

**CONSTRAINTS AFFECTING CROP DIVERSIFICATION:
A STUDY OF MUFILI AGRICULTURAL CAMP
LUWINGU DISTRICT
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ABSTRACT

Crop diversification is a key strategy in increasing agricultural productivity for every nation on the path of economic diversification where agriculture is prioritized to be the main economic driver. Hence, there have been multi-sectorial calls for economic diversification at national and sub-national levels from overdependence on copper mining, a wasting resource to agriculture, a sustainable resource.

Zambia in particular has prioritized economic diversification from the predominant copper mining to agriculture through formulating several policies aimed at supporting agriculture like any other nations that have thrived on agriculture.

It is inarguable that for most of Zambians, their livelihood is depended on agriculture – though in most cases mono-cropping has been largely practiced. For the country to yield maximal benefit there's need to crop diversify to several crops of high benefit meaning that agricultural exports produce should be extended to crops other than maize which the current staple food.

For this to be achieved, specific constraints relating to crop diversification and those leading to small scale farmers inability to improve their individual agricultural productivity such as limiting subsidies on inputs for maize cultivation, availability of ready markets, difficulty transport to markets, poor technology (to address inadequate manual labour) pests and late delivery of farming inputs have to be addressed.

The country is endowed with suitable climatic conditions for agriculture and the soils favour a wide range of ecologically supported crops. It is therefore prudent that economic diversification synergies are concentrated on agriculture.

The availability of markets for the produce within and outside the southern African region entails that agriculture has high potential of contributing favourably to Gross Domestic Product (GDP) and Gross National Product (GNP) respectively.

Majority of peasant farmers are still highly dependent on subsidised farming inputs though they equally have alternative crops to fall back on given a situation where subsidised inputs are withdrawn. The study concludes that overdependence on subsidies dictates what crops can be cultivated. Since subsidies on agriculture inputs are skewed towards maize cultivation and this has been shown to have highly slackened the pace of crop diversification. Therefore, subsidized inputs support towards alternative crops need to be deliberately scaled up in order to gain significant economic advantage from agriculture.

DEDICATION

To my wife Ntililwa and our daughter Chanda without whose understanding for their time deprivation and overwhelming encouragement it wouldn't have been possible.

My gratitude posthumously go to dad Mr. Maurice Mwansa Lupupa who provided full support towards my childhood education period and further encouraged me during the time of my studies. I'm eternally grateful to you all.

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LIST OF ACRONYMS

ASP	Agriculture Support Program
CEO	Camp Extension Officer
FISP	Farmer Input Support Program
FNO	Food and Nutrition Officer
FRA	Food Reserve Agency
GDP	Gross Domestic Product
GNP	Gross National Product
HDI	Human Development Index
ICU	Information and Communications University
IMDC	International Multi-Disciplinary Conference
JICA	Japan International Cooperation Agency
NCZ	Nitrogen Chemicals of Zambia
SAS	Senior Agricultural Supervisor
SPSS	Statistical Package for Social Sciences
UNDP	United National Development Plan
UNZA	University of Zambia
ZCAS	Zambia Centre for Accountancy Studies

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CHAPTER ONE: INTRODUCTION

1.1 Background Information

Economic diversification from mining to agriculture for a long time has been among the key resolutions made by the Zambian government as a means of emancipating the citizens from the ‘fettters’ of poverty and adaptation to a more sustainable of achieving economic development considering that mining is a wasting resource. As agriculture is being advocated for, it is important to consider the most economically sustainable crops to grow. Generally maize has been the mostly grown cash crop in Zambia for many years.

In an effort to emphasize the economic diversification trajectory, the agricultural minister issued a statement on 1st October 2015 in which he stated that his ministry through Farmer Input Support Program (FISP) had increased the number of crops to be supported in pursuant of the government’s policy of diversification (<http://www.parliament.gov.zm>).

It is generally accepted that in recent years the cost of producing maize has become high for an average peasant farmer with regards to acquisition of required farming inputs such as seed and fertilizers. Hand held tools are used in the process; speed and size of arable land is also limited which means that the peasant farmers who only have limited capital have to use much of their time and strength to manage only small portions of arable land. In most cases the small fields cultivated are unable to produce enough income to finance the following farming season, (Todaro, 2012:432). As a result the vicious cycle of economic dependence on the government for subsidized agro inputs repeats itself. The effort required to produce a significant amount makes maize production quite labour intensive and therefore justifies the need to explore cultivation of alternative crops.

Food security concerns continue to bloat the government’s expenditure on subsidized Millie meal and farming inputs such as fertilizers and seeds. End beneficiaries of these subsidized commodities have not been able to liberate themselves from overdependence on government subsidies overtime. This puts a huge bill on the government coffers, which must be shared with end beneficiaries.

Identification of specific challenges faced by small scale farmers in identifying and diversifying to growing alternative crops which are more efficient and of higher economic value is the basis of this research. Results of this study can help government and stakeholders to address specified high impact drivers to economic development at the grass root level and eventually at national level.

This research project will be targeted at small scale farmers who are the majority in the agricultural sector in Zambia and Luwingu district in particular. It is hoped that meaningful development could be realized if effective approaches to crop diversification were rolled out beginning with small scale farmers.

The Zambian economy has inarguably been extremely over dependent on mineral resources – copper to finance other sectors such as education, health and several social services. Considering that copper (which is a major mineral) is a wasting resource, there have been advocacy to diversify the economy to agriculture in order to be secure.

In 2015, as the world economy dwindled seeing the united states dollar gaining considerably against other currencies, china who was the major importer of copper from Zambia stopped buying in bulk and the price of copper on the marked became extremely low.

This means that the national income to finance various sectors was inadequate; therefore the cost of living for an ordinary Zambian has increased. In 2015, the exchange rate of a US dollar to kwacha went up from K5.44 in 2014 to K11.3 in March 2016. Such crises as this one are what were predicted by the proponents of economic diversification when they advocated for enhanced concentration on agriculture. Unfortunately even the peasant and subsistence farmers who produce the majority of maize which is the staple food, are constrained due to increased cost of production as fertilizer was selling at K320 per 50kg bag (NCZ). It has therefore become plausible to accelerate crop diversification within agricultural sector from costly agricultural practices to those which are cost effective and ecologically viable.

Government and private sector has made strides to advocate for cost effective farming with little or slow adaptation by small scale farmers.

This study therefore was aimed at investigating the constraints affecting adaptation to cost effective farming that could liberate the peasant farmers from perennial dependence on aid assistance to continue with farming.

1.2 Problem Statement

Over the past decades, a very high dependency on copper mining as a main economic driver has characterized Zambia. Lately this has been realized to be a problem both for the current generation and future generations. Currently, the economic growth tends to plummet whenever the external market forces on copper pricing go down and this phenomenon has resounded the need for economic diversification in the country from copper to agricultural produce as a sustainable measure. It has been observed that current dependency on mining instead of agriculture as the economic mainstay forms a gap in actualization of economy diversification process in the country.

For the agricultural sector to grow, there is need to harness crop diversification and significantly increase production of a wide range of crops other than concentrating on a single crop. This is the more reason why the government and its stakeholders have been making efforts to facilitate diversification of agricultural food crops through diverse approaches. The outcome of these efforts have not been commensurate as evidenced by continued overdependence on maize crop cultivation.

This therefore justifies the need to study the farming population to learn the constraints the sector is faced with in terms of significantly scaling up crop diversification and hence devise sustainable measures that would leverage this economic shift from mining to agriculture.

The largest proportion of the farming community in Luwingu district fall in the category of peasant and subsistence farmers who have inadequate capacity to meet the demands of high cost of unsubsidized farming inputs (fertilizers and seeds) and usually have little capital and do not have access to mechanized farming hence depend on manual labour. This means that production of maize remains threatened with the unprecedented future of FISP lifespan as well.

Identifying and devising appropriate solutions for the specific constraints farmers are facing is the only way government and stakeholders can successfully influence crop diversification and hence achieve economic diversification and food security.

The desire to better understand the extent of crop diversification and challenges faced by farmers and addressing these specific bottlenecks based on ethnographic and ecologic zones, is the key motivation factor for the development of this study.

1.3 Purpose of the study

The study was undertaken in partial fulfilment of my undergraduate Development Studies at Information and Communications University. The passion to conduct this study emanated from lectures attended in development economics and food security, through which I learnt about the identified essential determinants of human development namely; to live a long and healthy life, acquire knowledge and have the access to the resources required for decent standard of living (UNDP, 1990). Hence the HDI (Human Development Index) was developed for assessing the level of economic welfare of a people.

Apparently in sub-Sahara Africa, Zambia in particular had scored low in most HDIs. Considering that food security is very key at household rather than at national level, diversification of agriculture to achieve food secure status is anchored on knowing the factors inhibiting crop diversification to be appropriately addressed.

This study therefore provided information relevant to both food security and economic diversification which have been dealt since they are very much related to each other.

Luwingu district does not experience extreme droughts. In addition there are several swamps, rivers and streams for irrigation. Most soils are also fertile to support a wide range of other crops. The researcher noticed that there was over dependence on maize growing and the value of the harvest currently had become incommensurate with its cost of production.

High cost of maize production has potential to cause food insecurity and hunger since the majority of producers are peasant farmers who are usually not able to meet the intensive capital and labour costs needed for growing the crop.

It becomes therefore irrefutably necessary to adapt to alternative economically and ecologically viable crops which can be grown with minimal resources as opposed to a narrowed focus on maize which comparably demands more resources.

Findings in this research will significantly contribute to the scale-up of crop diversification through creation of new knowledge. This will in-turn be a synergy to the government efforts to shift from economic overdependence on copper and other mineral resources to agriculture through understanding the constraints faced by farmers and devising appropriate interventions.

1.4 Research Objectives

General Objective:

- To establish the challenges faced by farmers in crop diversification/ agricultural productivity and assessment of the extent of crop diversification in the light of economic diversification in Mufili cooperative camp of Luwingu district, Zambia.

Specific Objectives:

- To establish the main challenges in crop diversification faced by small scale farmers.
- To identify alternative ecologically viable crops that have potential economic advantage so that they can be prioritized for support towards crop diversification to achieve.
- To assess the extent of government efforts in farmer support services in changing the behaviours and attitudes towards crop diversification.

1.5 Critical Research Questions;

- i. Are farmers able to identify alternative ecologically viable crops for diversification?
- ii. What alternative crops can be grown without government inputs support interventions?
- iii. To what extent are the small scale farmers accessing support towards achievement of crop diversification?
- iv. What are the main challenges faced by small scale farmers in crop diversification?
- v. Is there a statistically significant association between the number of years a farmer has been receiving farmer Input support/ subsidized inputs and self-sustainability of individual farmers?
- vi. What are the root causes of the main challenges faced by farmers in crop diversification that need priority attention?
- vii. Are agriculture Camp Extension Officer services deployed by government and or cooperating partners playing their role in crop diversification?

1.6 Data Analysis

Data collection was done through administration of questionnaires to the participants and Statistical Package for Social Sciences (SPSS) version 16.0, manual tabulation and Microsoft excel were used for data analysis.

1.7 Research Variables

- Age
- Sex
- Duration of membership in a cooperative (in years)
- Main crop on the farm
- Other crops on the farm
- Ability to continue cultivating same size of land without subsidies
- Challenges
- Solutions
- Expected harvest
- Actual harvest

1.8 Significance of the Study

This study investigated the causes of slow progress to crop diversification and other related challenges in agriculture through an ordered simplistic approach. It has provided information relevant for policy makers and implementers that can be used for decision making on policies bordering on crop diversification that is pertinent to drive economic diversification. The research has contributed to the body of knowledge through a wider understanding of the various impediments that oppose accelerated crop diversification. The study has also helped to identify unique challenges in crop diversification and thus provides vital information on ethnographically viable crops for various ecological zones which may have divergent weather patterns suitable for traditionally preferred crops.

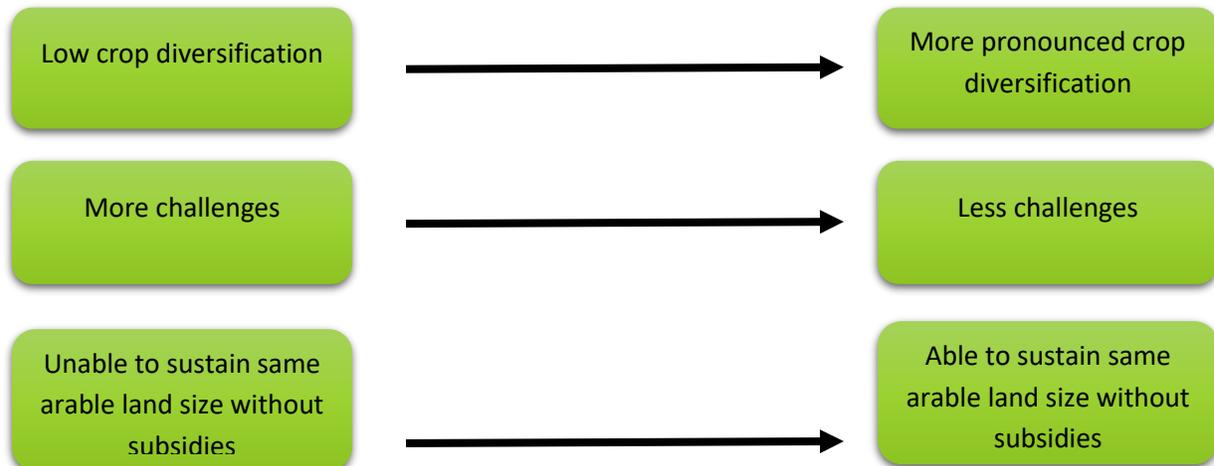
This study serves as a contribution to the national economic diversification agenda which places an emphasis on diverting from traditional dependence on copper mining to agriculture. This study informs decision makers on the importance of crop diversification in that it will mitigate a continued dependence on government subsidies on maize cultivation which may place an uneconomical burden on national coffers.

It provides information supporting the fact that though maize is a staple food and is widely cultivated, it is slowly becoming increasingly capital intensive for an average farmer.

1.9 Conceptual Framework

Farmer status without access to C.E.O.

Farmer status with access to a C.E.O.



1.10 Operational definition of concepts and scales of measurement

Within the context of this study the concepts/variables were operationally defined and scales of measurement provided in the following table as shown;

Table 1: Operational definitions of concepts

No	Variables	Operational definition	Scale of measurement
1.	Age	Number of years at the last birthday	Interval
2.	Sex	The status of being a male or female	Ordinal
3.	Duration of membership	Number of years a farmer has been a member of a cooperative	Nominal
4.	Main crop on the farm	The mostly grown crop by an individual farmer	Nominal
5.	Alternative crops	Other crops on the farm	Nominal

6.	Able to continue cultivating same size of land without subsidies	Ability to source non-subsidized farming inputs sufficient enough for cultivating same size of land given that subsidized input program is withdrawn	Nominal
7	Challenges	The crosscutting problems that directly affect agricultural productivity as encountered by farmers	Nominal
8	Solutions	Suggested interventions for implementation to address the identified challenges	Nominal
9	Expected harvest	The projected harvest for last farming season on terms of the number of 50kg bags of the main crop	Nominal
10	Actual harvest	The actual number of 50kg bags of the main crop harvested in the preceding farming season	Nominal
11	Diversification	To enlarge or vary the range of products or field of operation (Concise Oxford dictionary, 2008)	Nominal

2.7 Other key Terms

The following terms below according to this study will be defined as;-

- a) **Cooperative:** - An organization owned and run jointly by its members, who share the profits or benefits (Concise Oxford dictionary, 2008). It will refer to cooperative groups supervised by a CEO.
- b) **Population:** - The universe of people to which the study will be generalized (Scott W. Vanderstoep & Deirdre D. Johnston, 2009).
- c) **Sample;** - The subset of people from the population who will participate in the current study.
- d) **Simple random sampling:** - A form of probability random sampling which involves picking a certain number of participants in the sampling frame. A fixed percentage of the sampling frame is selected for participation enabling each element having an equal but non-zero chance of being selected.
- e) **Stratified sampling:** - A process of random sampling technique involving selection of participants based on their membership in a sub group or stratum.

CHAPTER TWO: LITERATURE REVIEW

2.1 Global perspective

Crop diversification

According to R. B. Hile, Y. C. Sale and D. J. Sanap (2016), in their study they found that the major constraints in crop diversification were unavailability of improved variety seeds, imbalanced fertilizer use by farmers, unavailability of mineral mixtures, unavailability of improved breed and lack of technical knowledge such as about animal nutrition and housing. The trio conducted a comparative analysis of net returns on existing agriculture systems were less than that of after diversification. The noted increase in crop component, animal component and processing components were 13.34, 69.38 and 72.38 percent respectively and additionally created employment at the farm. The gross income also increased by 25.85 after capacity building in the three diversification components. They concluded that diversification of current farming systems was profitable and increased output with cost reduction.

In a study conducted by Hannah Chaplin (2000), he stated that there are various reasons why a producer may decide to specialise or diversify. Kim (1981) also noted three (3) reasons why producers may decide to diversify namely (i) available factors resources such as land, (ii) extent of diversification in domestic and world markets (iii) market access restrictions (iv) Availability of infrastructure for inputs and market access and lastly (v) historical factors such as colonization. He also notes that, where a narrow range of commodities are subsidized, this may lead to specialization (monoculture) in these commodities.

De Beer & Swanepoel (2000:23) stated that, the shift in development thinking from large-scale economic development and industrialization to small scale, sustained, self-sufficient, development also requires adjustments in the implementation of rural development. Furthermore, he stated that in order to ensure sustainable development each person and community must handle its own resources and environment with the necessary care. De Beer & Swanepoel implied that, in handling their own resources this should include appropriate use to achieve maximal benefit from them.

Reagan (1996:160) as quoted by De Beer & Swanepoel (2000:251) stated that Aid creates dependency by making weaker governments/countries dependent on stronger ones, thus putting them at a disadvantage in economic and political discussions. At a micro level, this effect could possibly be a panacea and cogent reason for sluggish crop diversification due to the governments supposedly over emphasis on and the need

for bumper harvest in maize production. The other factor could be the dependency by farmers on subsidised inputs such as fertilizers and maize which might have captivated them in a maze of wanting an extra hand to feed them. Due to inadequate or lack of research or the intent to facilitate personal political agendas, some office bearers may have ignored this fact and anyway fallen in the trap of sustaining the subsidising at the expense of liberating the poor from the poverty trap.

Famine can result basically due to any of the two or a combination of the

De Beer & Swanpoel, (2000) distinguished two schools of theories on causes of famine; the supply- side theories and the demand-side theories. The supply –side theories emphasizes the role of climatic factors in the occurrence of famine in some ecological zones. He stated that, as a result of climatologic changes like droughts, floods, explicit crop failure can lead to food shortages due to reduced production. Though this theory is faced with a lot of criticisms, one of them being the reason that crop failure is not a cause of famine but the lack of alternative sources of food is what leads to a famine experience.

A well-functioning food system ensures and protects each individual in such a way that everybody has enough to eat to live a healthy, active life (Kutzinner 1991:8 quoted by De Beer (2000)). Crop diversification therefore becomes very important in the processes of ensuring that food security at household level is achieved.

Diversification and Food security

Food security, a state defined by World Bank (2006) as “access of all people at all times to enough food to have an active, health life” (Colofon 1997:9) can be achieved through adaptation of an economy which is concentrated and centred on agriculture. High agricultural productivity is desirable as it would eliminate the fear of food insecurities which Maxwell (1991b1:2) quoted by De Beer (2000), in his fuller definition of food security as one of the signs of food insecurity.

The prosperity of every household in being food secure is based on a right mix of investment, production and savings. Human activity and government support (through creation of an enabling environment) are both pertinent in achieving this right mix for growth at micro and macroeconomic levels. In most cases this right mix of investment, production and savings is not attained despite immense government and cooperating partners logistical and technical support through capacity building structural programs.

Otherwise the ideal result is supposed to be self-sustainability where farmers are able to thrive without further material support in farming inputs. The quest to identify the cause of failed sustainability remains the center of this research.

2.2 Previous studies at continental level

Christopher L. Delgado (1995) in his study illustrated that there was a decline in world commodity prices which required Africa to diversify from a few agricultural crops in order to reap the maximal benefits.

He recognized the fact that agriculture needed to be promoted because it created about 70% of total employment and about 40% of exports and one third of GDP in the sub-Sahara region. Also Jaffe (1992) as quoted by Christopher L. Delgado (1995) also stated that approximately one-third to two-thirds of value addition manufacturing depended on the supply of agricultural inputs.

Delgado here is cognizant of the fact that Africa has immense potential to grow its economy through agricultural diversification to crops which have demand on the external markets. In an important sense, successful pursuit of agriculture diversification involves trying to make markets function better and also requires a pro-active agricultural policy stance to overcome structural bottlenecks of the type endemic at early stages of agricultural transformation. These bottlenecks referred to include high transfer costs for agricultural commodities across time and space including the acceptance of trying out growing new crops and adapting to farming without subsidized inputs.

A proactive diversification policy is necessary for Africa for at least three interrelated reasons; firstly African countries need to depend mainly on agricultural exports like other third world countries. Secondly because the initial stages of agricultural transformation are characterized by imperfect factor markets, high transfer costs to external markets in many countries and a consequent large share of rural production consisting of commodities not traded across national borders. Thirdly, it can be argued that in the presence of the significant externalities and market failures that produce the above effects, policy makers in Africa also have considerable latitude to sustainably influence the factor intensity of long-run growth paths.

In a local context policies that would apply in Luwingu are those bordering on mitigating huge government expenditure on subsidized inputs which does not produce a corresponding output due to poor farming methods. Emphasis should otherwise be place on growing most cost effective crop or deliberate policies

which can result in encouraging farmer autonomy in acquisition of farming inputs without dependency on subsidies.

In addition, Prabhu L. Pingali & Mark W. Rosegrant (1995) stated that crop diversification besides achieving food security could address most of the serious environmental problems by providing a break in the monoculture system and improving crop system health. A non-rice crop if grown alternatively that allows the soil to dry up or improves soil fertility or arrests pest build up can improve productivity of the subsequent rice crop.

This is another value of crop diversification as described by Prabhu L. Pingali & Mark W. Rosegrant. They upheld the need for crop specific research to provide farmers a wider variety of choice to move relatively freely between crops. This they said would increase productivity if research also concentrated on yield potential, shorter duration cultivars, improved quality characteristics and greater tolerance to pest stresses.

2.3 Zambian perspective

In their report, Cathy Rozel Farnworth, Monica Munachonga (2010) emphasized the need for farmers to understand and take farming as an enterprise. The report was based on the evaluation of the impact of Agriculture Support Program implemented by the Swedish government with a bias to support women and youths. The approach used by ASP involved five components namely (1) entrepreneurial and business development, (2) Land, seed, crop and livestock development, (3) Infrastructure fund, (4) Improved service delivery of support entities and (5) Management Information and Learning Systems. According to this study it was found that respondents had internalized the importance of crop rotation and diversification in particular mixed farming systems to developing resilience.

Whereas other countries experience crop failure as a result of droughts, in Zambia crop failure is usually a result of limited access to subsidized farming inputs on which there is overdependence by majority small scale farmers.

This is why crop diversification is a high priority for them such that in an event of the main crop failure, they can leverage on alternative crops which may not be among the traditionally subsidized inputs supported crops. The alternative crop could be sold for income to substitute other locally preferred foods.

The reasons above attaches a lot of importance to the need of investigating reasons for the slow progress of crop diversification and the low or lack of self-sustaining maize growing so as to devise appropriate mechanisms to accelerate the process.

2.4 The case of Lupososhi constituency of Luwingu district

Luwingu district with a total population of 165,464 in 2016 has 490 cooperatives in total which receive farming inputs as in fertilizers and seeds. World Vision Zambia (Buyantanshi project) and Self Help Africa (SHA) are the two cooperating partners providing agricultural support services in the district. Lupososhi constituency in which a sample will be interviewed has 9 camp extension officers (CEOs) who provide farmer education, surveillance and coordinates activities of the cooperatives at macro level. By 31st December 2015, total membership of famers in cooperatives stood at 11,585 for the district while Lupososhi constituency alone had 6,343. Mufili camp where a sample was interviewed had a total of 675 members (Luwingu dept. agric, 2016).

In the 2015 to 2016 farming season, farmers were contributing 90 ZMW per bag of subsidized fertilizer and 40 zmw for maize seed, while, market price for fertilizer had gone to 350 zmw and maize seed was selling at around 210 ZMW.

The following are the inputs provided by government through FISP; in 2013 alone 5,818 bags of fertilizer, 2014 the number of bags reduced to 5,166 while in 2015 a total of 4,322 bags (50kg bags) were given to farmers. As can be seen the level of support continued to diminish from 2013 to 2015. In terms of maize seed (10kg bags) in 2013, 2014 and 2015, the number of bags of seed provided to farmers was 2,161, 2,583 and 2,909 for the respective years. As can be seen from this information, while the fertilizer support was diminishing, seed support continued increasing.

This observed unequal supply of inputs shows inefficiencies in planning and implementation of activities in line with policies anchored on diversifying the economy with a special focus on agriculture. It is not logical to have more seed but with less fertilizer provided.

This effect technically affects the output of the crop and subsequently overall household food security status. In actual sense, diminishing output is expected to be experienced against an increasing population.

The challenges faced by government in sustaining subsidies on farming inputs signals the need to find long lasting alternatives which can ameliorate the diminishing of food production support.

2.5 Previous studies at local level

Food Crop Diversification Support Project for Enhancement of Food Security in Zambia (FoDiS) conducted a baseline study in 2007 with support from JICA (Mukelebai Ndiyoi et al, 2007). This survey was undertaken in ten (10) districts namely, Mambwe, Petauke, Nyimba, Luangwa, Chongwe, Siavonga, Gwembe, Sinazongwe, Sesheke and Shan'gombo. These were identified as parts of the country which frequently experienced drought conditions.

The objective of this study was to collect up to date data on the promotion of maize-alternative drought tolerant crops, with a particular focus on root and tubers implemented by the government, donor and private sector organizations in the targeted districts.

This study had a special interest of providing a basis for supporting crop diversification in cognizance of the need to consider ecologically supported crops. The collected information could be used for promotion of cultivation of cassava and other draught tolerant crops in alongside and in place of maize which was proving to be difficult to grow in some cases.

The need to conduct the survey in the drought prone regions I and II was promulgated after consideration of the fact that in these sampled regions, over dependence on rain fed agriculture was the main cause of variations in food production. The other important reason was that Food crises in these regions were amplified due to over reliance on maize in these drought prone areas as the main staple food. The maize crop is particularly susceptible to low moisture availability and very hot spells during the silking period.

Because of its drought resistance properties, cassava was suggested as the nutritionally strategic alternative food crop in areas with unreliable rainfall such as the southern province of Zambia.

Considering other properties of cassava that it usually does not need chemical fertilizers, in Luwingu district were most of the farmers are unable to sustain the arable land for maize cultivation without input support, these farmers could adapt to cassava which can be within their means and this can go a long way in achieving household food security.

Luwingu district is privileged with abundant favourable land and water bodies that can support alternative crops other than the predominant maize. The reality is that the marginal benefit of growing maize has been diminishing (for a peasant farmer), hence it is no longer easy to achieve household level food security if a farmer continues to struggle with maize cultivation for which they are unlikely to acquire the inputs due to inadequate capital.

2.6 Personal critique summary

The cited researches and books have said a lot concerning the importance of economic diversification with a special concentration on agriculture. Crop diversification has also been looked at.

However, the subject of identifying individual constraints which farmers in given ecological zones may face in the process of crop diversification has not been much discussed.

This is the reason why it is important for government to direct part of its efforts in supporting farmers to identify crops which are ecologically viable in their respective areas. Specific challenges also need to be addressed with the appropriate approaches which may only be suitable to one region and not the other.

It is thus very important to invest in research studies before any support is rendered by government and or cooperating partners in order to avoid wastage of resources.

This study paid special attention to topical challenges that needed to be identified in order to accelerate the process of economic and agricultural diversification.

2.7 Establishment of the gap

A number of gaps were identified by researchers and project cooperating partners among them the need to diversify the market crops and crop diversification from traditionally rain fed maize cultivation to cassava and other tuber crops. The studies which were reviewed and hereby referred to, have not considered unique challenges which farmers in Luwingu district in Lupososhi constituency could be facing such as;

- a) The annual reduction in fertilizer support towards maize cultivation
- b) The uncertainties surrounding the government policy on continuity of FISP project
- c) Inadequate capital to sustain maize cultivation as the main source of food and income

The gap therefore as identified is the focus on farmer adaptation to alternate crops other than maize in order to achieve food security status in an event that government is no longer able to provide farming input subsidies adequately.

Despite farmers observing that government support have been diminishing, they seemingly do not diversify to a large extent to alternative crops. Equally the majority of those who are unable to access subsidized inputs rarely engage into crop diversification due to a consternation of factors which this study is determined to investigate.

On the other hand, farmer preparation for the future plans in terms of FISP project has not been emphasized and farmers have not been prepared for the unforeseen circumstances which might lead to a famine as long as farmers are not able to exploit available alternative food crop cultivation.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research design

A quantitative and qualitative cross-sectional survey will be conducted through which primary data will be collected through administration of structured questionnaires to consented subjects. The data collection instrument was designed to collect quantitative and qualitative data. Sections A, B and C were mostly composed of quantitative data, while qualitative data was collected from section D of the questionnaire. The open ended questions enabled respondents to fully provide the relative information which was collected using quantitative approach in sections B and C.

The options in the questionnaire attempted to be as exhaustive as possible. This type of research design was chosen due to its simplistic nature and its ability to collect the needed data for statistical analysis whilst upholding research ethics. Quantitative sections was able to generate results accurate enough to reflect the general characteristics of the population under study (**Scott W. Vanderstoep & Deirdre D. Johnston, 2009**).

Qualitative data was collected in section D of the questionnaire. It enabled a wide range of alternatives for qualitative analysis that is able to provide rich in-depth narrative description of the sample (**Scott W. Vanderstoep & Deirdre D. Johnston, 2009**).

3.2 Target population

The targeted population for the study will consist of small scale famers who are members of famers' cooperatives in Mufili area of Luwingu district. The research is going to randomly select small scale farmers from two cooperatives. The members to be interviewed should have been active in the cooperative for a period of not less than two (2) years.

3.3 Sample selection size

The sample size consisted of 50 members from two (2) farmers' cooperatives. The farmer cooperatives were purposively selected in Mufili zone due to their easy accessibility. This was done as shown in table 2 below:-

Table 2: Sample selection criteria

Participants	Quantity	Sampling method	Population	Data collection method
Cooperatives	2	Purposive sampling	5	Questionnaire administration
cooperative members	50	Simple random sampling	675	Questionnaire administration

3.4 Sampling Frame;

The sampling process involved purposive and simple random sampling methods, whereby the registers for the groups were used as primary sources of information on members. Farmers who had been members of a cooperative for at least two (2) years were sampled for the interview. The register had farmer names, age, address and NRC number.

Since most of the respondents are likely have difficulties with reading and understanding the questionnaire due to low literacy levels, the assistant researchers read questions, interpreted them and filled in the responses in the questionnaire in incidences where the respondent was not able to understand English.

To accord an equal chance to all the elements in the population, the names on the members who have been active for 2 years or more were isolated and then serially numbered. The sampling fraction was obtained by dividing the population (675) by a sampling fraction (675/50), and the quotient was 13.5. Therefore every 14th name after the first random pick was selected to be interviewed until a required sample size (50) was reached. The formula used was $K = N/n$, where k was the elements, $N = \text{population/universe}$ and $n = \text{sample size}$. $k = 675/50, 13.5 = 14$.

In summary the formula was $K = N/n$.

However due challenges in tracing the selected participants who were mostly out for farming activities, coupled with limited time purposive sampling was employed in the process.

3.5 Instruments for Data Collection

This study was based on primary data, hence a questionnaire composed of closed and open ended questions was used for data collection.

The instrument consisted of section A which collected biographic data, section B had variables on crops grown by individual farmers, approximate size of arable land, previous harvest season quantity (bags), extent of crop diversification and willingness to diversify agriculture. Section C had questions relating to individual accessibility to and perception of government subsidies on agriculture inputs, while section D comprised of open-ended questions for qualitative data. A questionnaire was used because of the need to standardize questions and answers for each participant.

3.6 Procedure for Data Collection

Two research assistants were trained and oriented on the use of the data collection instrument before they could start household survey. The questionnaire was then piloted at Mufili village in order to ascertain its reliability, familiarize the assistant researchers to the tool and to make adjustments to the questions before final data was collected. The pilot study employed the use of ten (10) questionnaires, and thereafter the instrument was refined. Data collection was implemented shortly after piloting and logistical and financial preparations had been conclusively made.

Before commencement of data collection the gatekeeper (headmen) where the population is situated was paid a courtesy call to explain the purpose of the study. This was for the purpose of registering the researcher's presence in the locality in order to win the community's acceptance and support. A random sampling technique was used to select respondents to be interviewed based on the cooperative registers to be accessed from the respective chairpersons.

Selected respondents were visited by the research assistants to administer the questionnaires. These two were local residents identified with the help of the CEO (Camp Extension Officer). During household visitations, the purpose of the visit was explained in order to get acceptance necessary for collection of true and as accurate data as possible. All data was collected through interviews and observations and entered in the fifty (50) questionnaires.

3.7 Data analysis techniques

Descriptive statistical tests as well as frequencies, percentages, numbers and cross tabulations were done. The process employed the use of Microsoft excel and statistical package for social sciences (SPSS) besides manual tabulation. Data on paper questionnaires was entered into an excel sheet and variables were coded. The excel frame was loaded on SPSS version 16.0 for quantitative analysis.

To complement Quantitative data, Qualitative data was collected, clustered and selectively coded according to similarity of responses for easier analysis through manual manipulation. Qualitative data was entered in an excel frame which was coded according to the clustered responses in order to allow for weighting. The charts, tables and graphs which have been generated were cross tabulated for variable interpretation and deducing the research study results.

All the necessary tables, charts and graphs have been included in the report for easier reference by the readers of this final research report.

3.8 Triangulation

The identified variables were compared and contrasted in multiple angles in order to generate a wider view of the study results. This enabled me to exclude temptations of intrinsic biasness that might occur to approve or disapprove the hypothesis.

This study was designed to be analysed both in quantitative and qualitative perspectives. This approach of triangulation conducted avoided reliance on only one type of analysis. It was realised that single methods of data analyses could have been potentially affected by intrinsic biases and could have influenced results in a way.

The number of years a farmer had received input supplies support was compared with ability of the respondent to continue cultivating the same main crop given withdrawal of subsidies to the current main crop. The number of participants in terms of productivity was compared in terms sex to determine whether males were as much productive as females. Also the various constraints to diversification between climatic conditions and dependence on government support in terms of subsidised farming inputs were contrasted.

3.9 Ethical consideration;

The research proposal was submitted and presented before the Information and Communications University research committee and as such it was scrutinized whether it met the ethical requirements. The purpose of the study was explained to and informed consent to participate in the research obtained. The researcher did not include names of respondents throughout the report. Other researchers interested in secondary data will access data file with encrypted subject identities.

Approval was sought from department of Agriculture and Fisheries to conduct the study it Agricultural Camp under its jurisdiction (*see Appendix 4*).

3.10 Delimitation of the study;

The study was limited to Mufili agricultural camp of Luwingu district which is comprised of two (2) zones and five (5) farmer cooperatives. Farmers in the five cooperatives were interviewed in and attempt to collect data to investigate constraints in crop diversification in the area.

CHAPTER FOUR: RESEARCH FINDINGS

4.1 Sample Description

The population sample constituted fifty (50) respondents who were randomly selected in the two (2) zones, namely Chambeshi and Sande zones respectively. These two zones comprised five (5) cooperatives (Natusensele, Mipa, Machesa, Chitamba and Ukutangila tekufika).

Ten (10) questionnaires were equally administered in each cooperative. The collected data was analysed for understanding the nature of the sample, the current farming trends/ situation, utilization and access to government innovations challenges and their proposed solutions. Therefore this chapter presents empirical findings which are classified in four major themes as outlined below;

- a) **Biographic data of the respondents**
- b) **Crop diversification practices and perception**
- c) **Utilization of services supporting agriculture and identified information needs;** - Viability of the efforts being put in and the extent to which farmers were benefiting from these services was analysed. The farmers' desire for specific information was also determined. The efforts towards crop diversification were analysed for effectiveness and appropriateness in supporting crop diversification.
- d) **Challenges and their proposed solutions;**- major challenges faced by farmers were identified and farmers proposed solutions to their problems and individual and government levels. Current levels of farming success were also determined.

4.2.0 Biographic data of the respondents

This thematic area will provide a summary of the aggregate characteristics of the sampled subjects in terms of gender, age (in years), marital status and sex of the household heads.

4.2.1 Gender distribution of participants

Femininity distribution of participants was 36% females and 64% males respectively. Though females are the majority in the district (51% as compared to males 49%), there was no equity of access to subsidized farmer inputs as compared to males who appeared to outnumber females by 28%. This was found to be a constraint affecting agriculture and needs to be addressed by the government through a deliberate system

that ensures equal access. From previous studies education levels have been low among females in the district and that affects their esteem when they have to engage in an activity where males who have better education are present. This information is summarized in table 2 below.

Table 3: Gender distribution of participants

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Female	18	36.0	36.0	36.0
Male	32	64.0	64.0	100.0
Total	50	100.0	100.0	

4.2.2 Age distribution of respondents

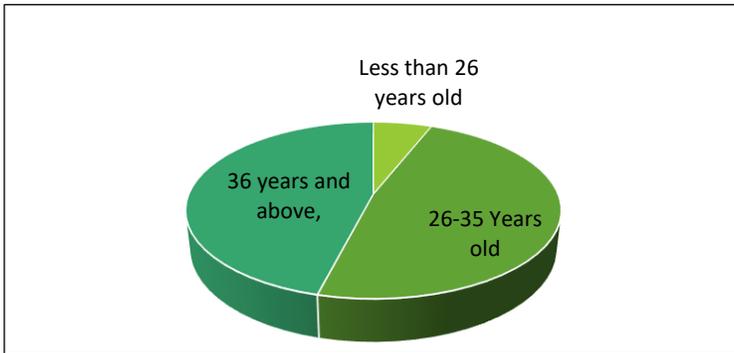
Participants were asked about their age and the responses were categorized in three (3) groups to determine the group that were the majority in the farming community. That was very important to determine also access to subsidized inputs by these varieties of age groups. According to the data collected 6% were below 26 years old, 48% between 26 – 35 years old and 46% 36 years old and above.

It was concluded that the majority of beneficiaries were within the expected productive age groups as illustrated in table 3 below.

Table 4: Age distribution

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Less than 26 years old	3	6.0	6.0	6.0
26-35 Years old	24	48.0	48.0	54.0
36 years and above	23	46.0	46.0	100.0
Total	50	100.0	100.0	

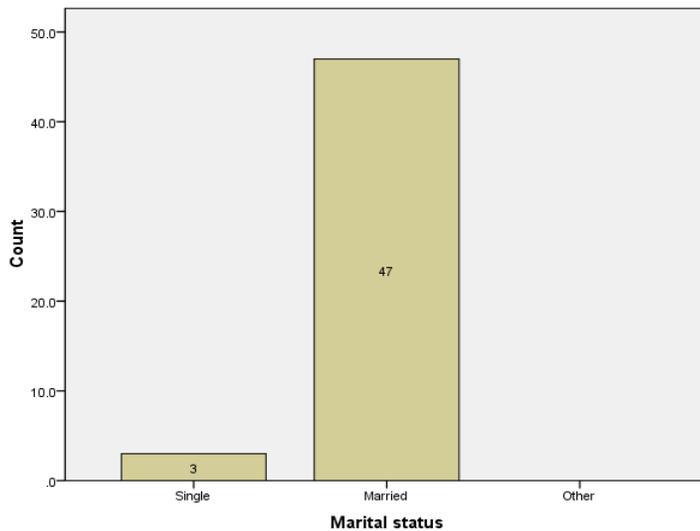
Figure 1: Age distribution of participants



4.2.3 Marital status of participants

According to Fig 2 Single participants were 3 representing 6% while married participants were 47 representing 94.0% respectively. There were no participants in the category 'others'.

Figure 2: Marital status



4.2.4 Gender of participants and Sex of the Household Head

These two variables were cross tabulated and results indicated that of the 49 valid responses, only 4 households were female headed while 45 were male headed representing 8.2% and 91.8%. This information is summarized in table 4 on the next page.

Table 5: Gender of participants and Sex of the Household Head

Count		Sex of the Household Head		
		Female	Male	Total
		Gender distribution of participants	Female	3
	Male	1	30	31
Total		4	45	49

4.3.0: Farmer status, crop diversification practices and perception

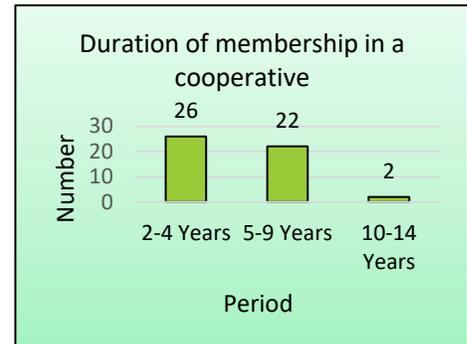
This section established the current situation in terms of diversity of crops on participants' farms and also to inquire the period in years respondents have been active members of the farmers' cooperative. This information was vital to determine progress from dependency on subsidized farming inputs. Information on perceived alternative crops from the traditional crop was also provided under this theme.

4.3.1.1 Duration of membership in a cooperative by individual respondents

The variable provided information on duration on participants who were members of a cooperative and thus benefitted from subsidized agricultural inputs for 2 – 4years, 5 – 9 years, 10-14 years, 15-19 years and above 19 years. The participants were required to state the number of years they had been members of a cooperative and thus benefiting from subsidized inputs. It was found that out of the 50 respondents 26 or 52% were members for 2 to 4 years, 22 or 44% for a period of 5 to 9 years and the remainder 2 or 4.0% 10 to 14 years. None of the participants had been members for more than 14 years as summarized in Table 5 below.

Table 6: Duration of membership in a cooperative

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 2-4 years	26	52.0	52.0	52.0
5-9 years	22	44.0	44.0	96.0
10-14 years	2	4.0	4.0	100.0
Total	50	100.0	100.0	



Years of benefiting from subsidized inputs * Age distribution of participants Cross tabulation

Count		Age distribution of participants			Total
		Less than 26 years old	26-35 Years old	36 years and above	
Years of benefiting from subsidized inputs	2-4 years	1	16	9	26
	5-9 years	2	8	12	22
	10-14 years	0	0	2	2
Total		3	24	23	50

Source: Field survey (October 2017)

The information in the above table is further summarized in the chart on the right.

4.3.1.2: Youth participation in farming cooperatives

The study showed that the mode of cooperative members (26) had spent only 2-4 years of membership while the least (2) had spent 10-14 years as members. The median category was 22 members who had membership of 5-9 years.

4.3.1.2: Pearson Chi-Square test to establish a possible association between variables

Table 6 presents results of the Chi-Square Tests which were run to determine whether there was an association between the number of years for which respondents had been members of respective cooperative and their ability to sustain cultivation the same crop (maize) given that subsidized inputs were to be withdrawn. The two-sided Asymptotic Significance Pearson Chi-Square statistic was 0.345 which is greater than 0.10 implying that there was no association between the number of years of membership and ability to wean from dependency on subsidized inputs to sustain farming the same crop.

Table 7: Pearson Chi-Square Test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.131 ^a	2	.345
Likelihood Ratio	2.472	2	.290
Linear-by-Linear Association	2.064	1	.151
N of Valid Cases	50		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .32.

4.3.2: Major crop grown on the farm

Maize was the leading crop at 90%, beans 8% and cassava at 2%. This scenario indicated that only 10% of the respondents were engaged in growing crops other than maize as a major staple food/ cash crop.

Table 8: The major crop cultivated on the farm

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Maize	45	90.0	90.0	90.0
	beans	4	8.0	8.0	98.0
	cassava	1	2.0	2.0	100.0
	Total	50	100.0	100.0	

4.3.3: Availability of other crops grown on the farm

The respondents were asked whether besides from the major crop cultivated there other crops were grown on their fields. All the 50 respondents (100%) said yes they were engaged in cultivation of other crops as shown in Table 8 below. However this was to a very low scale insignificant to assure food security as compared to the main crop.

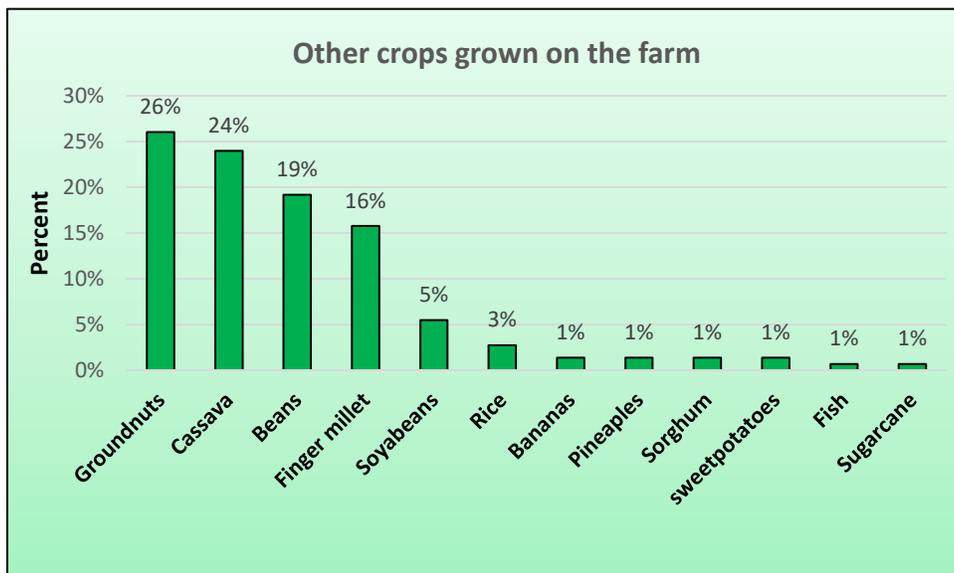
Table 9: Availability of other crops cultivated on the farm

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	50	100.0	100.0	100.0
	No	0	0.0	0.0	0.0

4.3.4: Other crops frequently grown on the farms

Respondents were asked to state other crops cultivated at their farms in order to identify potential crops that can be supported besides maize. A total of 146 valid responses and 3 invalid responses were obtained. The top five commonest crops with the most responses were groundnuts (26%), cassava (24%), beans (19%) and finger millet (16%). This information is summarized in Figure 3 below.

Figure 3: Frequency of other crops grown on the farm



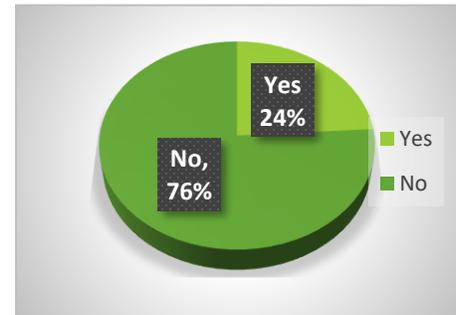
4.3.5: Perception on whether the main crop is easier to grow as compared to its alternatives

The variable sought to establish whether the respondents found the main crop easier to cultivate in all aspects in relation to other alternative crops. Of all respondents 76% stated that the main crop was more

difficult to grow while 24% of the responses indicated that the current crop (maize) was easier to grow as compared to its alternatives.

Table 10: Is the main crop is easier to grow as compared to listed crops?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid No	38	76.0	76.0	76.0
Yes	12	24.0	24.0	100.0
Total	50	100.0	100.0	



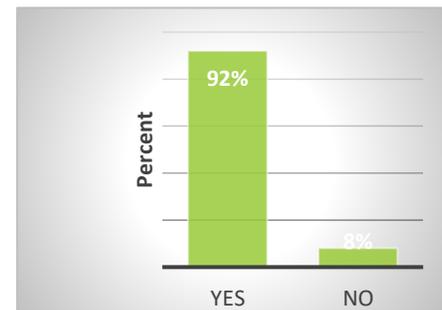
Source: Field survey (October 2017)

4.3.6: Respondents were able to identify a better alternative crop than the current main crop.

Under section B of the questionnaire was question number 9.0 which required respondents to state whether they had a better alternative food crop for cultivation. The result was that 92% equal to 46 participants said that they had a better alternative while 8% (4 participants) said that there was no better alternative.

Knows a better alternative to grow

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Yes	46	92.0	92.0	92.0
No	4	8.0	8.0	100.0
Total	50	100.0	100.0	



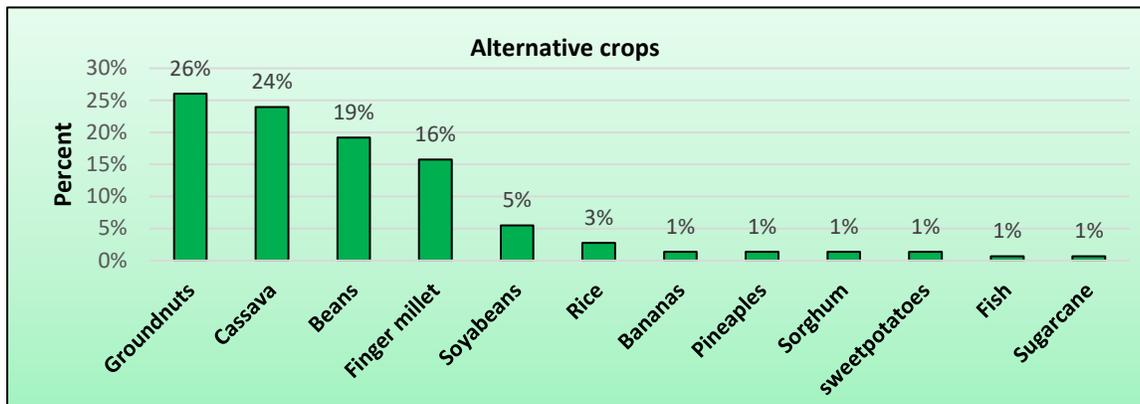
Source: Field survey (October 2017)

4.3.7: Alternative crops to the current main crop

Respondents were asked to list at least three (3) alternative crops which they would adapt to or whether they would still sustain the current major crop in an event where government FISP program was to be withdrawn.

A total 146 valid responses were obtained out of which 26% opted to fall back on groundnuts, 24% to cassava, 19% beans, 16% finger millet and 5% soya beans. These were the top five (5) frequently obtained responses of the total alternatives. This is illustrated in Figure 4 below.

Figure 4: Frequency of suggested alternative crops

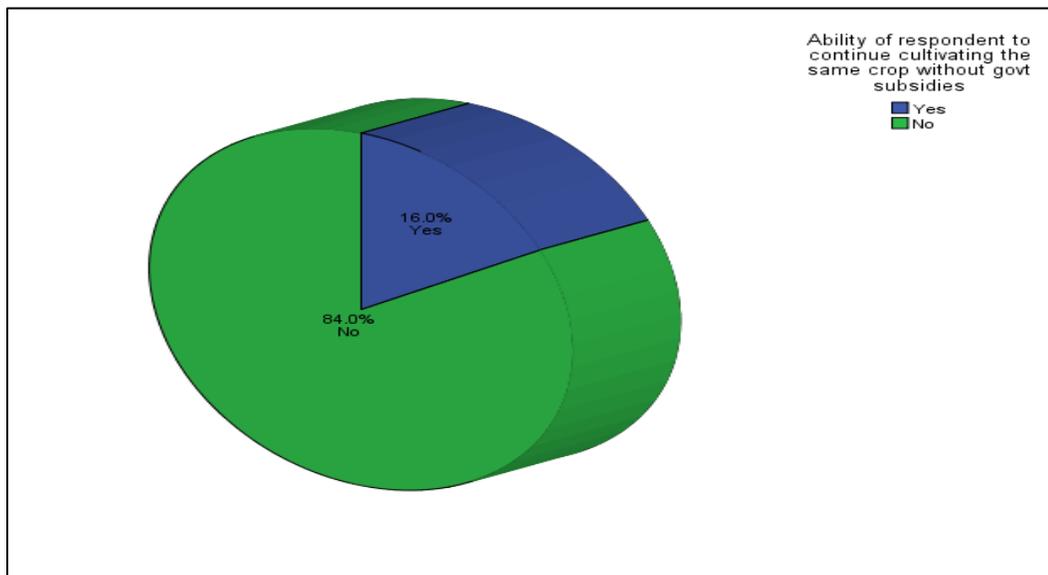


Source: Field survey (October 2017)

4.4.1.1 Respondents ability to continue cultivating the same size of arable land without subsidies

The study question had 50 valid responses of which 16% indicated that they could manage if the government discontinued subsidized inputs support while 84% of the respondents said that they couldn't continue (Figure 5 below).

Figure 5: Respondents ability to maintain cultivation of same size of arable land



Source: Field survey, October 2017

4.4.1.2 Respondents ability to cultivating the same size of arable land without subsidies by gender

In Table 9 below, the same data in figure 3 above was cross tabulated with gender and the result showed that of the 42 farmers who responded with **No**, 38% were females while 62% were males. Also of the 8 who responded with a **Yes**, 25% were female while 75% were males.

Table 11: Ability of respondent to continue cultivating the same crop without subsidies

Count		Gender distribution of participants		
		Female	Male	Total
Ability of respondent to continue cultivating the same crop without subsidies	No	16	26	42
	Yes	2	6	8
Total		18	32	50

4.4.1.3 Ability to sustain cultivating same arable land size without FISP by years of membership

When this data was cross tabulated in **Table 11** the 2 participants who had been benefitting from FISP for a period 10 – 14 years said that they couldn't sustain maize cultivation without subsidized inputs. On the other hand 6 of the 8 members that stated they could continue cultivating maize without subsidies were those who spent 2-4 years and 2 others who had been members for 5-9 years. None of those who had been members for 10-14 years and above acknowledged the ability to continue cultivating maize without subsidies.

Table 12: Ability of respondent to continue cultivating the same crop without subsidies

Count		Years of benefiting from subsidized inputs			Total
		2-4 years	5-9 years	10-14 years	
Ability of respondent to continue cultivating the same crop without govt subsidies	No	20	20	2	42
	Yes	6	2	0	8
Total		26	22	2	50

Source: Field survey (October 2017)

4.4.2: Main reasons for farmers' inability to sustain cultivation on same size of arable land

An open ended question was asked requiring respondents to state the main challenges. Responses were grouped respectively. Those responses relating to high cost of inputs comprised 90.5%, high transport costs 2.4% while 7.1% did not provide a response as seen in table 12.

Table 13: Reasons for respondents to downsize cultivation of subsidy supported crop

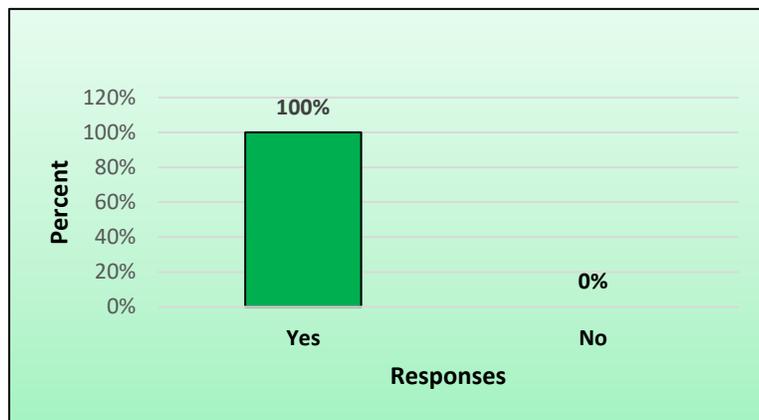
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid high cost of inputs	38	90.5	90.5	90.5
high transport costs	1	2.4	2.4	92.9
No response	3	7.1	7.1	100.0
Total	42	100.0	100.0	

Source: Field survey (October 2017)

4.4.3: Awareness of a responsible Camp Extension Officer (CEO) in the area

Respondents were asked to confirm if they knew the CEO responsible in their area. All the fifty respondents confirmed that they knew him (100 percent) as seen in **Figure 6**.

Figure 6: Respondents awareness of the responsible CEO



Source: Field survey, October 2017

4.4.4: Duration since last interaction with a Camp Extension Officer for farming related activities

Table 13 shows that 96% of the respondents had interacted with the camp extension officer in the last 3 months while 4% met with their camp extension officer in the last 6 months and 2% in the last 1 year respectively.

Table 14: Duration since the respondent last met the CEO for farming related activities

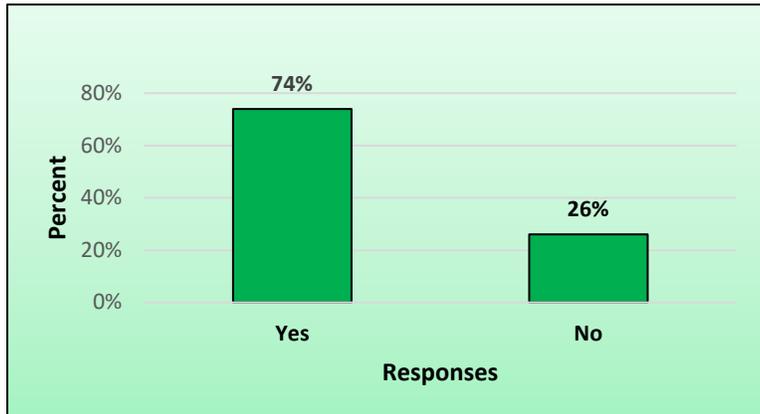
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid last 3 months	48	96.0	96.0	96.0
last 6 months	1	2.0	2.0	98.0
last 1 year	1	2.0	2.0	100.0
Total	50	100.0	100.0	

Source: Field survey, October 2017

4.4.5: Discussions on crop diversification with the farmers by the CEO in the past 1 year

Participants were asked whether they had an interaction with their CEO to discuss crop diversification in the last 1 year. There were 50 valid responses obtained as follows;- 37 or 74.0% acknowledged having had discussed crop diversification while 13 or 26.0% said they did not have an opportunity to discuss the subject as in Figure 8.

Figure 7: Discussions with CEO over crop diversification in the last 12 months

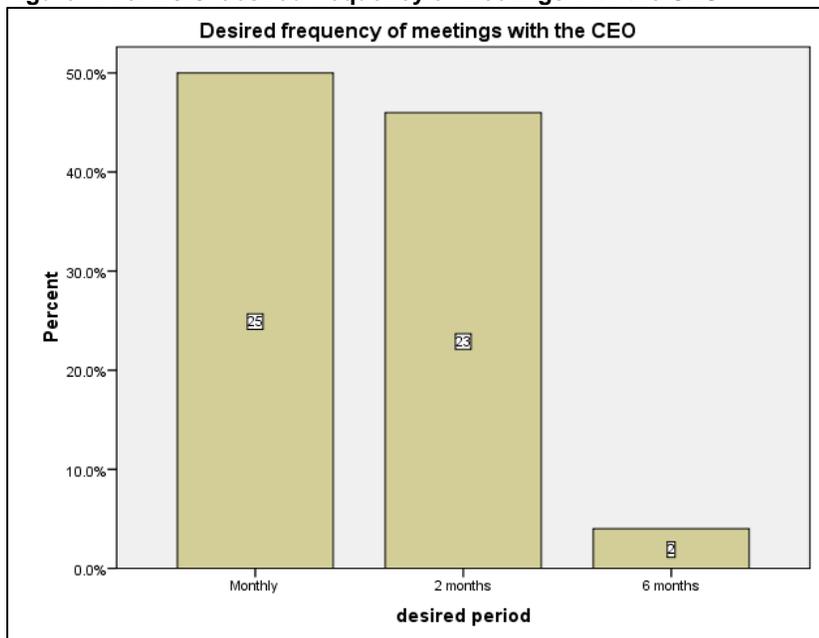


Source: Field survey, October 2017

4.4.6: Farmers desired frequency of interactions with the CEO

All the 50 respondents acknowledged having known an agricultural CEO responsible in their area. Against this back ground they were further asked on how frequent they felt they needed to be interacting with the officer.

Figure 7: Farmers' desired frequency of meetings with the CEO



Source: Field survey, October 2017

4.4.7: Desire for more knowledge on crop diversification

The participants were asked whether they desired more information on crop diversification and 100% of them acknowledged need for more knowledge on the subject as seen in table 14.

Table 15: Respondents desire for more information pertaining to crop diversification

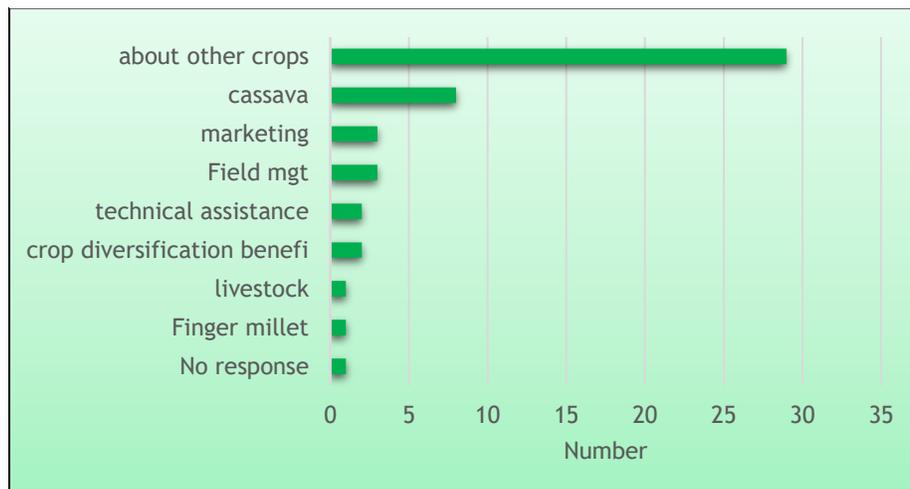
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	50	100.0	100.0	100.0

Source: Field survey, October 2017

4.4.8: Type of knowledge desired on crop diversification frequently suggested by farmers

The respondents were further asked to specify the kind of knowledge they needed on crop diversification and the responses were as shown in the table below. Out of all participants 58% representing 29 individuals referred their need to knowledge on various other crops while 16% or 8 specified their knowledge need on cassava growing. The others but one had varying responses from marketing of alternative crops, field management, generalized technical assistance, benefit of crop diversification, livestock and finger millet.

Figure 8: Type of knowledge desired by respondents in crop diversification



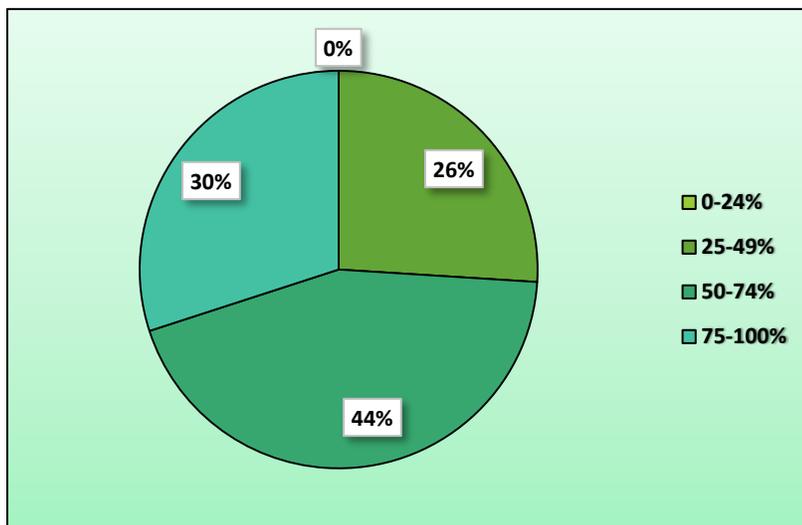
Source: Field survey, October 2017

4.5.1: Number of bags of main crop expected and actual harvested

The participants were asked to state the number of bags they expected to harvest and the actual harvested. This was intended to determine how the challenges they had faced were affecting their yields and or

harvest. None of the farmers were below 25% while 13 had harvested 25% – 49% of their expectation, 22 between 50 – 74% and 15 had 75 -100%. The mode therefore was a harvest ranging from 25% to 49% representing 30% of the sample. This is illustrated in Figure 9.

Figure 9: Percentage of actual harvest in relation to projected harvest

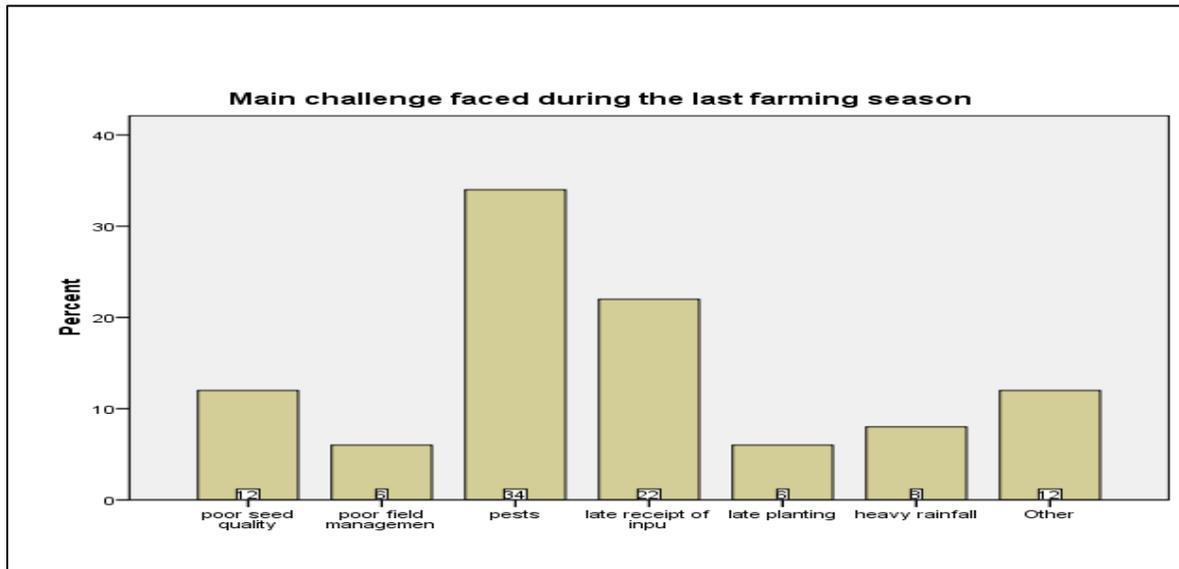


Source: Field survey, October 2017

4.5.2.1: Main challenges that were faced by farmers in the previous farming season

Participants were asked for the main challenge they had encountered during the last farming season and according to table 15 below the top six main constraints were pest's 34% followed by late receipt of inputs (fertilizers and seeds) at 22% and poor seed quality 12%. Others were 8% heavy rainfall, 6% late planting and 6% poor field management. Other reasons collectively were 12 % as in Figure 10.

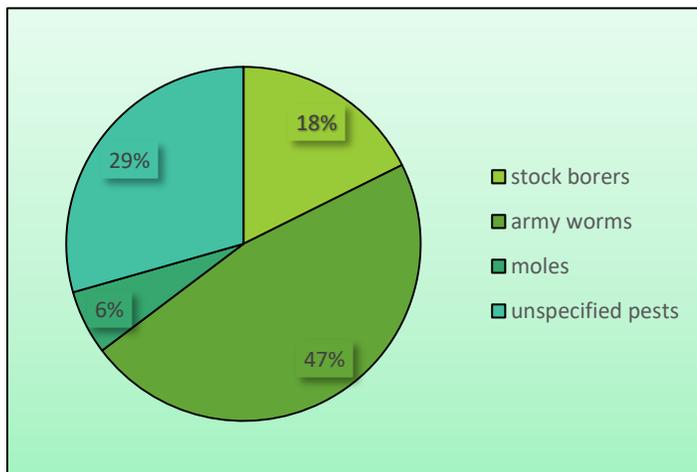
Figure 10: Main constraints encountered by farmers



4.5.2.1: Type of pests that attacked crops on the field in last farming season

The types of pests experienced referred to in Figure 10 were further summarized. According to Figure 11, According to it is evident from Figure 19.1 that army worms affected the majority farmers and amounted to 47% of those affected by pests followed by unspecified pests 29%, stock borers 18% and moles 6%.

Figure 11: Types of pests experienced



Source: Field survey, October 2017

4.5.3: Household level Food Security

The researcher intended to establish the level in terms of household food security and the proportion of households that were food secure. Table 15: presents the responses to the question on whether the respondent had harvested adequate food crop to sustain their family up to the next harvesting season. 26 said **yes** while 23 declined having had adequate food reserves. One (1) participant did not to respond to the question. That is 52 percent 46 percent and 2 percent respectively.

Table 16: Has the respondent got enough harvest to feed the family?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	26	52.0	53.1	53.1
	No	23	46.0	46.9	100.0
	Total	49	98.0	100.0	
Missing	System	1	2.0		
Total		50	100.0		

Source: Field survey, October 2017

4.5.4 Challenges which the farmers suggested the government to come in and address

Participants were asked to state the challenges they felt were beyond their capacity and needed the central government needed to address in the process of improving agriculture. The late inputs supply (30%) was leading followed by E-voucher system (18%) and farmer education (16%) as seen in table 16.

Among the top three constraints faced by farmers were late farming inputs supply was predominantly main concern for government to address as suggested by 30 percent of the respondents interviewed. This was followed by E-voucher system and farmer education at 18 percent and 16 percent respectively. The emergency of army worms is and other pests was another problem that was cited as an issue that couldn't be addressed by individual farmers. 6percent of the respondents also felt that the poor seed varieties on the market could be controlled by government. 6 percent of the respondents also indicated that FISP pack size needed to be upgraded. These responses have been summarized in Figure 12 below.

Table 17: Challenges that the government needs to address

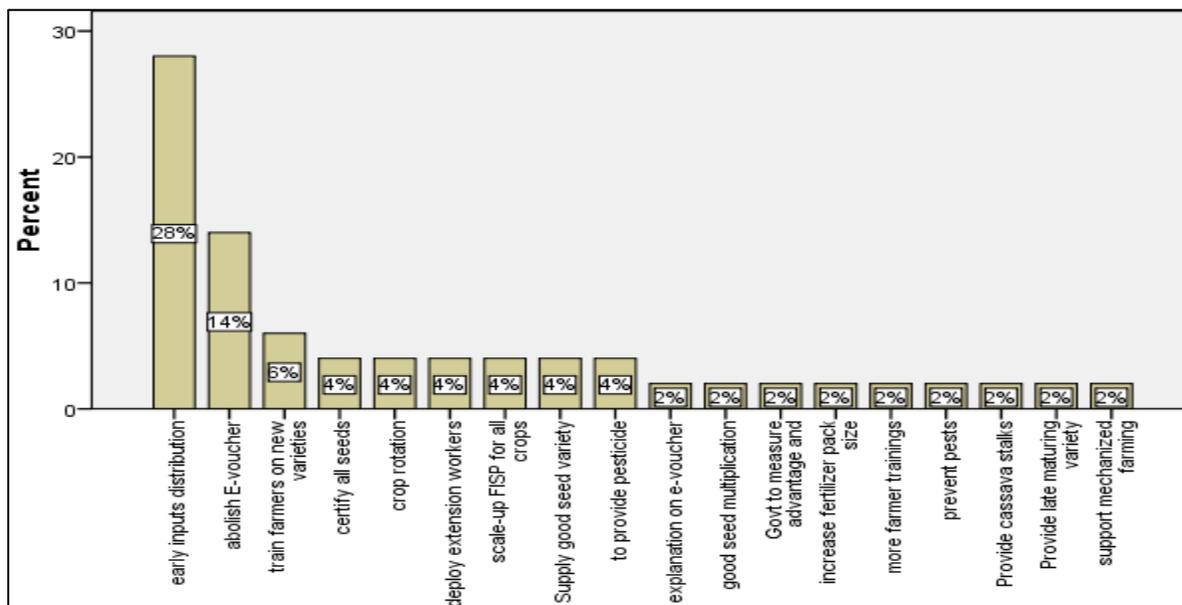
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Late input supply	15	30.0	30.0	30.0
	E-voucher	9	18.0	18.0	48.0
	Farmer education	8	16.0	16.0	64.0
	Pests	3	6.0	6.0	70.0
	Poor seed variety	3	6.0	6.0	76.0
	Small number of packs	3	6.0	6.0	82.0
	Uncertified seed	3	6.0	6.0	88.0
	Inadequate labour	2	4.0	4.0	92.0
	Acquisition of cassava stalks	1	2.0	2.0	94.0
	Crop diversification	1	2.0	2.0	96.0
	Early maturing variety	1	2.0	2.0	98.0
	Limited seed variety	1	2.0	2.0	100.0
	Total	50	100.0	100.0	

Field survey, October 2017

4.5.5.2: Proposed solutions to be undertaken by government to address the identified challenges

Respondents were asked to suggest solutions to the observed problems and the valid responses obtained were 45 (90%) of which the commonest was early inputs distribution at 28%, abolishing E-voucher system at 14% and training of farmers in new crops 6%. This information is summarized in Figure 13 below.

Figure 12: Farmers' proposed solutions to be undertaken by government

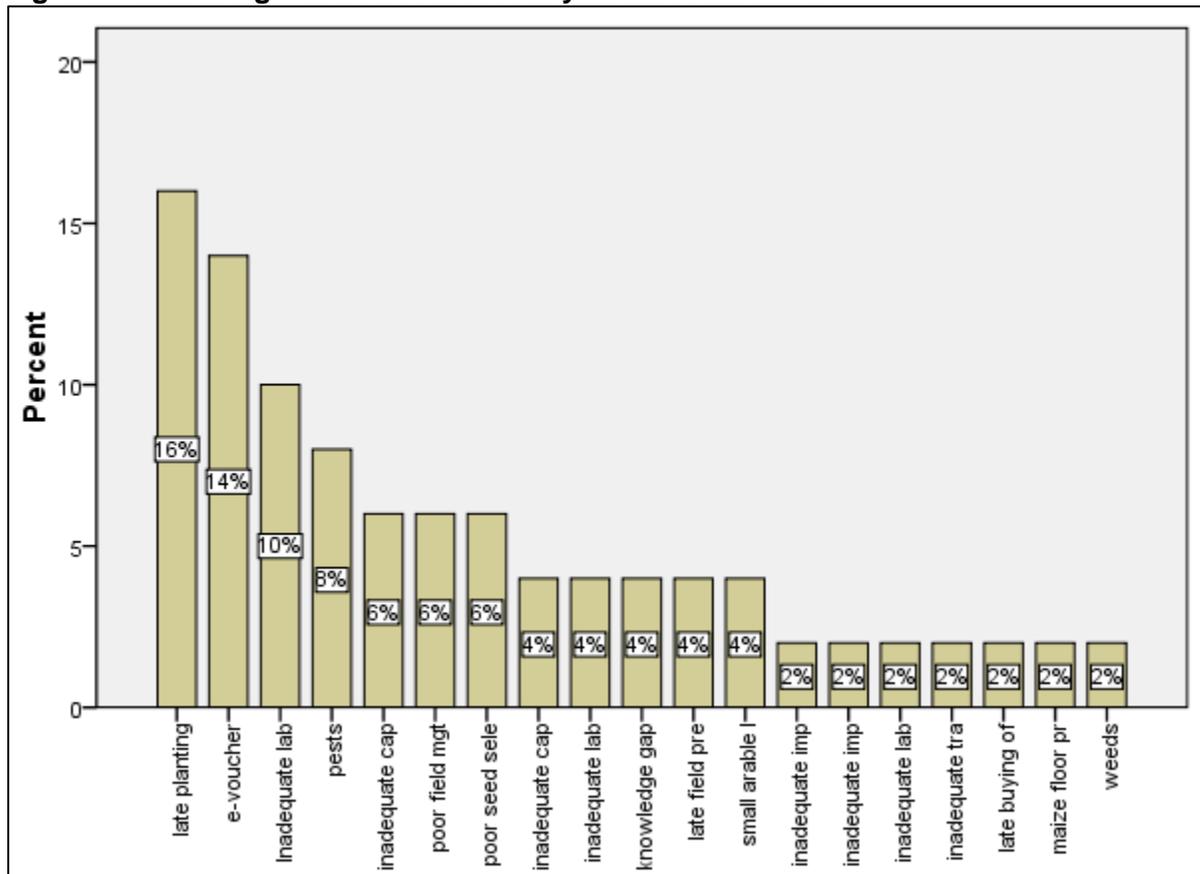


Source: Field survey, October 2017

4.5.6 Challenges which respondents felt needed their own effort to address

According to Figure 14, among the top four (4) most frequent responses were *late planting* at 16% of the total responses, e-voucher 14%, inadequate labour 10% and pests 8%. The range for the rest of the solutions was 6% to 2% spread across fifteen (15) different solutions.

Figure 13: challenges to be addressed by individual farmers

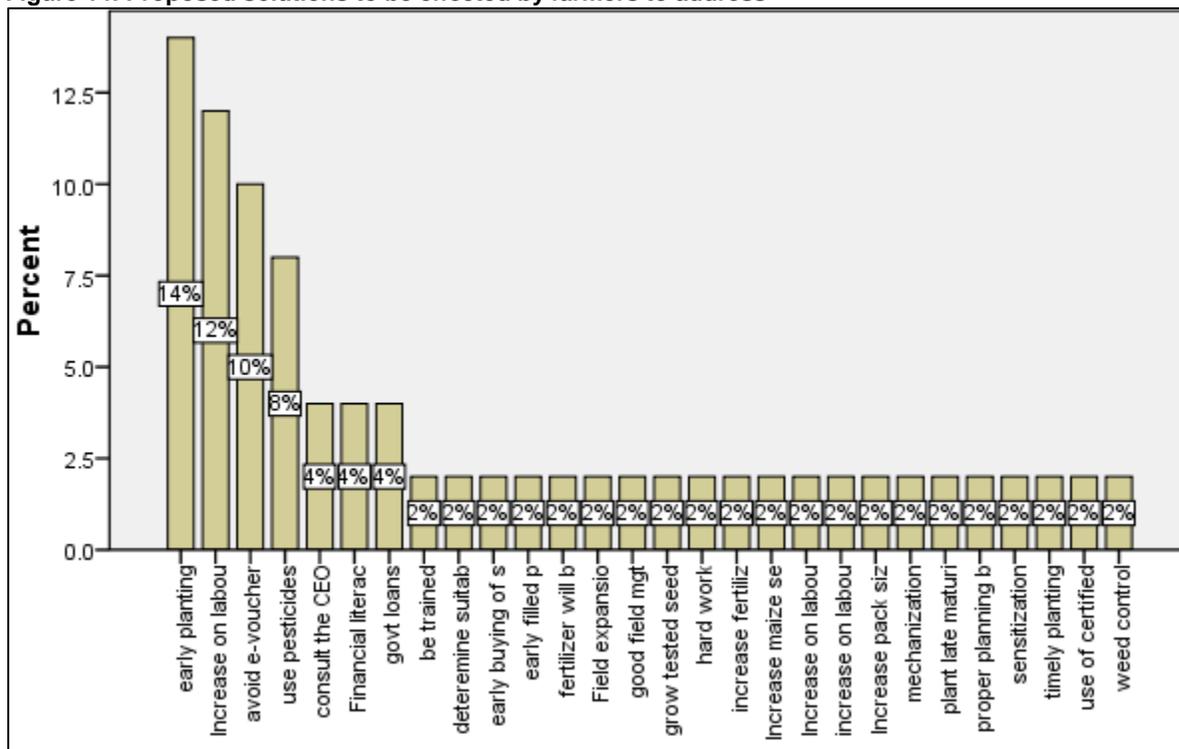


Source: Field survey, October 2017

4.5.7: Proposed solutions to be effected by farmers to address their identified constraints

According to Figure 14 below, the top four (4) solutions were early planting 14%, increase labour 12%, and avoid E-voucher 10% and use of pesticides at 8%. There was also one (1) invalid response.

Figure 14: Proposed solutions to be effected by farmers to address



CHAPTER FIVE: DISCUSSION OF FINDINGS

Introduction

This chapter discusses the findings of the research study conducted in Mufili agricultural camp of Luwingu district. The major discourses hinge on challenges faced by small scale farmers which may impede accelerated crop diversification in the sampled population and extends to household level food security concerns. Eight (8) major themes emerged during data analysis as seen in the next subsections.

5.1 THEME 1: Equitable Access to FISP inputs and Youth Participation in Farming Activities

After analyzing the data, the study revealed that only 3 out of 50 (6 percent) respondents were youths. Youths in this age band didn't seem to be adequately benefiting from FISP subsidized inputs as 6% was too low. Participating in farming activities as regards being members of farming cooperatives and. Only 3 or 6% constituted the selected sample.

Low participation of the youths implies that they do not acquire necessary skills (through interactions with Camp Extension Officers and hands on experience) during their most productive period in life and this negatively impacts their productivity even in later years even if they were to access subsidized inputs or other government and or stakeholder support.

5.2 THEME 2: Crop Diversification Efforts and Practices

Respondents were asked whether there were other crops cultivated on their farms. All the 50 respondents (100%) stated that they were engaged in cultivation of other crops.

Responses on the available crops on the form showed that maize was the leading crop at 90%, beans 8% and cassava at 2%. This scenario indicated that only 10% of the respondents were engaged in growing crops other than maize as a major staple food/ cash crop. Majority of the population depend in the area depend on maize as a main staple food. This could be a reason besides others reasons to explaining why maize was the dominantly cultivated crop. In addition, the quantity of alternative crops grown is to a very low scale insignificant to assure food security as compared to the main crop.

Of the three main crops identified, only maize cultivation was currently receiving significant government support in form of subsidized inputs to farmers. This explains to a great extent why the majority of farmers were unable to adapt to other alternative crops as main crops at their farms. This being the case it entails that there is need for government to actively support growing of alternative crops other than maize for crop diversification and consequently agriculture as a whole to be well exploited before it can be taken up as a main contributor to GNP.

5.3 THEME 3: Self sustainability of small scale farmers and independency from subsidized inputs

According to the sample surveyed, only 8 out of 50 respondents (16%) stated that they could continue cultivating the main crop given a situation where the government discontinued subsidized inputs support while 42 (84%) of the respondents said that they couldn't sustain maize growing.

Furthermore, the study showed that 76% of the respondents perceived the current main crop to be too demanding to cultivate as compared to alternative crops while 24% said that it was easier to grow. Respondents were further asked for main reasons as to why they perceived cultivation of the main crop and 90.5% of the sample gave responses relating to high cost of inputs comprised 90.5%, high transport costs 2.4% while 7.1% declined to respond.

Chi-Square test result

Chi-Square Tests which were run to determine whether there was an association between the number of years for which respondents had been members of respective cooperative and their ability to sustain cultivation the same crop (maize) given that subsidized inputs were to be withdrawn. The two-sided Asymptotic Significance Pearson Chi-Square statistic was 0.345 which is greater than 0.10 implying that there was no association between the number of years of membership and ability to wean from dependency on subsidized inputs to sustain farming the same crop.

These results revealed that the majority of farmers are still **highly dependent** on government's subsidized inputs owing to the high cost of production. This signified that, given withdrawal of subsidies on fertilizers, seeds and transportation for any reasons, production at household level would drastically diminish. This conclusion was also strongly supported by the Chi-Square test result that showed that there

was no strong association between duration of receiving subsidized inputs and ability of farmers to wean from dependency on subsidized inputs.

5.4 THEME 4: Proposed Alternatives to main Crop

There was an outright indication that known and available alternative crops exist which could be encouraged through subsidizing the related farming inputs to increase productivity by providing a wide range of options to farmers.

It was noted that all farmers only received subsidized inputs support related to maize (fertilizer, seeds and transport to markets/ selling points mainly to Food and Reserve Agency (FRA) but not for other crops, hence maize was the most widely cultivated crop.

The following were the top five most frequent responses to maize cultivation in their order;-

- Groundnuts 26%
- Cassava 23%
- Beans 19%
- Finger millet 15%
- Soya beans 5%

This result shows that small scale farmers in the population are alive to the fact that these are alternative ecologically supported crops which the government can equally support in leveraging crop diversification efforts. Adaptation would be easier since farmers themselves have identified them.

5.5 THEME 5: Farmer - Camp Extension Officer Interactions

The study results concluded that the assigned extension officer was actively interacting with farmers in Mufili area as all the 50 respondents acknowledged that they personally knew the CEO responsible in their area. Furthermore, 96% of the respondents had interacted with the camp extension officer in the last

3 months while 4% met with their camp extension officer in the last 6 months and 2% in the last 1 year respectively.

Generally the participants who met the camp extension officer more frequently (52.1%) also desired that the meetings should be made monthly, 22 (45.8%) opted for bi-monthly meetings and 1 (2.1%) preferred to be interacting at 6 monthly intervals.

Participants were asked whether they had discussed crop diversification with the CEO in the past 1 year. The responses obtained were that 37 or 74.0% said *Yes* while 13 or 26.0% said *No*. The desire for more information on crop diversification was further consolidated through responses obtained from Question 18 which required participants to state whether they needed more information on crop diversification or not, and further specify the kind of information they much wanted. Out of all participants 58% representing 29 individuals referred their need to knowledge on various other crops while 16% or 8 specified their knowledge need on cassava growing. The others but one had varying responses from marketing of alternative crops, field management, generalized technical assistance, benefit of crop diversification, livestock and finger millet.

This scenario established the extent to which the meetings facilitated by agricultural Camp Extension Officer (CEO) were advancing the efforts to diversify crops through encouraging farmers during those meetings which were good opportunities.

There was an excellent farmer – extension health worker contact ratio which is desirable for advancement of agricultural sector. Also noticed was that crop diversification information was being disseminated through the CEO appreciably and the farmers were still desirous of more information from the CEO.

5.6 THEME 6: Household Level Food Security

The researcher asked participants the number of bags (of the main crop on the farm) they harvested against the expected in the last farming season. None of the farmers were below 25% while 13 had harvested 25% – 49% of their expectation, 22 between 50 – 74% and 15 had 75 -100%. The mode therefore was a harvest ranging from 25% to 49% representing 30% of the sample.

Respondents were also asked whether they had harvested adequate food crop to sustain their family up to the next harvesting season. 26 said **yes** while 23 declined having had adequate food reserves. One (1) participant did not to respond to the question. That is 52 percent 46 percent and 2 percent respectively.

The researcher intended to establish the level in terms of household food security and the proportion if households that were food secure. These responses also entails the extent to which the challenges faced by farmers were affecting their yields to achieve household food security. Only 52% were food secure despite having had access to subsidized inputs. This is an indication of the importance of implementing measures that address bottlenecks to productivity in order to boost productivity of individual households.

5.7 THEME 7: Challenges Identified by respondents

Challenges which respondents felt needed governments effort to address

In order to classify the challenges faced by farmers, participants were asked to name the challenges which they felt were beyond their capacity and thus needed the central government to intervene. According to the responses in Table 17, the top three were late delivery of farming inputs (30%) followed by E-voucher system (18%) and farmer education (16%) as seen in figure 12. It can be concluded that the respondents truly do not have decision space on the listed top three challenges hence genuinely needs stakeholders to act on them.

The emergency of army worms and other pests was another problem that was cited as an issue that couldn't be addressed by individual farmers. 6 percent of the respondents also felt that the poor seed varieties on the market could be controlled by government. 6 percent of the respondents also indicated that FISP pack size needed an upward adjustment.

Challenges which respondents felt needed their own effort to address

The proposed solutions that respondents felt they were capable of resolving on their own were listed in descending order according to the frequency of responses, the top four (4) problems identified were late planting at (16%), e-voucher 14%, inadequate labour 10% and pests 8%. The range for the rest of the solutions was 6% to 2% spread across fifteen (15) different solutions as shown in Figure 14.

This information revealed the available capacity in famers' ability to identify and streamline roles for both themselves and the government to play in improving agricultural productivity. It was realised that farmers

were able to distinguish solutions that needed government intervention from those that were supposed to address by farmers themselves.

According to the responses in Figure 14 it shows that most farmers had challenges with labour, late planting (which was usually related to inadequate labour), e-voucher uncertainties and inadequate capital. It was noted that the majority of the constraints to be addressed at individual level were widespread but attainable given that problem focussed guidance is provided through the CEOs. Arising issues such as inadequate labour could also be addressed at farmer level through proper planning.

5.8 Limitations of the study

The study may have been limited by some of the following factors;-

- Evidence of engaging in agriculture was limited to questionnaire responses as physical viewing of arable land could not be conducted hence subjective data may be used for analysis since some respondents may not be always truthful.
- The data collection instrument was not designed in local language, hence misinterpretation of the questions during questionnaire administration by the research assistants may not be entirely well articulated.
- On questions relating to operations of the CEO, some respondents might have withheld factual information for fear of being reported by the researcher even though confidentiality was assured to them.

5.9 Strengths of the study

- The sample size was adequate to obtain results that can be generalized to the population of the district. The study was conducted in two farmer cooperatives in the district and a sample of 50 respondents was selected.
- Social-economic status of the residents of Mufili agricultural camp is very similar to other farmer cooperative members located in other parts of the district, hence results were representative of the whole district.
- Adequate critical responses were provided by the selected participants.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The revelations in this current study in Mufili agricultural camp show that available subsidized farming inputs are those linked to maize cultivation only. This can be strongly attributed to slow crop diversification. This fact that maize received the most if not all support in relation to alternative crops, explains the reason why most farmers were found to have developed dependency on cultivating the crop. Furthermore, the government serves as a major institution that buys maize crop from farmers through Food Reserve Agency. The study revealed that in an event that subsidized inputs were withdrawn, only 16 percent of the respondents stated that they could continue cultivating the crop.

Furthermore, it was found that there was no association between duration of membership in a cooperative and ability of the farmer to graduate from dependency on subsidized inputs. This means that there is no marginal growth of productivity among the supported farmers thus it is necessary to explore alternative crops to preferred by those individuals that can be supported or even adaptation to new methods of growing the same crop which may be cost effective.

Most of the farmers were ready to diversify agriculture and had some knowledge about crop diversification. Therefore, if the farmers are willing to diversify crops, then current farmer support services should thrust their focus on educating the farmers with respect to preferred choice of crops and how these alternatives can better be undertaken. All the respondents expressed the desire for more knowledge on farming, implying that it is possible to change mind-sets.

The struggle in fostering the shift of national economic dependence from mining to agriculture through promotion of cost effective appropriate technologies, is anchored also on crop diversification based on the cost imprecation among other factors. Farmer support services are also provided by government employed staff to provide knowledge on the issues of crop diversification.

Given that the current farmer support services are appropriate, they are supposed to result in farmers' individual improvement in annual incremental productivity and independency from over reliance on government support at some point.

6.2 Recommendations

- The government should actively support alternative ecologically suited crops to encourage farmers to explore crops that can be less dependent on subsidized farming inputs support. Inputs support should lean towards the choices made by a farmer instead of an imposed support. Since the results revealed that the main reason why most farmers still upheld main cultivation as their main crop was partly because of the availability of government support in terms of subsidies, the government can direct support towards alternative crops to promote diversification. It is apparent that if other crops are supported overall productivity in the agricultural sector can be achieved.
- The responsible ministries need to deliberately empower youths below 26 years in agriculture through deliberate allocation of farming inputs. This increase in access to FISP inputs will support early skills acquisition in farming to improve future productivity.
- The defined term of membership to benefit from FISP that have been decided by government to continue being upheld so that farmers will be able to work hard towards independency and prepare their exit plans from the program and accord other farmers a chance to enroll on the program. i.e only 16% were ready to continue cultivating maize if subsidies on inputs were to be withdrawn.
- Farmer extension workers to package their messages in a way to encourage farmers to explore markets for crops beyond maize.
- The responsible ministries need to address the problem of late farming inputs as it affects productivity as schedules of planting and fertilizer application are defined since most of these farmers are dependent on rain fed agriculture.

It is hoped that if these recommendations are implemented by the responsible line ministries, they are going to leverage on the concerted efforts aimed at scaling-up crop diversification and subsequently boost agriculture.

Through operationalizing new knowledge and concepts, agricultural productivity can significantly improve to become an economic mainstay in the context of economic diversification from mineral explorations to agriculture.

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APPENDICES

APPENDIX 1: List of Research Study Variables

- i. Sex
- ii. Age
- iii. Marital status
- iv. Sex of the Household Head (HH)
- v. Duration of membership in a cooperative
- vi. Ability to sustain farming without subsidized farming inputs
- vii. Main reasons for failure to sustain growing of main crop
- viii. Main crop on the farm
- ix. Availability of other crops grown
- x. Example of other crops cultivated
- xi. Whether the main crop is more Labor and cost requirement as compared to alternatives
- xii. Participants perception on better alternative crop
- xiii. Best substitute crop
- xiv. Awareness of a Camp Extension Officer
- xv. Duration since last meeting with Camp Extension Officer
- xvi. Discussions on crop diversification
- xvii. Respondents desire for more knowledge on crop diversification
- xviii. Expected harvest last season
- xix. Actual harvest last season
- xx. Main challenge faced last season
- xxi. Best solution to the challenge experienced
- xxii. Needed quantity of bags to have food thorough out the year
- xxiii. Challenges to be addressed by the government
- xxiv. Perceived best solution to the challenge by the government
- xxv. Challenges to be addressed by individual farmers
- xxvi. Perceived solution from individual farmers

APPENDIX 2: Questionnaire

Questionnaire No: _____



School of Humanities And Social Sciences

Department of Development Studies

Questionnaire for Mufili agricultural camp respondents

Research topic:

An investigation in the constraints affecting crop diversification in

Mufili agricultural camp – Luwingu district

Dear respondent,

I am a student of the Information and Communications University pursuing a development Studies program which requires me to conduct this study in partial fulfilment of the requirements to complete my study program.

You have been randomly selected to take part in this research and I appreciate to have your input in this study. I further assure you that any information which will be collected will be kept confidential and will be used for academic purpose and to generate new knowledge on crop diversification.

Feel free and provide your views.

Thank you.

7.3 Research Questionnaire;

Section A: Biographic data

Q No.	Question	Response	Official use
1	What are your full names?	
2	What is your sex?	<input type="checkbox"/> Female <input type="checkbox"/> Male	
3	How old are you?	<input type="checkbox"/> <25 years <input type="checkbox"/> 26 -35years <input type="checkbox"/> >36 years	
4	What is your marital status?	<input type="checkbox"/> Single <input type="checkbox"/> Married <input type="checkbox"/> Other	
5	What is the sex of the household head?	<input type="checkbox"/> Female <input type="checkbox"/> Male	

Section B: Diversity of crops on the farm

6	How many years ago did you join as a member in the cooperative?	<input type="checkbox"/> 2 - 4 years <input type="checkbox"/> 5 - 9 years <input type="checkbox"/> 10- 14years <input type="checkbox"/> 15- 19years	
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Other specify.....

7 If government and or cooperating partners withdraw current inputs support, can you manage to continue cultivating the same size of land as at now? Yes No

8.0 What is the major crop on your farm?

8.1 Apart from the major crop, are there other crops which you grow at your farm? Yes No

8.2 List at least two crops referred to in 8.1

9 Do you think the main crop is easier to grow than the other crops? Yes No

10 Do you think there is an alternative crop which can be a better food crop to grow? Yes No

11 If the answer to 8.0 was Yes, list down the best alternative

Section C: Sustainability

12 If government and or cooperating partners withdrew current inputs support, can you manage to continue cultivating the same size of land as at now? Yes No

- 13 If the answer to question 10 was no, what could be the main challenge?
- 14 Do you know a Camp Extension Officer responsible in your area? Yes No
- 15 How long ago did you last meet with your Camp Extension Officer to discuss farming? Last 3 months Last 6 months Last 1 year
- 16 Have you ever discussed crop diversification in the last 1 year? Yes No
- 17 How often would you want to be meeting with the camp extension officer? Monthly 2 months 6 months
- 18 Any reasons as to why you need more frequent meetings with camp extension officer?
.....
.....

Section D: Challenges and their proposed solutions

- 19 How many bags of the main crop were you expecting to harvest last farming season?
- 20 How many bags of the main crop did you actually harvest last farming season?

- 21 What do you think were the challenges?
-
-
- 22 According to you, what is the best solution to
the challenge mentioned in Q21?
-
- 23 How many bags do you need per farming season
to have food through?
- 24 What is the major challenge in current farming
do you think the government needs to address?
-
- 25 According to you, what is the best solution to
the challenge in Q19?
-
- 26 What is the major challenge in current farming
do you think needs your effort to be addressed?
-
- 27 What do you think are the solutions to the
challenges observed in Q21
-

THANK YOU FOR PARTICIPATING IN THIS ACADEMIC RESEARCH

Privacy statement:

Respondent information contained herein shall be used only for academic purpose and shall be secured to protect the dignity and privacy of the person interviewed. All personal details shall be considered and treated as confidential, unless with express authority of the respondent.

APPENDIX 3: List of selected cooperatives in Mufili Agricultural Camp

1. Sande Zone
 - a. Natusensele cooperative
 - b. Mipa cooperative
 - c. Machesa cooperative
2. Chambeshi Zone
 - a. Chitamba cooperative
 - b. Ukutangila tekufika cooperative

APPENDIX 4: Authorization letter from Department of Agriculture & Livestock

Information and Communications University,
P.o Box 30226,
Lusaka - Zambia.
15th September, 2017.
Cell: +260978303567 /academic@icuzambia.net

The District Agricultural Coordinator,
Luwingu District,
P.o Box, 460035,
Luwingu.

Dear Sir/ Madam,

REF: AUTHORITY TO CONDUCT A RESEARCH STUDY AT MUFILI AGRICULTURAL CAMP

Reference is made to the stated subject.

I am a bonafide student at Information and Communications University pursuing an undergraduate program in the school of Humanities. In my final year I am required to conduct a research project. It is against this back ground that I have written to your office for your permission to administer questionnaires to fifty (50) respondents (active members of Mufili agricultural camp.

Your kind permission will be highly appreciated. Enclosed herein is a data collection instrument for your reference.

Yours faithfully,


Lupupa Nana Ernest

Phone #: +260978678254

Email: nanalups@gmail.com

cc. Academic Supervisor

cc. personal file

*NOTED
NO OBJECTION
S.A.S.O*



APPENDIX 5: Research Budget

No.	Item	Cost (each) zmk
1.	Proposal Presentation	800
2.	preparation of pilot study instruments	80
3.	Pilot the instruments	150
4.	Refine the instruments	00
5.	Final preparation of instruments	350
6.	Data collection and data cleaning	400
7.	Data entry in excel template	00
8.	Learn how to use of SPSS	300
9.	Data analysis using SPSS	00
10.	Report writing/ dissertation	00
11.	Present research dissertation during ICU residential	1,300
12.	Present research dissertation at Radisson Blue Hotel	1,300
13.	Publish the research paper in a journal (data bundle)	120
Total Budget		4,800.00

APPENDIX 6: Schedule of research activities

Scope of the study;

The study was designed to be phased in a systematic order to avoid overlapping of unrelated activities, while accommodating time and material resource mobilization within acceptable timeframes. This practice is critical in social research. The schedule was as tabulated below.

Start date	End date	Activities	Comment
5 th June 2016	8 th April 2016	Proposal Presentation	during June exams
10 th June 2017	20 th June 2017	preparation of pilot study instruments	Joysam enterprises prints 10 copies
22 nd June 2017	27 th June 2017	Pilot the instruments	Pilot at chiponde village
28 th June 2017	30 th June 2017	Refine the instruments	
1 st July 2017	5 th July 2017	Final preparation of instruments	Joysam enterprises prints 50copies
6 th July 2017	15 th July 2017	Data collection and data cleaning	Data collection in Mufili village
15 th July 2017	20 th July 2017	Data entry in excel template	
21 st July 2017	30 th July 2017	Learn how to use of SPSS	To consult researchers
31 st July 2017	10 th August 2017	Data analysis using SPSS	
11 th August 2017	20 th January 2018	Report writing/ dissertation	
TBA 2018	TBA 2018	Present research dissertation	At UNZA during ICU residential
29 th August	31 st August 2018	Present research dissertation	At Radisson Blue Hotel during IMDC 2018
September 2018	September 2018	Disseminate the research in an international journal	