipments and inputs was the first specific objective of the study. According to modernization theory, although Tanzania exported some of agricultural products, agriculture sector in the country is partly perceived to be in the primitive society stage because most of the food production is consumed by producers and technology employed is very limited (Valenzuela and Valenzuela, 1978). It was found further that Kongwa district council has an estimated of more than 700 privately owned tractors. On top of it, 22 power tillers and 2 tractors were distributed to farmer groups by the government. Therefore, importation of mechanized agricultural technology (tractors and power tillers) under Kilimo Kwanza strategy and distribution to farmer groups and individuals added to the existing stock. The mechanized equipments are essential in an attempt adopt modernization theory for improving agricultural production. Moreover, it is an initial stage in the process for transformation that would lead to capital formation and ultimately industrialization in the country (Chachage, 1978). The study focused on the contribution of agricultural equipments owned by the farmer groups. In order to gauge the achievement of the objective, the following were examined.

4.3.1 The Number of Farmer Groups Distributed with Mechanize Agricultural Equipments

Data on the number of farmer groups supplied with tractors or power tillers by the council in the area of study helped to identify the efforts of the council in enhancing mechanized agriculture and its agricultural mechanization. This in turn contributes

to the existing status of mechanized agricultural equipments. According to the records collected from Kongwa district council; there were 24 farmer groups and each of these was supplied with either one tractor or power tiller. For each of the agricultural equipment the council paid 80% and the groups were required to pay only 20% of the price of the equipment. Among these 24 registered groups, 22 were supplied with power tillers (Kubota, a Japanese type of power tillers) and 2 groups were supplied with tractors.

There are many farmer groups in Kongwa district council. Therefore, for transparency and fairness purposes, the district set the following criteria for selecting farmer groups to be issued with power tillers:- the group with formal registration and operating, group consisting of not less than 15 members, commonly owned farm of not less than 5 acres and a bank account. On the basis of these criteria, the following farmer groups with the names of respective villages met the criteria and were supplied with power tillers: “Mamboleo” (Kongwa), “Chapakazi” (Machenje), “Muungano” (Ibwaga), “Mapinduzi” (Mtanana), “Huruma” (Sagara B), “Twende Jitume” (Mbande), “Jitegeme” (mbande), “Uzalishaji mali na Kujitemea” (Msunjulile), “Umoja ni Nguvu” (Ndurugumi); “Nguvu kazi” (Mkutani), “Changamoto” (Mkutani), “Mahaghaila” (Zoisia), “Kaza Mwendu” (Mlanje), “Muungano” (Banyibanyi), “Nia njema” (Chamae), “Uvumilivu” (Tubugwe Juu), “Mwangaza” (Saguta), “Ushirika wa Mazao” (Ngomai), “Mkonongo” (Ngomai), “Mshikamano” (Mlali Lyegu), “Tumaini” (Chiwe) and “Juhudi” (Kinangali).

Moreover, the following criteria were employed in selecting farmer groups to be supplied with tractor and its parts: Bank account, commonly owned farm of not less

than 100 acre, not less than 15 members and the group was supposed to be functional. The rationale for these criteria was to enhance fairness in the selection and supply of equipments among many applicants. Moreover, meeting the criteria was perceived that the farmer group can be sustainable and bring about expected impacts.

On top of these, all registered groups applying for issuance of tractors were voted by the respective Village Assembly based on the aforementioned criteria. The group that got the majority of Village Assembly votes was submitted to Kongwa district council which issued it with a tractor and its parts. Therefore, Msingisa Youth Development Group (at Msingisa village) in Sagara ward and “Ushirika” at Mautya village farmer groups in Ugogoni ward were supplied with tractors. Moreover, on average each of these groups comprised of not less than 15 group members.

4.3.2 Year of Establishment of Farmer Group

Table 4.3 summarizes responses regarding the year in which the farmer groups were established in the study area. The year of establishment has a linkage with whether or not the group was established with expectation of being supplied with agricultural equipments which in turn has impact on its sustainability. The data on whether or not farmer groups supplied with tractors or power tillers are sustainable helped to assess the current and future status of mechanized agricultural equipments in the study area.

Table 4.3: Year of Establishment of Farmer Group

Responses	Frequency	Percentage
Between 2001 – 2004	8	18.6
2005-2008	9	20.9
2009-2012	26	60.5
Total	43	100.0

Source: Field Data, 2014

The findings in table 4.3 show that about 61% of the respondents pointed out that the farmer groups were established between 2009 and 2012, and 21% of the total respondents had the views that they were established between 2005 and 2008. Only 19% pointed out that the groups were established between 2001 and 2004.

On the basis of this, majority (that is over 80%) of the farmer groups in the study area were established during the implementation of the Kilimo Kwanza Strategy (2009) and only few were formed prior the period. It was supported by responses from interview and Focus Group Discussions in which interviewees revealed that *“most of the groups came into existence as a result of identification of community projects which emphasized on farmer group formation for realization of the identified needs. It was clearly emphasized that most of the groups were formed in order to contribute towards achievement of Kilimo Kwanza strategy”*. Therefore, they were established in order to secure resources (assets) meant to support the implementation of Kilimo Kwanza. This was supported by interview responses in which District Agricultural Officer and other employees in the department clearly pointed out that *“majority of them were formed with expectation of getting tractors or power tillers”*. This is supported by World Bank (2012) and Malhotra (2013)

whose findings revealed that in 2009/2010 and 2010/2011, under the Agriculture Sector Development Program, a total of 3,562 power tillers and 169 tractors were purchased and distributed to farmer groups by the respective local government authorities. This implies that many groups were formed during this period to capitalize on the emerging opportunities.

Therefore, such groups are likely to lack long term experience based learning (working and solving problems among themselves), norm formation and internalization, and have not gone through other basic stages for group formation and development such as:- mutual support, a traditional collective action in which members could work together to solve emanating problems and resource pool stage in which members of the group contribute resources to solve existing problems; instead they went into managing common asset (Sharma and Ohama, 2007). Hence, members of these groups are likely to face difficulties in working together which will jeopardize the sustainability of the groups and hence affect the current status of mechanized agricultural equipments in the council.

4.3.3 Founders of the Farmer Groups

Table 4.4 presents a summary of responses on people or organization that established or facilitated the establishment of farmer groups in the study area. Data on the manner in which farmer group's establishment idea was conceived and brought into existence helped to assess the sustainability and its effects to the status of mechanized agricultural equipments in the study area.

Table 4.4: Founders of the Farmer Groups

Responses	Frequency	Percentage
Members of Farmer group	21	48.8
Members of farmer groups with assistance from local government	16	37.2
Members of farmer groups assisted with NGOs/CBOs and FBOs	6	14.0
Total	43	100.0

Source: Field Data, 2014

The findings revealed that 49% of the total respondents had the views that farmer groups were established by the respective members of the group. Moreover, 37% of the respondents were of the views that such groups were established by the farmer group with the assistance from local government. On the other hand, 14% were of the views that such groups were established by the members of the respective farmer groups with the facilitation from NGOs/CBOs and FBOs.

Therefore, over half of the total respondents (37% and 14%) pointed out that farmer groups were established by group members with the assistance from local government and NGOs/CBOs and FBOs. This corresponds to responses gathered from in-depth interviews with Community development officers at ward levels whose responses pinpointed out that *“normally, during planning process, community members were encouraged to form groups which could facilitate the achievement of identified needs and be facilitated by the local government and other development partners to achieve the same”*. This implies that there is a likelihood of

weak cohesion among group members, hence greater possibility of unassailability due to differing norms among group members.

4.3.3 Motive behind the Establishment of the Farmer Groups

Table 4.5 presents a summary of responses concerning the motive behind the establishment of farmer groups in the study area. The motive behind the establishment of any group has impact on the sustainability and functionality of the respective group. This in turn has impact on the current and future status of mechanized agricultural equipments in the study area.

Table 4.5: Motive behind the Establishment of Farmer Groups

Responses	Frequency	Percentage
Meeting the requirement for accessing loan for agricultural equipments	28	65.1
Enhancing availability of extension services	6	14.0
Improving productivity and marketing for the produce	4	9.3
Self help among group members	4	9.3
Non response	1	2.3
Total	43	100

Source: Field Data, 2014

The findings indicated that about 65% of the total respondents had the views that farmer groups were purposely established to facilitate accessibility of loan for agricultural equipments. This was revealed in both interviews with local government leaders and employees together with in-depth interview with the focus group discussions. It was emphasized in the discussion that politicians at local level have influence on the formation of the farmer groups because in most cases they are members with the focus to getting power tillers or tractors in accordance to the prevailing plans of the local government. It was further revealed that, 14% of the

respondents pointed out that the groups were meant to facilitate availability of extension services that could contribute to improving agricultural production and 9% mentioned self help among group members as the motive behind the establishment of the groups.

Therefore, the findings imply that the majority of the groups were established solely to facilitate the acquisition of loans for agricultural equipments. This matches with responses from local government officers who pinpointed out that *“the manner these groups were formed have impact on their sustainability. The group formations were influenced by securing equipments. After realizing the motive, there would be no possibility of sustainability”*. This is supported by Sharma and Ohama (2007) who clarify that such groups lack accumulated experience or experience based-learning and reflection which is an important instrument in inculcating a set of new values and behaviour like the sense of ownership, commitment, responsibilities and achievement oriented mindset.

4.3.4 Mechanized Agricultural Equipments Possessed by Farmer Groups

Each of 8 selected farmer groups owned one power tiller. With exception to Msingisa Youth Development Group in Sagara ward (Kongwa division) which was supplied with a tractor in 2013, the remaining farmer groups (7 groups) were supplied with power tillers earlier. The tractor is efficiently working and members of that farmer group have great hope of increasing production and contributing to both food security and reduced poverty. Due to short period of time since its supply to farmer groups, it was difficult to collect tangibles data for gauging its contribution.

However, the evident challenge facing groups supplied with tractors is the mismatch between tractor and planter. The tractor was unable to pull the planter because of its low capacity. On top of it, the questionnaires and group discussion responses differed significantly with the responses from council's employees at headquarter who raised greater doubt on the performance of the group (owning the tractor) and its sustainability. It was pointed out that *“the group's capacity to own a tractor is low and its decision to be provided with tractor was premature as there was no assessment on the group capacity. It was mentioned that each of these groups failed to raise income exceeding 2 million perceived to be minimum for tractor owners”*. Therefore, there is a possibility of failing to meet repair costs. Also, the groups failed to buy trailers that would enable them to raise income associated with carrying luggage.

On the part of power tillers, there were mixed responses regarding their operation and existing situation. Out of seven farmer groups owning power tillers, three groups namely: “Muungano” (Banyibanyi village), “Mapinduzi” (Mtanana village) and “Umoja ni Nguvu” (Ndurugumi Village) were not operating for a long time. The former two groups had serious problems. For example, Mapinduzi was disbanded many years ago. Interview with local government officers clarified that *“from the very beginning the power tiller did not reach to the registered group”*. On the part of “Muungano” group, an interview with the VEO revealed that *“the group was disbanded and the power tiller was sold”*. Moreover, the power tiller belonging to “Umoja ni Nguvu” parked since 2010 due to break down and lack of willingness among group members to carry out maintenance.

In FGD with group members to explore on the cause for lack of commitment to repair the equipment, it was revealed that *“the power tiller was used for only one year and few members of the group used it”*. It was emphasized that the power tiller used to cultivate only two acres per day, hence members became frustrated. Also, in most cases they were hiring drivers who ran away during farming seasons. Drivers preferred to use power tillers for carrying luggage rather than using it for cultivation. According to the responses collected during the discussion, it was perceived that *“ploughs drawn by cows was better off compared to power tillers as they are incapable of cultivating and improving agricultural production in such a dry area”*.

However, their responses differed from the responses from both in-depth interviews with LGAs leaders, grassroots employees and private owners of power tillers who perceived *“power tillers to be useful and cultivate an average of 5 acres per day”*. To them the failures noted in various groups resulted from *“lack of experience to use it and internal problems of the group”*. Private owners of the power tillers insisted that for efficient working of power tillers, among others, *“there should at least be two drivers per power tillers to smoothen cultivation”*.

The interview with local government employees (headquarter) revealed that *“despite the challenges facing power tillers like inability to cultivate in some soils, there was normally a great problem related with supplying assets to groups with no assessment of their capacity. The groups had no capacity to own and run neither power tillers nor tractors. The groups lacked coercion of working together and vision of what was expected to be achieved. It was on this basis that individually owned power tillers to some extent seemed to be efficient in agriculture compared to*

group ones. The individuals had vision prior the purchase of power tillers and after acquisition worked towards the realization of the vision whereas farmer groups' vision were only to acquire power tillers and they do not have anything to lose because they did not invest much money in the asset. Therefore, resources used to buy the equipments are likely not to yield the expected returns”.

Also, it was clarified that *“power tillers were not ideal agricultural equipments in some dry areas with short rainfall season coupled with rainfall variability. Moreover, it was pointed out that even the functioning of power tillers were much used in carrying luggage than cultivation”.* The findings correlate with those of Tiwari and Vashney (1997) who pointed out that power tillers were specifically designed for wet-land cultivation in lowland paddy fields. Also, the challenges that farmers face in the use of power tillers relate with Biggs, et. al (2002) whose findings on the use of power tillers in Nepal revealed that the equipments were abandoned due to their unsuitability. They came again into popular use by paddy farmers after various scientists undertaking a series of testing in farm field on its use, type of seeds and fertilizer for quality agricultural production.

On the basis of the above findings, in order to improve the use of power tillers for increased productivity, there is an urgent need to cooperate with stakeholders in undertaking research on the mechanical part of the equipment so that modifications can be done to suit the environment and nature of soil when need be. Moreover, emphasize should also be placed on improved seed varieties suitable to the respective climatic conditions coupled with extension services linked with research institutions.

4.4 Contribution of Mechanized Agricultural Equipments and Inputs in Corn Production in the Study Area

This objective intended to examine contribution of mechanized agricultural equipments and inputs in improving corn production in the study area. In order to assess the achievement of the objective, data on various aspects related to the objective were collected, presented and analyzed as follows.

4.4.1 Extent of Contribution of Mechanized Agricultural Equipments and Inputs in Corn Production among Farmer Group Members

Table 4.6: presents a summary of respondents' views regarding the extent to which mechanized agricultural equipments contribute to the increased corn production among farmer group members in the study area.

Table 4.6: Extent of Contribution of Mechanized Agricultural Equipments in Food Production among Farmer Group Members

Responses	Frequency	Percentage
Greater contribution	11	25.6
Somehow	12	27.9
Moderate	6	13.9
Little contribution	3	7.0
No contribution at all	10	23.3
Total	43	100

Source: Field Data, 2014

The findings exposed that about 28% of the total respondents pointed out that equipments (power tillers) somehow contributed to the improved food production. On the other hand, 25% of the respondents said that the equipments had greater

contribution in improving agricultural production. Out of this response 4 (36%) of those who pointed out that mechanized equipments had greater contribution in improved agricultural production belonged to groups owning tractors as indicated in the questionnaires and FGD. On the other hand, 23% of the respondents had the views that the equipments had no contribution at all in agricultural production, and 7% of all the respondents pointed out that the equipments had little contribution. On the other hand 1(2%) did not answer the question.

The responses were confirmed by FGD which, among others, mentioned the big number of members of farmer groups as a challenge to ensure every member cultivated the farm on time. It was noted that in most cases only few members used power tiller per season and other members were requested to make arrangement to use it in the next farming seasons. Hence, to deal with such a situation, such members hire tractors from private owners. This results from the big number of members in relation to ability of power tillers to cultivate, short farming seasons coupled with unreliable rainfalls and frequent breakdown accompanied difficulties in getting spare parts for maintenance in the area and nearby towns.

However, interview with local government employees revealed dissatisfaction on the contributions of both tractors and power tillers. According to them, *“level of investment does not correspond to its returns; for quiet sometimes, agricultural production remained stagnant and in some cases decreased”*.

The identified challenges in the study match with the early years of Nepalese experience in using Japanese power tillers in paddy production. The challenges were solved through scientists undertaking a series of testing the Chinese power

tillers in farm fields, the use of seeds and fertilizer for quality agricultural production as elaborated in paragraph 2.5.2 above.

Therefore, although power tillers have contributed into changing farming from hand hoe into machinery propelled equipments and increased area of cultivation per day, its contribution in food production is insignificant due to aforementioned challenges.

4.4.2 The Number Bags of Agricultural Food Harvested before and the Acquisition of Tractor/Power tillers and Agricultural Inputs

In order to precisely examine contribution of the agricultural equipments in improving agricultural production, respondents were requested to write the number of bags of food crops harvested per annum before and after the acquisition and use of tractors/power tillers. Table 4.7 provides the summary of responses.

Table 4.7: The Number of Bags Harvested Before and After Acquisition of Tractor/Power tillers and Agricultural Inputs

Number of Bags	Harvest before acquisition of tractors/power tillers		Harvest after acquisition of tractors/power tillers	
	Frequency	Percentage	Frequency	Percentage
1-10	26	60.5	7	16
11-20	15	34.9	22	51
21-30	1	2.3	4	10
31-40	1	2.3	1	2
41-50	0	0	3	7
Above 50	0	0	6	14
Total	43	100	43	100

Source: Field Data, 2014

The findings revealed that before the acquisition of power about 61% of the total respondents were getting a range of 1 to 10 bags of food crops in farming season whereas, 16% of the respondents were getting the same range of bags after the acquisition of mechanized agricultural equipments. Also, 35% were harvesting between 11 and 20 bags of food crops before the acquisition of the agricultural equipments and 51% of the respondents were harvesting the same range of food crops.

Moreover, 2% of the respondents were getting a range of 21 to 30 bags before the acquisition of the agricultural equipments, the number of respondents harvesting within the same range increased to 10% after the acquisition of the equipments. On the other hand the number of respondents getting 41 to 50 and above 50 rose from zero to 7% and 14% respectively.

Therefore, the amount of production realized by farmer group members before the acquisition of agricultural equipments was neither sufficient for food security particularly if encountered with prolonged season of draught nor helpful to farmers in meeting their necessities of life such as Medicare and education for their children. In the words of Maliyamkono and Manson (2006), such situation leads into income and non income poverty to the farmers. Moreover, such a level of agricultural production is perceived by the National Agriculture Policy (2013) as reason for the country's inability to reduce poverty despite the realized economic growth rate of 6 to 7% noted in the recent years. This emanates from the fact that, the sector employs over 75% of the workforce of the country.

On the other hand, the acquisition of mechanized agricultural equipments did not lead to significant increased agricultural production. Majority of the respondents (51%) harvested between 11 and 20 bags per annum. Cumulatively, around 77% of

the total respondents were getting the range of 1 to 30 bags of food crops per annum. Out of these only 23% of the respondents harvested between 31 to above 50 bags per annum. On basis of this the improvement is insignificant as majority of the respondents harvest between 1 and 20 bags of food production which is insufficient to reduce both income and non income poverty.

However, on the other hand the findings on increased production after the acquisition of agricultural equipments do not correlate with the secondary data from Kongwa profile which indicated a decrease in agricultural production. The profile shows that a total of 48,960 hectares were cultivated and planted maize in financial year 2010/2011 and 73,440 tones were harvested which amounts to 1.5 tons per hectare. Moreover, in the same year a total of 34,880 hectares of sorghum were cultivated and yielded 34,880 tones which is equivalent to 1.0 tons per hectare.

Also, in 2011/2012 a total of 38,550 hectares of maize were cultivated and yielded 57,834 tones which is equivalent to 1.5 tons per hectare and in the same year a total of 28,018 hectares of sorghum were cultivated and resulted into 28,018 tones which is equivalent to 1.0 tons per hectare. This level of food production is perceived by the National Agricultural policy as low agricultural productivity (URT, 2013). According to the respondents through interviews, *“the decrease in the cultivated area between the two seasons resulted from variability in availability of rainfall with the year 2011/2012 having shortest rain season”*. However, from the data in both seasons productivity per hectare remained constant.

The difference between primary and secondary data relies on the dual aspects. The first aspect is that the production at individual level might have increased but, which had insignificant impact in affecting the production of the council. The second

aspect is that their responses were incorrect either unknowingly as they were based on estimates or knowingly with aim to safeguarding power tillers from being taken by the council.

In interview with local government employees (headquarter), “it was pinpointed that production has not been improved” and according to them “the purchase and distribution of power tillers resulted from political pressure; hence it was not the genuine/authentic requirement for improving agricultural production in the country. There is a need to seek professional advice, accompanied by research findings on agricultural production improvement”.

On top of it, inputs which were perceived to be important for improving agricultural production was no accessible to most of the villages. For example, NAVIs focuses on maize production and most of the power tillers were issued in areas where sorghum is widely grown. The decision was made on the basis that such areas do not have adequate private owned tractors, hence the provision of power tillers were meant to relieve farmers of these areas from hand hoe.

Among the 8 selected farmer groups, only Ngomai village was eligible for the inputs provided by the scheme. The remaining 7 groups were involved in sorghum, hence not eligible for agricultural inputs under NAVIs. Moreover, interviews revealed that even in areas where fertilizer such as Minjingu was supplied, productivity has not improved because of its unsuitability. This situation is well known, however, for unknown reasons politicians have popularized the use of such unsuitable fertilizer. Moreover, seeds brought to the area cannot withstand the existing climatic conditions: as they were grown and tested in different areas and sometimes imported, hence low yields.

Therefore, production in the study area remained stagnant over different farming seasons. This implies that Tractors/ power tillers and improved seeds have little contribution in improving food production. The findings relate with those of Mashindano et. al (2011) who pointed out that agriculture grew at an average of 4% between 1998 and 2009. Moreover, they correlate with the National Agricultural Policy in which in presenting the performance assessment of the sector, it points out that with the population growth rate of 2.6%, and the average agricultural growth rate of 4.4% is insufficient to lead to significant wealth creation and alleviation of poverty (URT, 2013). By implication since 1998 to 2013, agricultural production countrywide increased by 0.4% which is insignificant in improving food security and poverty reduction.

4.4.3 Things Considered Most Important in Improving Agricultural Production

In order to investigate reasons for inability to significantly improve corn production in the study area, data were collected regarding things perceived to be the most important for improving agricultural production. The data are presented in column, where the highest score in column 1 indicates first priority, the highest score in column 2 indicates second priority and highest score in column 3 indicates third priority. The same arrangement goes on until column 6 as summarized in Table 4.8

Table 4.8: Important Things in Improving Agricultural Production

Important things	Scores						Total Scores
	1	2	3	4	5	6	
Weather forecast information	6	7	4	15	4	7	43
Improved seed varieties	9	9	7	4	8	6	43
Tractors/power tillers	8	8	12	5	5	5	43
Fertilizer	5	6	5	9	12	6	43
Irrigation scheme	10	7	6	4	7	9	43
Marketing information	5	6	9	6	7	10	43
Total	43	43	43	43	43	43	

Source: Field Data, 2014

Findings revealed that in the first column, 10 respondents selected irrigation as the most important alternative in improving corn/agricultural production in the area. The next important thing is improved seed varieties as indicated in the second column. Power tiller acquisition was ranked number three as shown in the third column. Weather forecast information was ranked the fourth in terms of importance in improving corn production. Moreover, availability of fertilizers and marketing information were ranked fifth and sixth in terms of importance in improving corn/agricultural production in the area respectively.

The interview with local government officials indicated that “irrigation was important for improving agriculture. Interviews pointed out that harvesting rainfall water can be the easiest way to establish irrigation. In cases where irrigation cannot

be immediately undertaken due to high initial costs, they suggested provision of improved seeds matching with the soil and climate condition is ideal when compared to power tillers and tractors”. Their responses based on the impacts of the proposed action in terms of coverage and capability of the community.

On the basis of the above, majority of the respondents listed important things for improving agricultural production in the following order:- Irrigation scheme, improved seeds, tractor/power tillers, fertilizer, marketing and weather information. This implies if there was involvement before decision to purchase power tillers, farmers as important stakeholders would have recommended for the establishment of the irrigation schemes in the place of power tillers. This coincides with the responses from interview with extension agricultural officers and grassroots leaders who pointed out that provision of tractors and power tillers entails expanding areas of cultivation. However, according to them, this would not ensure increased production particularly with unreliable rainfall in the area. Hence, they recommended establishment of irrigation schemes which will enable farmers to carry out farming activities throughout the year with assurance of reaping.

4.4.4 Provision of Agricultural Extension Services

Table 4.9 summarizes responses concerning provision of agricultural extension services. The extent of the service provision was perceived to have impacts in agricultural production in the study area.

Table 4.9: Provision of Agricultural Extension Services

Responses	Frequency	Percentage
Very frequently	4	9.3
Frequently	12	27.9
Rarely	13	30.2
Very rarely	8	18.6
Never	6	14.0
Total	43	100.0

Source: Field Data, 2014

The findings revealed that 30% of the total respondents informed that extension services were rarely provided in the study area. Moreover, 19% and 14% of the total respondents had the views that agricultural extension services were very rarely and never provided in the study area respectively. On the other hand, about 9% of the respondents perceived that the service was very frequently provided and about 28% of the total respondents perceived that the services were frequently provided.

Therefore, from the findings it was noted that extension services are among the impediments for improving agricultural production, because they are rarely visiting farmers implying that they could not give advice to farmers on variety of suitable seeds, spacing in planting, weeding and other emanating agricultural complexities which required scientific solution. In an interview with farmer group members, it was revealed that even in cases where problems were reported to extension officers, they took very long time and no feedback was given. For example at Ndurugumi village there emanated weeds which spread seeds rapidly and in such areas no agricultural products could produce crops. Although the matter was reported for about two years ago, neither solution nor feedback was given to farmers. In a

discussion with the Agricultural extension officer of the area, it was found that he was not aware of the problem. This implies that extension officers were either not cooperating with farmers or farmers were not trusting them.

Moreover, through interview it was learned that causes for the failure included: *“inadequate agriculture extension staff compared to the number of villages in a ward, lack of transport and lack of formal linkage between groups and the ward and village offices”*. The findings imply that the difficulties that farmer group members face in adopting and adapting innovations could be minimized if extension officers are involved in the process. Therefore, innovation which is perceived by modernization theory as a source of change is not likely to produce the expected results due to among others, poor administrative arrangements.

4.4.5 Important Stakeholders for Agricultural Production in the Study Area

Generally, the findings revealed that the local government authority (LGA) is the only stakeholder that is directly linked with farmer groups and hence known to them. Table 4.10 recaps a summary of respondent's views concerning their respective roles LGAs in agricultural production.

Table 4.10: Important Stakeholders and their Roles in Agricultural Production

Responses	Frequency	Percentage
Establishment of farmer groups, provision of power tillers/ tractors and extension services by LGA	29	67.4
Training/facilitation	7	16.3
Non response	6	13.9
Total	43	100

Source: Field Data, 2014

According to the findings in table 4.10, about 67% of the total respondents perceived that the role of LGA is to establish farmer groups, provision of tractors/power tillers and agricultural extension services to farmer groups. On top of it, about 16% of respondents said that LGAs provided training and facilitation to farmer groups. However, approximate 14% of the respondents did not answer the question.

This implies that although the National Agricultural Policy of 2013 appreciates participation of stakeholders, yet in the process of the provision of power tillers and use in agricultural production, little was vividly seen by members as directly involving the stake holders. In a follow up question in group discussion among group members, it was noted that farmers were not involved in decision on whether or not tractors/power tillers were suitable for improvement of agricultural production. According to them, it was solely decided by the government.

However, the findings obtained through questionnaires to some extent differed from those collected through interview from the local government employees whose responses showed that there was an involvement of the stakeholders. It was clarified

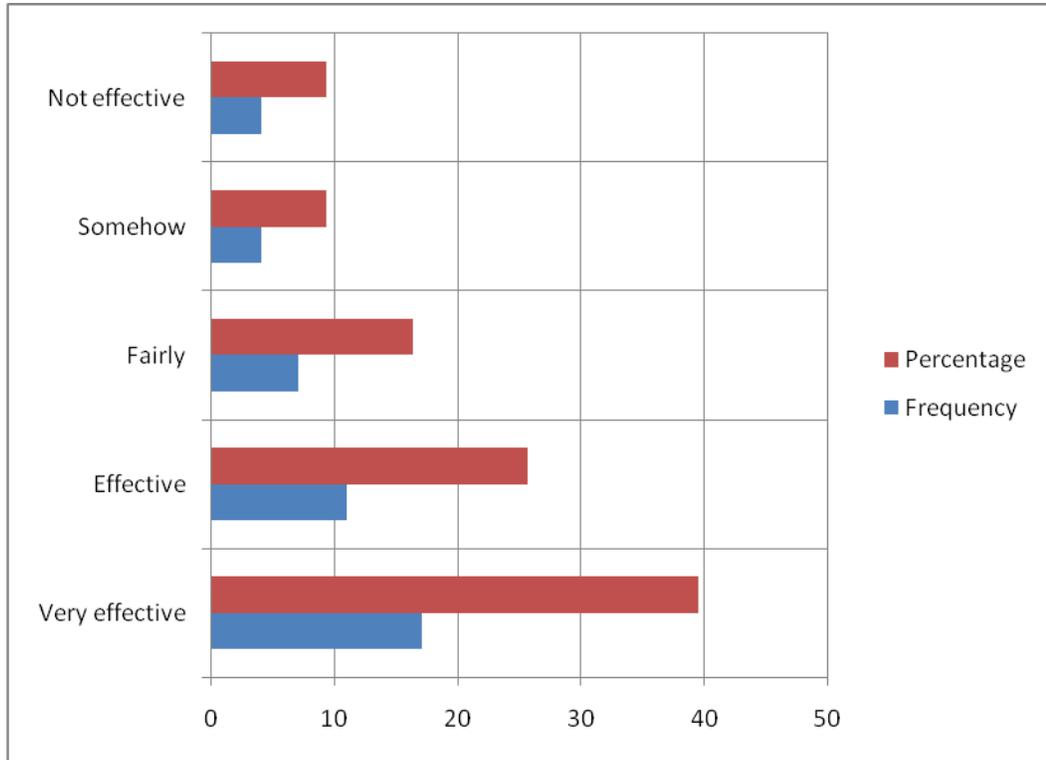
that provision of power tillers and tractors was made in due course of implementing “Kilimo Kwanza”, a strategy conceived by private sector. Moreover, distribution of power tillers was undertaken by private sector. Generally, direct participation in at grassroots community is nonexistent.

Therefore, according to the findings, LGA is the only stakeholder to the farmer groups which played the roles of farmer group establishment, provision of power tillers/ tractors and extension services. However, private sector participated in formulation of “Kilimo Kwanza” idea and provision of tractors/power tillers to the farmer groups through the respective local government.

4.4.5 Effectiveness of the Rules Governing Farmer Groups

It is perceived that effectiveness of rules governing any community have positive impacts on functionality and sustainability of the respective group. The researcher employed Likert scale rating to collect data regarding group members’ perception on the effectiveness of the rules governing the respective farmer groups. The results of the findings are summarized in figure 4.4.

Figure 4.4: Effectiveness of the Rules Governing Farmer Groups



Source: Field Data, 2014

The findings in figure 4.4 show that approximately 40% of the respondents perceived rules governing farmer groups were very effective. Moreover, approximately 26 % and 16% of the total respondents perceived that the rules were effective and fairly effective respectively. A follow up question to explore the issues in both Focus Group Discussions and interview with some farmer groups and LGAs employees revealed that all the registered farmer groups had constitutions which governed their operations. However, about 9% of the respondents perceived that the rules were somehow effective and another 9% of the respondents were of the views that rule were not effective. In order to clarify the matter, focus groups discussed the issue and asserted that although constitutions were established, in most cases, they were not adhered to in the functioning of the groups. The matter was further clarified in the interview with LGA staff who pointed out that power

difference among group members resulted into unequal enjoyment of power tiller services. People who are financially powerful and probably who initiated the establishment of farmer groups tend to violate the constitution for their benefits at the expense of other members. For example, in most cases they used the power tillers in the farms for long time and information regarding income generated and its respective expenditure was not shared. The interview with councilors and 4 local government employees confirmed that reporting mechanism to village and ward offices was overlooked during the issuance of power tillers. It was highlighted that if it were in place, it would empower VEOs, WEOs and their respective political leaders to solve the emerging problems and enhance accountability among group members regarding the use of power tillers.

To overcome the problems, it was recommended for training and setting requirements for groups to hold meetings and submit the proceedings in the respective village governments which would compile and submit the same to the respective ward and ultimately to the council. Also, since, local government paid 80% of the price of the equipments; mechanism for frequent auditing should be established to avoid misuse of the equipments.

The findings correspond to Modernization Theory which emphasizes that during innovation and diffusion of innovation, among others, norm changing is important. Generally, it was learnt that rules are not facilitative to enhancing utilization of power tillers for increasing agricultural production to group members. Therefore, administration of local government has the role to play on this to arrest the situation.

4.5 Challenges in Managing and Using Mechanized Agricultural Equipments and Inputs for Food Production in the Study Area

The objective focused to explore challenges in managing farmer groups, challenges facing agriculture in the study area and ultimately come up with suggestions to overcome the challenges as shown in the preceding paragraphs.

4.5.1 Challenges in Owning and Using Commonly Owned Mechanized Agricultural Equipments

Table 4.11 presents a summary of responses about challenges facing farmer groups in owning and using commonly owned mechanized agricultural equipments.

Table 4.11: Challenges in Owning and Using Commonly Owned Mechanized Agricultural Equipments

Responses	Frequency	Percentage
Violation of the regulation set in the constitution	9	20.9
Lack of training to farmer group members	7	16.3
In availability of spare parts	10	23.3
Lack competent drivers and high price of spare parts	5	11.6
Inability of the tractor to pull planter	1	2.3
Some of Local government leaders command to use tractor freely	4	9.3
Frequent breakdown of Tractor plough	4	9.3
Inability to meet maintenance costs	2	4.7
Total	42	97.7

Source: Field Data, 2014

The findings revealed that 23% of respondents mentioned lack of spare parts in nearby shops and cities as a challenge in effectively managing and using commonly

owned power tillers. Moreover, 16% of the respondents perceived lack of training to farmer group members as a challenge in management and use of commonly owned asset. On top of it, another 9% of the respondents highlighted frequent breakdown of disc plough of tractors as a major challenges which the groups owning tractors faced since the supply of it. Other respondent's highlighted challenges associated with: - lack of competent drivers to use power tillers for cultivation (11% respondents) and some of local government leaders at lower level command the use of tractors freely which add burden of operational cost to farmer group members. In interview with local government grassroots leaders and employees, the following challenges were identified: - formation of farmer groups focused on securing power tillers/tractors and imposition on decisions by political leaders for their own interests in purchasing and distributing of power tillers; political leaders and grassroots officers being members of the farmer groups eliminates follow up and accountability and individualistic behavior of human being.

On the other hand, 21% of the respondents mentioned violation of the regulations set in the constitution as a major challenge in managing and using common assets. This relates to LGAs' employees' respondents that farmer groups were established to secure assets. Moreover, although, "Kilimo kwanza" strategy in the area of farmer group formation and provision of mechanized agricultural equipments is made in small scale, it resembles to Ujamaa and Self Reliant Policy which made attempt to capitalize an opportunity of 90% of population living in rural areas by establishing *Ujamaa* villages that could engage in massive collective production of agricultural produce. Despite of efforts the popularize the strategy, yet compared to other countries following similar strategy, like China, USSR and Mexico, Tanzania

population engaged in collective farming is only 15.3% far below other countries as shown in Table 4.12.

Table 4.12: Comparing the Magnitudes of the Population Engaged in Collective Farming between Tanzania, China, U.S.S.R. and Mexico

<i>Comparing Country</i>	<i>Size (Sq. Miles)</i>	<i>Population (millions)</i>	<i>Rural Population (%)</i>	<i>Area Farmed (Hectares)</i>	<i>Percent in Collective</i>
Tanzania	363,708	13.63	93.7	7,776	15.3
China	3,746,453	697.26	74.3	112,000,000	96
U.S.S.R.	8,647,172	245.07	42.8	223,500,000	49.4
Mexico	758,259	50.83	43.4	23,817,000	43.2

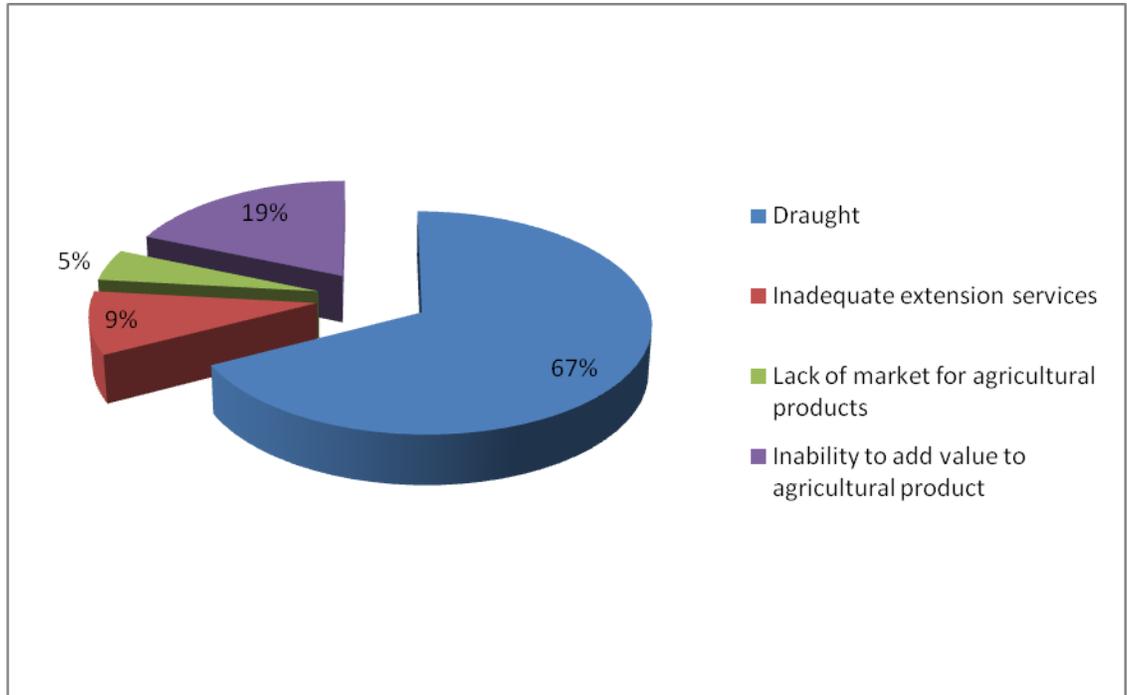
Source: McHenry, 1976 (as quoted by HAKIARDHI, 2011)

This implies that Tanzanians do not have the culture of working together and owning common assets. Therefore, there is an urgent need to find mechanisms of solving the problem before supplying assets that might not produce expected results. The government if need be can endeavor into enforcing behavioural change to minimize individualistic behaviour which robs the benefits of collective efforts.

4.5.2 Challenges in Improving Agricultural Production

Figure 4.5 presents general challenges in improving agricultural production in the study area. The identified challenges enhanced to strategize ways to overcome the challenges and improve food production in the study area.

Figure 4.5: Challenges in Improving Agricultural Production



Source: Field Data, 2014

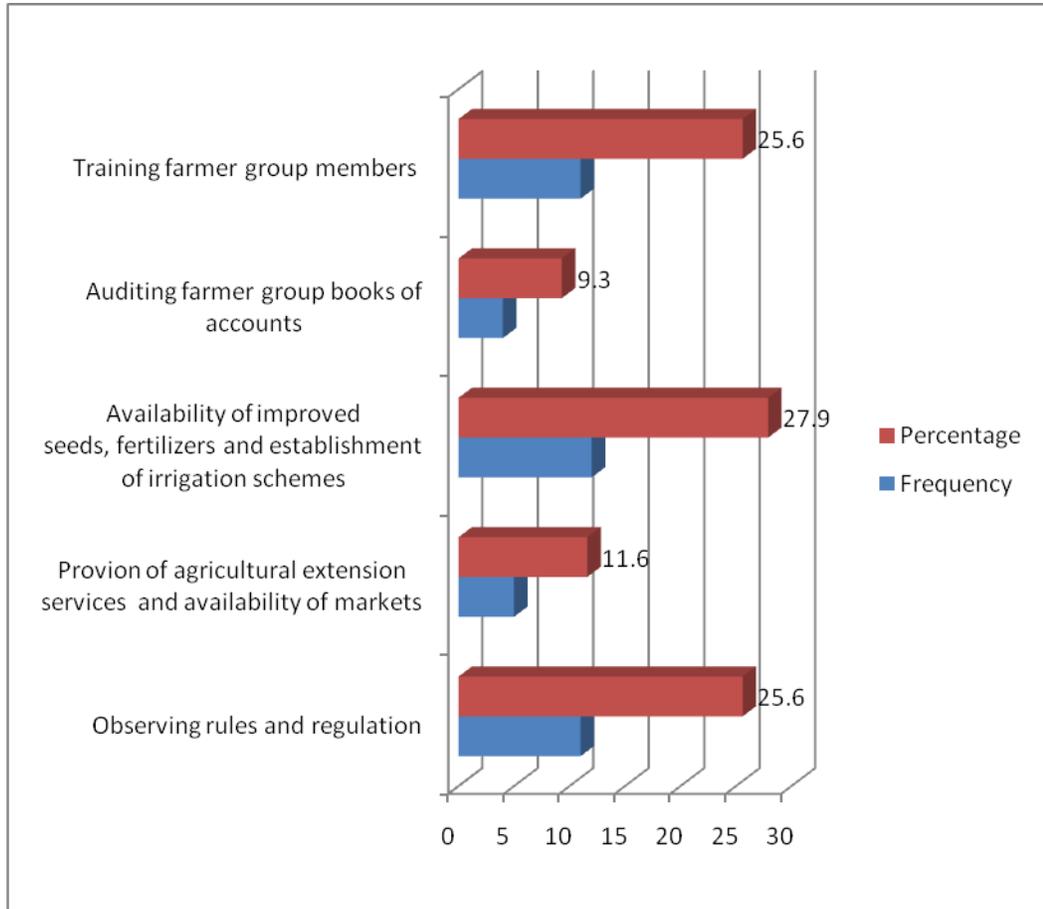
According to the findings, approximate 67% of the respondents pointed out draught as a major challenge in improving agricultural production in the area. The responses from interview and Focus Group Discussion supported this by highlighting that rainfall in the area is unreliable and rains for a short period of the time. According to them, even if tractors/ power tillers and agricultural inputs were adequately supplied, yet draught could hamper the expected results. In addition, 19% of the respondents perceived that inability to add value to agricultural production is among the challenges facing agriculture in the country. Moreover, 9% and 5% of the total respondents pinpointed that inadequate extension services and lack of markets for agricultural products respectively were among the challenges facing agricultural production the council.

Therefore, on the basis of the above findings, draughts, lack of markets for the products and inability to add value to agricultural products are among the pressing challenges in the sector. This implies that, even though power tillers and tractors are abundantly provided little is expected to improve agricultural production. The equipments are only meant to increase size of cultivated area, but the availability of rainfall which is a prerequisite for improved production is depending on the dictates of nature.

4.5.3 Suggested Ways to Overcome the Challenges Facing Agriculture

Figure 4.6 provides a summary of respondents' suggestions on how to deal with the identified challenges. Therefore, suggestions here comprises those concerning improving management and use of commonly owned power tillers/tractors and those related to improvement of agricultural production in the study area.

Figure 4.6: Suggested Ways to Overcome Challenges Facing Agriculture



Source: Field Data, 2014

According to the findings, 28% of the respondents mentioned availability of improved seeds, fertilizers and establishment of irrigation schemes as one way of overcoming the aforementioned challenges. This correlated to the LGAs views gathered through interview. Moreover, 26% of the total respondents pinpointed that in order to improve management and use of the commonly owned power tillers/tractors, training to the group members is imperative. In both Focus Group Discussions and interview provision of training to group members was frequently raised. They emphasized that training should focus on management of groups and finance.

Other identified ways to overcome the challenges in owning and managing commonly owned tractor/power tillers included the following: - establishing reporting system starting at village level in which information is compiled and submitted to the ward level which in turn the report is submitted to the council level. The reporting system informs grassroots leaders and officers which enables them to take informed decisions when need arises. Also, it was suggested that there is a need of establishing auditing mechanisms to ensure that resources are used for the benefits of the groups and village government should set mechanisms for the farmer group to present income and expenditure reports at least four times per annum. In an interview with local government employees at headquarter, it was recommended that grassroots leaders and officers should not be members of the group for enhancing follow up and accountability mechanisms in farmer groups to its members and local government authority. On top of it, 26% of the respondents suggested that group members should observe rules set in their constitution for both management and use of commonly owned agricultural equipments. This is possible by establishing reporting mechanisms and empowering village government and ward level to intervene when need arises

General suggestions to improve agricultural production collected through interviews included:- reducing political interference on professional issues, political leaders adhering to advice given by professional, encouraging research on agriculture and documenting them so that every government in power work towards identified areas or means for agricultural improvement; farmer group formation should be established by farmers focusing on self help and self reliance; grassroots political leaders and officers should not become members of farmer groups; stakeholders' participation should be enhanced for sustainability of the project; capacity of farmer

group should be assessed and assistance should be provided basing on the capacity to handle and utilize the assistance; laws should be enacted and enforced to ensure national priorities prevail in all plans which use tax payer money; and patriotism cultivated among both political leaders and officers so that they work hard to the realization of the national development aspirations.

There are evidences from literature on how some of the suggestions have been implemented to arrest the situation. For example, heavy investment in agriculture, expanded investment in extension services, introduction of research and development and accessibility of credits to farmers doubled the agricultural production in most of the Asian countries in their attempts to improve agricultural production (Asenso-Okyere and Jemaneh, 2012). Also, Nepal improved the use of power tillers and agricultural production after various scientific undertakings which included: testing in the field on the use of power tillers, examining in the field type of seeds and fertilizers and provision of training on managing power tillers (Biggs, *et al.*, 2002).

On the other hand, there is scarcity of documentation on how the following have been tried in attempts to improve agriculture: establishment of farmer groups by members for self reliance, disengagement of grassroots political leaders and officers as members of farmer groups, capacity assessment prior provision of assistance and the need to adhere to national agricultural priorities.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

The chapter presents the summary of the study, conclusion and recommendations made on the basis of the findings guided by research objectives and respective research questions. Together with the introduction, other parts of the chapter include: summary of the findings, conclusion and recommendation made on the basis of the findings.

5.1 Summary of the Study

This study was meant to assess the contribution of mechanized agricultural equipments in improving agricultural production in Kongwa District Council. The study focused on farmer groups which were provided with tractors/power tillers at 80% price being paid by the local governments in the attempts to contribute towards realization of “Kilimo Kwanza”: a green revolution strategy that was envisioned in 2009 by private sector in collaboration with public sector. To achieve this objective, the following specific objectives were formulated: to examine the status of mechanized agricultural equipments and agricultural inputs for corn production in the study area; to examine the contribution of mechanized agricultural equipments and inputs in corn production in the study area; and to bring out challenges in managing and using mechanized agricultural equipments and inputs for corn production in the study area.

In order to achieve the specific objectives, the following research questions were employed to guide data collection for realization of the specific objectives:- *What is the status of mechanized agricultural equipments and inputs in the study area for corn production? What is the contribution of mechanized agricultural equipments and improved agricultural inputs for corn production in the study area? And what challenges do farmer group members face in managing and using tractors/power tillers and agricultural inputs in corn production in the study area?*

The data collected in each of the research question contributed to the assessment of specific objectives. These in turn contributed to the assessment of the general objective of the study.

5.2 Summary of the Findings

Findings of the study show that Kongwa district council has 24 farmer groups. Among these 21 farmer groups comprising 11 to 18 members were given power tillers at 80% price paid by the local government. Moreover, there are 2 farmer groups supplied with tractors. To ensure fairness and transparency in distributing the power tillers and tractors criteria were set including functionality of the group, having a bank account and commonly owned farm of 5 and 100 acres for groups owning power tillers and tractors respectively. More specifically, for tractors votes were casted in a village assembly to determine groups which were eligible for tractors.

The majority of the respondents attained primary school education level (69%), most of them (72%) were of the age between 33 to 47 years. Moreover, among them, 96% were married and majority of groups (65%) were male dominated.

Specifically, the summary of the findings on the contribution of mechanized agricultural equipments on food production in Kongwa district council are presented below on the basis of their respective specific objective:

5.3 The Status of Mechanized Agricultural Equipments and Agricultural Inputs for Food Production in the Study Area

The findings revealed that Kongwa has numerous registered farmer groups. Out of them, 21 were supplied with power tillers at 80% value of the price paid by the council and each farmer group was required to pay 20% of the price. Out of the six selected farmer groups owning power tillers, three power tillers of the groups were not operating for more than two years. Out of these three, one power tiller was sold and the other two parked due to lack of willingness to repair and conflict among group members.

Moreover, the study noted that majority (80%) of the farmer groups which were given tractors/power tillers were established between 2009 and 2012. This was the time for initiation and implementation of Kilimo kwanza: a green revolution strategy version in Tanzania. Therefore, the groups came into existence with the focus to secure agricultural equipments which were given by the local government to support its implementation.

Furthermore, most of the groups were established with the assistance of local government. This implies that ideas to establish the group was conceived outside the members and, being recently established, they lack experience based learning , which is sine quo non condition in solving problems and sustainability of the group.

5.4 Extent of Contribution of Mechanized Agricultural Equipments in Food Production among Farmer Group Members

The findings revealed that although the government's intention was to help farmers shift from hand hoe into machinery propelled agricultural equipments, that could improve production, yet their contribution is insignificant. Estimates of farmer group members indicated a small increase in bags of agricultural products as a result of using power tillers. However, the productivity per acre remained 1.5 and generally there was a decrease in agricultural production in some years. For example, according to the profile of the council, in 2010/2011, a total 73,440 tons of maize and 34,880 sorghum were harvested. In 2011/2012 a total of 57,834 tons of maize and 28,018 tons of sorghum were harvested. This indicated a decrease in tones of maize by 15,606 tones and decrease of sorghum production by 6,862 tones.

The following were some of the noted challenges in this part: Lack of stakeholders participation, inadequate extension services and only few of the area of the study is provided agricultural inputs under NAVIs since parts which cultivate sorghum are not included in the NAVIs and private sector seemed to participate in the formation of Kilimo Kwanza strategy and the sales of power tillers. The findings did not reveal direct roles played by private sector, NGOs/CBOs and FBOs to grassroots community in improving the agriculture. Moreover, the purchase of power tillers

seemed not to be the top most priority of neither the farmers nor the National Agricultural Policy of 2013, which in the list of priorities for improving agriculture, irrigation and improved agricultural inputs are highly prioritized in manned they were listed. Likewise, in the list of things farmers perceived that they would improve agricultural production tractors/power tillers were not the priority. This implies that if there could be genuine community participation, tractors/ power tillers would not have been introduced.

5.5 Challenges in Managing and Using Mechanized Agricultural Equipments and Inputs for Food Production in the Study Area

The study noted various challenges in managing and using commonly owned agricultural equipments. These include: unavailability of spare parts for power tillers, violation of the constitution by some of the members, lack of training, imposition of decision by political leaders on group formation and distribution of power tillers/tractors; group formation with focus to secure agricultural equipments from Kilimo Kwanza which jeopardizes its sustainability and individualistic behavior which affected Ujamaa village farmers persisted in the current collective farming and grassroots leaders; officers forming part of the group members and lack of established reporting system at grassroots level office impacted negatively on enhancing groups performance and accountability.

Other general challenges facing agricultural production in the study area include draught and variability of rainfall; lack of efforts to add value of agricultural produce, inadequate extension services and unavailability of improved agricultural inputs since a great part of the study area is not eligible for NAVIs. These factors have impacts in improving agricultural production the study area.

5.6 Conclusion

The study revealed mixed perceptions on the contribution of mechanized equipments on food production. There were some respondents who perceived mechanized equipments (power tillers) to have contributed to the improvement and a large part of the respondents were of the views that they have little or no contribution at all. However, careful examination on the gathered data, particularly bags harvested before and after the acquisition and use of power tillers coupled with secondary data from council profile and interviews led into the conclusion that despite the government efforts to relieve peasants from hand hoe by supplying them with power tillers at 80% of the price paid by the government, its contribution to improve food production in the area is insignificant.

The following are the challenges which contributed to the failure:- Farmer groups to whom power tillers were distributed were not properly trained, the number of farmer group members is too large to ensure every member gets an opportunity to cultivate his/her farm on time using power tiller given cultivation capability of power tillers and variability of farming season, violation of constitution by some members resulting from the manner in which farmer groups were established, inaccessibility of spare parts, lack of drivers, inaccessibility of agricultural inputs, lack of adequate extension services, lack of established functional reporting system coupled with grassroots leaders and officers forming part of members of the group, lack of community involvement which led into supply of power tillers which seemed not to be their priority, formation of the groups for securing agricultural equipments, lack of capacity for farmer groups to own and use power tillers, lack of

associated research on the improvement of agriculture and political pressure to provide power tiller without consultation from the professionals.

5.7 Recommendations

On the basis of the findings, recommendations were given on how to improve the contribution of mechanized agricultural equipments in food production by farmer groups in particular and food production improvement in general. The recommendations are divided into policy based recommendations and recommendations for further studies as explained in subsequent parts.

5.8 Policy Based Recommendations

In order to improve food production, the government should adhere to the priorities incorporated in the National Agricultural Policy. Important things for improving agricultural production should be well prepared by professionals in ordered priority. The law should recognize such prioritized plans and any government in power should adhere to the plans. The implementation of the plan should be in sequential order starting with the topmost priorities and ending up with least important ones.

Also, formation of farmer groups should be made by members of the group with focus on self help and self reliance. Where need be, assistance should be provided in participatory manner and in accordance to the capability of the group coupled with well elaborated and facilitative administrative system.

In order for the community to adapt and adopt new technology like power tillers and tractors, it is recommended that various stakeholders should be involved including

the community. The process coupled with training will create ownership of the technology and enhance its adoption.

LGAs should set mechanism to enhance efficient utilization of extension officers. The provision of transport and schedule for visiting farmers with feedback mechanism will facilitate efficient utilization of the extension officers. This will enable farmers to follow farming practices which improve agricultural production. In addition, frequent meeting between farmers and extension officers will provide an opportunity for solving emanating agricultural problems by the officers or research institutions through officers.

Moreover, construction of dams for irrigation is the possible way to improve agriculture which is hampered significantly by variations of seasons and unreliable rainfall. While this might take many years to cover large part of the country, supply of agricultural inputs suitable to specific areas can act as a short term solution which can improve yields. Implementation of the plan will cover large part of the population at lowest cost.

On top of it, it is recommended that local government prepare mechanisms to ensure agricultural extension officers reach and help farmers in improving agriculture. In due course of facilitation should work in team with community development officers so that they cooperate in helping farmers in the process of agriculture improvement and development. Failure to realize it will mean that agricultural officers are employed to live in villages and not facilitating farmers.

5.9 Recommendations for Further Studies

The study covered on social aspects of the contribution of mechanized agricultural equipments on corn production with much focus on farmer groups owning power tillers because although there were two groups supplied with tractors, it was not possible to assess their contribution as they were supplied in 2013. The issue of incapability of power tillers was raised by members and local government officers. Therefore, research on technical part is recommended to prove the allegations.

Moreover, studies on the use power tillers in various countries such as: - Nepal, Nigeria and Ghana indicated that power tillers were used successfully in paddy production which implies in wet areas; therefore, it is recommended to undertake a similar study on paddy production.

Moreover, since Japan is one of the stakeholders in Agricultural Sector Development programme whose part of resources used to buy Kubota, a Japanese type of power tillers widely purchased and distributed by local government to farmer groups, there is a need to assess the impact of donors' influence to recipient countries to purchase equipments made in their respective countries

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APPENDICES

Appendix I: Questionnaire (Farmer Group Members)

The questionnaire is meant to collect data on the contribution of mechanized agricultural equipments in improving corn production in Kongwa district council. The data are meant only for academic report writing which is a partial requirement for an award of Master Degree in Development Studies awarded by the University of Dodoma. Therefore, you are requested to feel free in answering the questions and anonymity is granted.

Part A: Respondent’s Preliminary Information

Department/Ward/village/Kitongoji.....

(Please tick the relevant choice)

- I. Sex (a). Male (b). Female
- II. Respondent’s age
(a).18-32 (b). 33-47 (c) 48-62 (d) Above 62
- III. Respondent’s marital status (a) Single (b) Married (c) Separated (d) Divorced (e) widow/widower
- IV. Respondent’s education level (a) Informal education (b) primary (c) secondary (e) Tertiary

V. Part B: Status of Mechanized Agricultural Equipments and Inputs in the Study Area

1. How many members are there in this farmer group?

1-9 members	10-19 members	20-29	30-39	40-49	50 and above
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2. When was it established?

Before 2000	Between 2001-2004	2005-2008	2009-2012	After 2012
-------------	-------------------	-----------	-----------	------------

3. Who established this farmer group? (*Tick the appropriate answer*)
- a) Members of the group []
 - b) Local government []
 - c) Members of the group with assistance from the council []
 - d) Group members with the help of NGOs/CBOs and FBOs []
 - e) NGOs/CBOs and FBOs []
 - f) Private/donor []
4. What was the motive behind the establishment of the group? (*Tick the appropriate answer*)
- a) Accessing loan and agricultural inputs []
 - b) Meeting requirements of LGA for securing loan []
 - c) Enhancing easy availability of extension services []
 - d) Increased productivity and marketing for the produce []
 - e) Facilitating value addition for agricultural outputs []
5. How many mechanized agricultural equipments does the group possess?
- a) One []
 - b) Two []
 - c) More than two []
6. What type of mechanized agricultural equipments does the group possess?
- a) Tractor []
 - b) Power tiller []
 - c) Irrigation scheme []
7. How many of these are still operating? []
8. What were the roles of stakeholders in acquisition of the equipments?
- a) Sensitization of community members on importance of group formation []
 - b) Formation of the group []
 - c) Provision of agricultural equipments []
9. Financial support []

**Part C: The Contribution of Mechanized Agricultural Equipments and Inputs
in Corn Production**

1. To what extent have mechanized agricultural equipments have contributed to the increased corn production among farmer group members?

- a) Greater contribution []
- b) Somehow []
- c) Moderate contribution []
- d) Little contribution []
- e) No contribution at all []

2. How many bags of corn were you getting before the acquisition of mechanized equipments and use of agricultural inputs? *(Select the correct range)*

Range	Tick the correct range	Range	Tick the correct range
1-10 bags		11-20 bags	
21-30 bags		Above 31 bags	

3. How many bags of corn do you get as a result of the use of Tractor/Power tiller and agricultural inputs? *(tick the correct range)*

Range	Tick the correct range	Range	Tick the correct range
1-10 bags		11-20 bags	
21-30 bags		31-40 bags	
41-50 bags		Above 51 bags	

4. Select the following in terms of their importance in improving corn production by writing 1 to 6 *(whereby 1 attaches highest and 6 lowest in terms of importance)*.

Terms	Ranking
Tractor/power tillers	
Improved seed varieties	
Fertilizers	

Infrastructures for irrigation	
Information about market price	
Weather forecasting	

5. How frequently did extension officer visit the group during the farming season per year?

- a) Very Frequently []
- b) Frequently []
- c) Rarely []
- d) Very Rarely []
- e) Never []

6. Among the following, select the important stakeholders in corn production in your area (*put 1 for the very important and 6 for least important*)

Stakeholder	Ranking
NGOs	
CBOS	
FBOs	
Research institutions	
Local Government	
Private sector	

7. What have been the roles of these stakeholders in improving corn production in your village? (*please tick the relevant answer*)

Provision of	NGOs	CBOS	FBOs	Research Institution	LGA	Private sector
tractors/power tillers						
Undertaking research to improve production						
Extension services						
Provision of loans						
Value addition						
Marketing of the agricultural production						
Education to farmers on						

improving agricultural production						
--------------------------------------	--	--	--	--	--	--

8. In your opinion, how do you rate the effectiveness of regulations in enhancing management of the farmer groups?

- a) Very effective []
- b) Effective []
- c) Fairly []
- d) Somehow effective []
- e) Not effective []

Part D: Challenges in Managing and Use Mechanized Instruments and Agricultural Inputs in corn Production in Kongwa District Council

1. What are challenges facing the group in relation to owning mechanized instruments and using them for productivity improvement?

- a) Policy []
- b) Institutional set up []
- c) Human resources []

2. What are challenges in improving corn production?

- a) Draught []
- b) Inadequate extension services []
- c) Marketing of the products []
- d) Adding value to agricultural products []

3. In your opinion, identify possible ways to overcome the challenges facing agricultural production in your village

Thank you for your cooperation

Appendix II: Interview Guide (DED, LGAs employees and leaders)

Part A: Respondent’s Preliminary Information

Department/Ward/village/Kitongoji.....

Part B: Status of Mechanized Agricultural Equipments and Inputs in the Study Area

1. How many farmer groups are there in the council /ward/village?
.....
2. How many members are there in each of the group?
.....
3. When were they established?
.....
4. Who established them?
.....
5. What was the motive behind the establishment of the group?
.....
6. Which of these groups have been distributed with mechanized agricultural equipments?
.....
7. What types of mechanized agricultural equipments have been distributed to the groups?
.....
8. What were the conditions for distributing the mechanized agricultural equipments to the farmer groups?
.....
9. What are the future plans for other group that have not been given the equipments?

Part C: Contribution of Mechanized Agricultural Equipments and Inputs in corn production

1. Is there any increased corn production resulting from the use of mechanized agricultural equipments and inputs among group members?
.....

2. In your opinion what do you think is very important for improving corn production in the area?.....

3. How frequently do agricultural extension officers visit farmer groups and individual farmers in their respective village during farming seasons?
.....
.....

4. What are the monitoring mechanisms in place to ensure that they spent their time facilitating farmers to improve production?
.....

4. Who are the important stakeholders in corn production in your council?
.....

5. What have been the roles of these stakeholders in improving corn production?
.....

6. In your opinion, do the rules governing farmer group members enhance smooth functioning of the groups?
.....

Part D: Challenges in Managing and Using Mechanized Instruments and Agricultural Inputs in Corn Production in Kongwa.

1. What are challenges facing the farmer groups in relation to owning mechanized agricultural instruments and using them for productivity

improvement?

.....

2. What are the challenges facing agriculture in your council?

.....

3. What are the possible ways to overcome the challenges facing agricultural production in your council?

.....

Thank you for your cooperation

Appendix III: Interview Guide (Private owners of Power tillers)

Part A: Respondent’s Preliminary Information

Department/Ward/village/Kitongoji.....

Part B: Status of Mechanized Agricultural Equipments and Inputs in the Study Area

1. How many farmer groups are there in the ward/village?
.....
2. What was the motive behind the establishment of the groups?
.....
...
3. What types of mechanized agricultural equipments have been distributed to the groups?
.....
4. What were the conditions for distributing the mechanized agricultural equipments to the farmer groups?.....

Part C: The Contribution of Mechanized Agricultural Equipments and inputs in Corn Production

1. Is there any increased corn production resulting from the use of mechanized agricultural equipments and inputs among group members?
.....
...How frequently do agricultural extension officers visit farmer groups and individual farmers in their respective village during farming seasons?
.....
...What is your opinion on the functioning of agricultural extension officers?.....

2. Who are the important stakeholders in corn production in your ward/village?

.....

3. What have been their roles in improving corn production?

.....

Part D: Challenges in Managing and Using Mechanized Instruments and Agricultural Inputs in Corn Production Kongwa District Council

1. What are challenges facing the farmer groups in relation to owning mechanized agricultural instruments and using them for productivity improvement?

.....

2 What are the challenges facing agriculture in your ward/village

.....

3 What are the possible ways to overcome the challenges in managing farm groups and agricultural production?

.....

Thank you for your cooperation

Appendix IV: Focus Group Discussion

1. What is the status of mechanized agricultural equipments and availability of agricultural inputs in the study area for corn production?

.....
.....
.....

2. What is the contribution of mechanized agricultural equipments and improved agricultural inputs for corn production in the study area?

.....
.....
.....

3. What challenges do farmer group members face in managing and using tractors/power tillers and agricultural inputs in corn production in the study area?

.....
.....
.....

Thank you for your cooperation