GENDERED INFLUENCES AFFECTING ADOPTION OF IMPROVED COMMON BEAN PRODUCTION TECHNOLOGIES DISSEMINATED BY VARIOUS AWARENESS CREATION METHODS IN KARATU DISTRICT, TANZANIA

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OFAGRICULTURAL EDUCATION AND EXTENSION OF THE SOKOINE UNIVERSITY OF AGRICULTURE. MOROGORO, TANZANIA.

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ABSTRACT

The importance of common bean in improving socioeconomic in the community is well known. There are different improved common bean production technologies introduced by both government and NGOs in Tanzania such fertilizer application especially DAP during planting. However, none or low adoption of recommended common bean production practices like recommended land preparation, seed selection, weed control, fertilizer application and harvesting method is reported everywhere. Cross sectional research design was employed in this study whereby 400 respondents (154 males, 125 females and 121 youth men and female) involved in Scaling up of Improved Legume Technologies (SILT) project and those who were not involved in SILT project were interviewed using questionnaires and checklist questions as the main tools. Data were analyzed by using statistical package for social science (SPSS 16.0), where frequency and percentage were used to determine distribution of the study variables inferential analysis was used to test how independent variables affect the adoption of improved common bean varieties. Result from the study shows that accessibility of information through radio, demonstration and extension agents was relatively high to men than women and youth. This was due to interventions of SILT project. The study further revealed that farmers in SILT project were aware on improved common bean technologies like improved seed varieties, storage and harvesting than those who were not in SILT project. The study concludes that Men have higher access to information on improved common beans production technologies as compared to women, boys and girls. Therefore, the study recommends to the extension workers and NGOs such as SILT that there is a need to address gender inequalities with regard to ownership and control over resources and information sources at household level which impacts on adoption of common bean. This can be achieved through using the strategy of gender mainstreaming in all projects targeting farmers.

DECLARATION

I, Ernesta Sanga, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

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DEDICATION

This work is dedicated to my late beloved parents, my father Gerald Mwasanga and my mother Editha Kilongo who laid the foundation of my study.

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LIST OF ABBREVIATIONS AND SYMBOLS

ACORD	Agency for Cooperation and Research in Development
AES	Agriculture Extension Services
AGRA	Alliance for a Green Revolution in Africa,
AHSC	Academic health science centre
CAN	Calcium Ammonium Nitrate
CIMMTY	*Centro Internacionale de mejoramientro de maizy Trigo*
DAICO	District Agricultural Irrigation and Cooperative Officer
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus Group Discussion
IFAD	International Fund for Agriculture Development
IFPRI	International Food Policy Research Institute
IITA	The International Institute of Tropical Agriculture
ILT	Improved Legume Technologies
SA	Sulphate of Ammonium
SILT	Scale up of Improved Legume Technologies
SPSS	Statistical Package for Social Science
SSA	Sub-Saharan Africa
SUA	Sokoine University of Agriculture
T&V	Training and Visit
TARP 11	Tanzania Agriculture Research Project Phase Two
TSP	Triple Super Phosphate
UNHABITAT	United Nation agency for human settlements and sustainable urban development
VEO	Village Executive Officer

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Gender and Development issues in the world continue to generate interest among researchers and policy makers (Wagura *et al*., 2014). Gender is a social construct, it refers to the social meaning of and roles assigned to being biologically male or female, the relationships between them, and the nature of the social and economic hierarchies that these relationships produce, United Nations agency for human settlements and sustainable urban development (UNHABITAT, 2010). Njuki *et al.* (2011) defined gender as 'the socially constructed roles and status of women and men, girls and boys. It is a set of culturally specific characteristics defining the social behavior of women and men, and the relationship between them. Gender roles, opportunities and constraints are as dynamic as are variations in different farming activities (Leavens and Anderson, 2011).

According to Aregu *et al.* (2011) gender roles and relationships influence the division of work, the use of resources, and the sharing of the benefits of production between women and men. In developing countries, rural women, men and youth play different roles in agriculture productivity (Food and Agriculture Organization FAO, 2013). Agriculture plays an important role in reducing poverty and serves as an engine for growth in developing countries (Lyimo *et al*., 2014). According to United Republic of Tanzania (2015), the significance of this sector in terms of economic growth has been recognized by the fact that it plays an important role in food security, employment, and export earnings. It is estimated that 70% of the labour force in sub-Saharan Africa (SSA) work in agriculture while 67% of the labour force in South Asian are employed in the same sector (Maxwell,

2001). Based on its importance, several countries in SSA including Tanzania have put efforts to improve agriculture sector.

In almost all societies, men and women differ in their activities and undertakings regarding access to and control of resources and participating in decision making in agriculture. Men and women, girls and boys contribute significantly to agricultural production yet, their access to these agricultural resources differ (Doss 2006; FAO, 2013). Women in most countries including Tanzania contribute 60-80% in agriculture (Mehra and Rojas, 2008). In spite of the contribution of women in agriculture, it is evident that they did not have as much access to and control over agricultural resources as men.

In Africa agricultural sector, women are responsible for producing 80% of the food, as opposed to men who tend to engage more in income-generating activities such as cash crop production, perhaps because of their responsibility of availing food for the family (Mehra and Rojas, 2008). Despite this essential contribution to household food production and provision, access to resources such as appropriate technologies, modern farming methods, markets, credit and extension services for women is limited (FAO, 2011). It has been widely acknowledged that in most African countries, customary laws and practices toward how land can be used, managed, and transferred discriminate against women, (Agency for Cooperation and Research in Development, ACORD, Oxfam and Action Aid, 2012). Often, development and technology interventions tend to be male-focused, with the assumption that the men are the important farmers and technology related information and benefits will trickle down to other household members including women (Aregu *et al*., 2010). Women are deprived of access to major agricultural resources (AGRA, 2013). The gender inequality in various sectors including agriculture and in many developing countries imposes costs on society in terms of unexploited potential in achieving

agricultural output, food security and economic growth. This is why efforts for promoting gender equality in productivity and access to productive resources and economic opportunities are increasingly becoming high on the development agenda. These efforts include provision of agricultural extension service to all farmers irrespective of their gender.

In Tanzania, farmers have been accessing agriculture information from extension workers through interpersonal communication. However, this seems to be inefficient given that the ratio of extension staff to farmers is increasing. According to report from Africa Soil Heath, ASH (2015) the average ratio of agricultural extension officers to farming families is 1:630, although this ratio varies considerably by region. This leads to low achievement of the current extension service in the country with respect to reaching out to farmers with timely and relevant information. Since information is critical in agriculture, dissemination methods are seen as one of the solutions to rapidly get information to farmers. There are different dissemination methods which are used in delivering agricultural information to the farmers (Stienen *et al.*, 2007). These include field days, demonstrations, educational tours, on-farm trials, farmer field schools, training and visit, mass media such as computers, internet, mobile phones, radio and television.

The extension system in Karatu District like in many other parts of Tanzania is also gradually changing to use various dissemination methods including demonstration, radio and technology brief to deliver appropriately packaged agricultural information to farmers so as to improve agricultural production including common bean productivity. Karatu District in collaboration with Scaling up of improved legume technologies project (SILT), The Africa Fertilizer and Agribusiness Partnership (AFAP) and Farm Radio International (FRI) have been working to strengthen these methods to enable farmers obtain up to date

information about recommended common bean production technologies, market, price trend, consumer preferences, weather and soil moisture condition appropriate for bean production. Along this, there have been reforms in the existing dissemination method and selection of innovative technologies for bean production developed by SILT project to continuously empower rural populations, with an attempt in ensuring that adult men and women, girls and boys can have access from different dissemination methods to enhance adoption of common bean technologies. However, smallholder farmers' level of adoption based on their gender and gendered factors influencing the adoption of recommended common bean production technologies disseminated in Karatu District is not well known. This study therefore was intended to assess gendered influences affecting the adoption of recommended bean production technologies in Karatu District.

1.2 Problem Statement and Justification

Extension provision in the agricultural sector has been more often biased against rural women and youth farmers as they often lack access and control over productive resources and technologies that are affordable and appropriate to their needs (Quisumbing and Pandolfelli, 2010; Swanson and Rajalahti, 2010). In this case several initiatives taken by developing countries) are currently underway to improve rural extension delivery including improving dissemination/ awareness creation methods with a focus on gender equity and social inclusion in order to improve adoption of recommended technologies (Deere and Doss, 2006; FAO, 2010; Mbo'o-Tchouawou1 and Colverson, 2014). Therefore, improving agricultural productivity and development and thereby improving smallholder farmers' income requires increased efforts in influencing farmer to adopt yield enhancing technologies like improved bean varieties. According to the World Bank and International Food Policy Research Institute (IFPRI)–World Bank (2010), FAO and IFAD (2008), gender plays a role in smallholder farmer's adoption of new technologies.

However, little is known on gendered influences affecting adoption of recommended technologies in Tanzania (Slavchevska, 2015 and Kamau *et al.*, 2014). Various studies assess factors influencing adoption of recommended technologies without considering gender perspectives (Mwakatwila, 2016). This study intends to investigate gendered influences affecting adoption of improved beans production technologies disseminated using various awareness creation approaches in the Karatu District.

1.3 Justification of the Study

Common beans are important food and commercial crop in Tanzania (Ahmed *et al.*, 2012). It is a major source of employment, income and food security for many rural households. The crop is extensively produced in Mbeya, Songwe, Morogoro, Iringa, Ruvuma, Arusha, Manyara and Rukwa in Tanzania. Tanzania has the potential to double the record of common beans produced per hectare with increased yields alone through adoption of improved common beans technologies. This study assessed gendered influences affecting adoption of improved common bean production technologies disseminated by various awareness creation methods in Karatu district. Information obtained from this study will generate useful knowledge to development planers policy makers and practitioners in reducing poverty through increasing agriculture productivity and strengthening common bean farming and use.

1.4 Objectives of the Study

1.4.1 Overall objective

To assess gendered influences affecting adoption of improved common bean production technologies disseminated by various awareness creation methods in the study area.

1.4.2 Specific objectives

i) Determine gender differences in accessing information on improved common bean production technologies disseminated through awareness creation methods in Karatu District.

ii) Identify gender differences in the level of adoption of improved common bean production technologies disseminated in Karatu District.

iii) Determine gender factors influencing adoption of improved common bean production technologies disseminated in Karatu District, Tanzania.

1.4.3 Research questions

i) Who gains access to information on improved common beans production disseminated through different awareness creation methods?

ii) Are there gender differences on the level of adoption of improved common bean production technologies disseminated by various awareness creation methods in Karatu District?

iii) Which are gendered factors influencing adoption of improved common bean production technologies disseminated by various awareness creation methods in Karatu District?

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 The Concept of Gender and Gender Relations

Njuki *et al.* (2011) defined gender as 'the socially constructed roles and status of women, men, girls and boys. It is a set of culturally specific characteristics defining the social behavior of women and men, and the relationship between them. Gender roles, opportunities and constraints are as dynamic as are variations in different farming activities (Leavens and Anderson, 2011). According to Aregu *et al.* (2011) gender roles and relationships influence the division of work, the use of resources, and the sharing of the benefits of production between women and men. Women face several constraints in accessing and controlling productive resources due to the inequalities which are perpetuated by socially constructed norms embracing male dominance (Nkhonjera, 2011). For instance, men are largely responsible for cash crop farming and income generating activities within the household (Sambrook, 2011). Again, the management of crops which traditionally form the household diet is often the primary responsibility of women (Sambrook, 2011; Leavens and Anderson, 2011). Gender inequalities in agriculture is reported among Sub-Saharan African countries in form of farmers' access to adequate productive resources such as land, credit, agricultural inputs, education, extension services, and appropriate technology which results in relative inefficiencies of male and female farmers (Ayoola *et al*., 2012).

2.2 The Concept of Adoption of Agricultural Technologies

2.2.1 Technology adoption

Various authors define technology in different ways; Lavison. (2013) define technology as the means and methods of producing goods and services, including methods of

organization as well as physical technique. These authors define new technology as new to a particular place or group of farmers, or represents a new use of technology that is already in use within a particular place or amongst a group of farmers. Technology is the knowledge that permits some tasks to be done more easily (Lavison, 2013). Agricultural technologies include all kinds of improved techniques and practices which affect the growth of agricultural output (Jain *et al.*, 2009). Agriculture technology is critical because it increase agriculture productivity (Challa, 2013). Technology helps to improve a given situation to a more desirable level. It assists the applicant to do work easier than he would have in the absence of the technology hence it helps save time and labor Bonabana-Wabbi, (2002).

Adoption is defined in different ways by various authors. Loevinsohn *et al*. (2013) defines adoption as the integration of a new technology into existing practice and is usually proceeded by a period of 'trying' and some degree of adaptation. Other studies define adoption as the extension service recommendations of using only new certified seed (Doss, 2003; Bisanda, 2012). According to Bonabana-Wabbi (2002) adoption is a mental process an individual pass from first hearing about an innovation to final utilization of it. Adoption is in two categories; rate of adoption and intensity of adoption. The former is the relative speed with which farmers adopt an innovation, has as one of its pillars, the element of 'time'. On the other hand, intensity of adoption refers to the level of use of a given technology in any time period (Bonabana-Wabbi, 2002). According to Rogers (1999), adoption refers to the decision to use a new technology, method and practice by a firm, farmer or consumer. Adoption is not a permanent behavior; an individual may decide to discontinue the use of an innovation for a variety of personal, institutional or social reasons one of which could be the availability of an idea or practices that is better in satisfying his or her needs. The adoption or rejection of an innovation is the consequence

of diffusion of an innovation. Diffusion is a process by which new ideas are communicated to the members of a social system.

2.3 Awareness Creation Methods and Adoption

Exposure or awareness can be defined as the degree at which technologies are known to the users (Simtowe, 2012). The rate of exposure is a critical variable explaining adoption. It is the proportion of farmers that have been exposed to the technology. Adoption is defined as the degree of use of a new technology and its potential (Simtowe, 2012). The rate of adoption is a critical variable in estimating the returns to research and development investments. Exposure or awareness to modern technologies like new varieties is one of the critical drivers and the first step to adoption of technologies. Farmers must first know about the technology and thereafter take the decision to adopt or not.

2.4 Common Bean Production Technologies

The common bean (*Phaseolus vulgaris*) is a major staple in Eastern and Southern Africa, where it is recognized as the second most important source of dietary protein and the third most important source of calories. Animal protein is seldom affordable by the poor in developing countries, so the bean provides the chief and sometimes the only source of protein (Hillocks *et al.*, 2006). The importance of common bean as a food crop in Tanzania cannot be over emphasized as most of the estimated 80% rural community who depend on agriculture for their livelihood and the urban poor take common beans in their daily diet, Pan-African Bean Research Alliance (PABRA Database, 2015, Ministry of Agriculture Food and Cooperative (MAFC) (2015). In tropical and sub-tropical countries, the per capita consumption of beans may vary from country to country and region to region, within a country, however generally there is often a higher consumption of bean among low income families both in rural and urban areas (Hillocks *et al.*, 2006).

Despite the importance of beans, its production is not convincing. The average bean production in Tanzania stands at 1.5t/ha instead of 2.8t/h under good management practice (Akibode and Maredia, 2011). This is attributed by low adoption of recommended bean production technologies, for example less than 15% of farmers use fertilizers and 95% rely on hand weeding (Simtowe, 2012). In order to improve beans production, adoption of recommended beans production practice is imperative. These include recommended common beans varieties, fertilizers, spacing, weeding, and pest management practices.

2.5 Common Beans Production Practices

2.5.1 Land preparation

Land preparation is important to ensure that the beans field is ready for planting. A well-prepared field controls weeds, recycles plant nutrients, and provides a soft soil mass for transplanting and a suitable soil surface for direct seeding. Land preparation covers a wide range of practices from zero-tillage or minimum tillage which minimizes soil disturbance. It typically involves plowing to "till" or dig-up, mix, and overturn the soil; harrowing to break the soil clods into smaller mass and incorporate plant residue, and leveling the field. Most fields under cultivation are managed based on their soil's crop production potential and different soils are managed in their own way to reduce costs and to ensure profitability (Ondrej and Hunady, 2007).

In Karatu District the recommended land preparation by Scaling up of Improved Legume Technologies (SILT) project is to make the field free from weed, stones, water logging condition, plowing and harrowing by using hand hoe, oxen or tractor. This is done one month before planting and the recommended period of land preparation is during February and this is normally done by men.

2.5.2 Common beans variety

Beans (*Phaseolus vulgaris*) originated along with maize in Mexico, Central and South America over 7 000 years ago. The family of the beans is Fabaceae, sub-family Papilionoideae and genus *Phaseolussensustricto*. The genus *Phaseolus*is now planted around the world and in different cultivars, such as, common green beans, kidney beans, french bean, runner bean, black beans, among others (Hillocks *et al.,* 2006). Within each species there are many seed types which differ in size, shape and colour. In each type there are different cultivars and the seeds of these cultivars differ very little from one another. However, considerable differences may occur in adaptability, growth habit, disease resistance and many other characteristics (Schwiertz, 2003).

Tanzania has traditionally grown local varieties of beans which are Nkanamna, Mukeredu, Nanka, Gonka, Beti10, Fimwititu and Kibwebwe that are commonly used in making makande, samosa (dishes involving mixing cereals with beans) dishes or in mtori (mashed banana and beans porridge) whereas, the large seeded common bean genotypes such as Masukanywele, Lyamungu 90, Kablanketi, Kigoma, Chipukupuku and Uyole 98 are commonly used to supplement cereal dishes and for breakfast (Mghase, 2010). The recommended varieties which are economically good are like Uyolenjano, kablanketi, Masukanywele and Lyamungu 90. As reported by Mghase (2010), these varieties combine the high yield potential, responsiveness to improve and the resistance to diseases, and mature early. In Karatu District the recommended common beans variety by Scaling up of improved legume technologies (SILT) project are Uyolenjano, Lyamungu 90, Jesca, Lyamungu 85, Selian 97 and Selian 94.

2.5.3 Fertilizer

Fertilizer is very important input for intensive beans production. Common fertilizers used particularly in beans fields range from organic to inorganic. Only large-scale producers

use inorganic fertilizers. Most of middle and lower level farmers do not use fertilizers because they produce for home consumption as opposed to larger scale common bean producers who produce for commercial purposes (IITA, 2018). The organic fertilizers are farmyard manure and compost which are found locally and not very widely used. Inorganic fertilizers such as Urea, Triple Super Phosphate (TSP), Di-Ammonium Phosphate (DAP), Sulphate of Ammonium (SA) and Calcium Ammonium Nitrate (CAN) are widely recommended. DAP or TSP is recommended to be applied during planting as basal fertilizers while CAN or SA or Urea are recommended to be applied during top dressing. Phosphate and Nitrogen nutrients are the most important nutrients in beans production.

Different types of fertilizers are recommended by Scaling up of improved legume technologies (SILT) project at Karatu District according to stages and size of farms. For example DAP is recommended during planting, and is recommended to be applied at the rate of 100 kg per hector or 40 kg per acre while NPK during planting is recommended to be applied at the rate of 230 kg per hector or 92 kg per acre and Minjingu phosphate during planting is recommended to be applied at the rate of 230 kg per hector or 92 kg per acre, but top dressing is not required.

2.5.4 Spacing

To avoid nutrient competition sufficient spacing between plants and rows is vital to get maximum yield in given plot of land. Appropriate spacing enables the farmer to keep appropriate plant population in his field. Hence, a farmer can avoid over and less population in a given plot of land which has negative effect on yield (Baloch *at el.,* 2002). Enough space, along with other favorable conditions, allows the plant roots to grow profusely both vertically in deeper parts of the soil and horizontally to cover a larger area,

and when roots are spread to a larger volume of soil, they tap more nutrients, which results in the development of larger plants with larger numbers of tillers and grains. The optimum spacing essential for proper beans crop development and high grain yields depends on cultivar, soil fertility, and season. No single spacing recommendation, however, is best for all beans cultivars, International Rice Research Institute (IRRI, 1991). The recommended spacing at Karatu District by Scaling up of improved legume technologies (SILT) project is 10 cmx 25 cm for single row where by one seed is planted per hole.

2.5.5 Weed control

Weeds are the most important biological barriers in beans production in a way that a noticeable part of the production costs are allocated to them and are among the most important inhibiting factors with regards to increasing beans production (Mudge, 2004). Weeds also serve as alternative hosts for many plant diseases and animal pests that attack crops; they also harbour various bacterial and fungal diseases (Akobundu *et al*., 1999). Weeds should be controlled to minimize competition for nutrients, water, sunlight and space. Weeds are also a host for some common pests. Weeds can be controlled manually or chemically, or using a combination of the two approaches. Losses caused by weeds exceed the losses from any category of agricultural pests. The total annual loss of agricultural produce from various pests, weeds account for 45%, insects 25%, diseases 25% and other pests 5% (Rao, 2000). Frequency of weeding is an important factor of weed control in beans production; however, weeding frequency depends on number of factors like plant spacing, time of planting, location of the field and beans variety. In Karatu District the recommended weeding practices by SILT project are manual weed control and chemical weed control where by manual weed is done about 2 weeks after planting and second weeding (5-6 weeks after planting) and chemically weed control is by using herbicides such as *Stomp 500EC, Galex 500EC*, Pursuit plus or *Fusilade*. The application

rate for stomp is 200 ml per 20litre of water (1000 ml per 100litre of water per acre). The application rate for galex500 EC is 150 ml per 15litresof water (750 mls per 75 litres of water per acre). This is applied once after four weeks.

2.5.6 Disease and pest control

Research in East Africa has shown diseases and insect pests to be the most limiting factors to common bean production and one of the greatest challenges confronting farmers (Broughton *et al.,* 2003). The prevalence and importance of each pest and disease varies depending on the location, season, year, and cultivar (Kimani *et al*., 2001). The main biotic constraints in Eastern Africa were listed in order of importance by Kimani *et al.*, (2001) anthracnose (*Colletotrichumlindemuthianum*), bean stem maggot (BSM) (*Ophiomyia* spp.) and *Acanthoscelidesobtectus*), root rots (*Fusariumsolani*f. sp. *phaseoli*), common bacterial blight (CBB) (*Xanthomonas. phaseoli*), aphids, rust, and bean common mosaic virus (BCMV) (*Poty viru s*spp.). Bean stem maggots are widespread and cause serious damage, especially for late planted crops grown under unfavorable conditions (Kimani *et al*., 2001). Low yields are often caused by a combination of pests including thrips, pod borers and plant-suckers (*Helicoverpa, Maruca,* and *Clavigralla*), foliage beetles (*Oothecas*pp.), whiteflies (*Bemisiatabacci*), and pollen and blister beetles (Kimani *et al.*, 2001). The common bean disease control in Karatu District by SILT project is the use of integrated pest management practices (IPM) which includes crop rotation, mixed cropping (cultivating beans and maize in the same farm), early planting of beans, and the use of pesticides such as Thiamethoxam products (e.g. Actara and Sotiva) at the rate of 50mls in 60lts of water per acre. This is sprayed once after four weeks.

2.5.7 Harvesting and storage

Weather conditions play a major role in harvesting common bean. Although it is not easy to do, is the optimal to harvest common beans is at 17 to 18 percent moisture. This will

hold splitting and seed coat damage to a minimum. This is because harvesting at lower moisture levels may results in an excessive percentage of split common beans and checked seed coats. Delaying harvesting can cause huge losses and getting the grain dry. The recommended harvesting time by SILT project in Karatu is when the leaves and pods are dry and yellow-brown and threshed by beating. Then the grain should be dried and winnowed to remove chaff, dust and other rubbish, shriveled, diseased, broken grains and grains of other varieties to achieve high quality. Then the grain should be stored in containers including plastic or metal drums or PICS (Purdue Improved Cowpea Storage). The grain bags should be stacked on a raised platform or wooden pallet away from the wall. Direct contact of storage bags with the ground should be avoided.

2.6 Factors Affecting Adoption of Recommended Common Beans Technologies

2.6.1 Gender roles

Gender issues in agricultural technology adoption have been investigated for a long time and most studies have reported mixed evidence regarding the different roles men and women play in technology adoption (Bonabana-Wabbi, 2002). Mwangi *et al*. (2012) did a research on gender differentials in the adoption of improved maize production technologies in Mbeya Region of Tanzania. The results indicated that the adoption of improved maize seed and fertilizer is biased by gender, where female-headed households adopt the technologies less; this scenario can be attributed to the fact that female-headed household have limited access on information and training. In analyzing the impact of gender on technology adoption, Morris and Doss (1999) had found no significant association between gender and probability to adopt improved maize in Ghana. They concluded that technology adoption decisions depend primarily on access to resources, rather than on gender and if adoption of improved maize depends on access to land, labor, or other resources, and if in a particular context men tend to have better access to these

resources than women, then in that context the technologies will not benefit men and women equally. Thus, it is agreed that gender have a significant influence on some technologies. Gender affects technology adoption since the head of the household is the primary decision maker and men have more access to and control over vital production resources than women due to socio-cultural values and norms (Tesfaye *et al.,* 2001; Mignouna *et al*., 2011). For instance, a study by Obisesan (2014) found that, gender had a significant and positive influence on adoption of improved cassava production in Nigeria. His results conquered with that of Lavison (2013) which indicated male farmers to adopt more organic fertilizer than their female counterparts.

2.6.2 Education

Education of the household has been found to significantly affect adoption of new technologies of farmers. According to a study by Laha and Kuri (2011) in India, farmers' years of schooling was found to have a positive effect on adoption of technology. The findings suggest that the more years a farmer had spent in school the more he can adopt new technologies. Other studies have found that education has positively associated with adoption (Doss and Morris, 2001; Simtowe *et al*., 2012). However, other studies have also found a negative relationship between education and adoption of new technologies; for instance, Nwachukwu and Onyenweaku (2007) in Nigeria.

2.6.3 Farm size

Depending on the characteristics of innovation and situational setting, farm size can have an effect on the rate of adoption. Farm size plays a critical role in adoption process of a new technology. Many studies have reported a positive relation between farm size and adoption of agricultural technology (Gabre-Madhin and Haggblade, 2001; Ahmed, 2004; Uaiene *et al*., 2009; Mignouna *et al.*, 2011). Farmers with large farm size are likely to adopt a new technology as they can afford to allocate part of their land to try new

technology unlike those with less farm size (Uaiene *et al*., 2009). Some studies have shown a negative influence of farm size on adoption of new agricultural technology (Yaron *et al.*, 1992). Farmers with small land may adopt land-saving technologies such as greenhouse technology, zero grazing among others as an alternative to increase agricultural production. However, in other situations farmers with small farms may adopt soil conservation measures to control soil erosion from reducing the farm demand for increased subsistence production.

2.6.4 Age

Age is also assumed to be a determinant of adoption of new technology. Older farmers are assumed to have gained knowledge and experience over time and are better able to evaluate technology information than younger farmers (Mignouna *et al.*, 2011; Kariyasa and Dewi, 2011). On contrary age has been found to have a negative relationship with adoption of technology. This relationship is explained by Mauceri *et al*. (2005) and Adesina and Zinnah (1993) that as farmers become more older, they decrease interests in long term investment in the farm. At the same time younger farmers are typically less risk-averse and are more willing to try new technologies. For instance, Alexander and Van Mellor (2005) found that adoption of genetically modified common beans is mostly adopted by younger farmers because they gain experience easily and increase their stock of human capital but adoption rate declines with age for those farmers closer to retirement.

2.6.5 Income

Wealthier farmers have better access to extension services and information and stand better chance to use their resources to try new technologies, *Centro Internacionale de mejoramientro de maizy Trigo* (CIMMYT, 1993). Generally, it is farmers with more resources in terms of capital, land and labour that are able to take advantage of new

technologies and practices. According to Diiro (2013), reported that income is expected to provide farmers with liquid capital for purchasing productivity enhancing inputs such as improved seed and fertilizers.Wambura (2004) found that young, richer and better educated farmers had higher extension contacts than poorer older and less educated farmers. However not all technologies have shown positive relationship between income and their adoption. According to Diiro (2013) indicate that income to farmers may undermine their adoption of modern technology by reducing the amount of household labor.

2.6.6 Household size

Household size may have positive or negative influence on adoption of technologies. For labour intensive technologies family size positively influences adoption. This is because for smallholder farmers, household labour is the most dependable source of labour. Consequently, household with more labour supply are expected to adopt labour intensive technologies. However, apart from the household size, scholar Kalineza *et al.* (1999) have centrally view because they emphasize on number of adults in the households who are able to work as a major factor influencing adoption of technologies. Senkondo *et al.* (1998) observed that household with many family members working in the farm field are associated with adoption of technologies.

2.6.7 Institutional variables

Institutional variable particularly extension services plays an important role in influencing the behaviors of farmers contact in adoption of improved technologies. Frequent extension contact is positively related to the adoption decision of farmers. Access to extension services has also been found to be a key aspect in technology adoption. Farmers are usually informed about the existence as well as the effective use and benefit of new

technology through extension agents. Extension agent acts as a link between the innovators (Researchers) of the technology and users of that technology. According to (Tesfaye *et al*., 2001 and Habtemariam, 2004), in their study reported that the availability of reliable information sources will enhance communication process and had significant associations with adoption of improved technologies. It has also been observed that regular visits of extension workers positively influence farmer's adoption (Obare *et al.*, 2010). The findings by Obare *et al.* (2010) also reveal that extension contacts provide information on price patterns, new varieties and available markets such as those aired through the media. This information increases farmers' ability to use farm resources optimally. Many authors have reported a positive relationship between extension services and technology adoption. A good example includes; Adoption of Imazapyr-Resistant Maize Technologies (IRM) by Mignouna *et al*. (2011) and adoption of modern agricultural technologies in Ghana Akudugu *et al.* (2012). Therefore, extension visits or contacts enhance a farmer's adoption of new technologies.

2.7 Conceptual Framework

Conceptual framework is the system of concepts, assumptions, expectations, beliefs, and theories that supports and informs the research (Robson, 2011). The conceptual framework of this study (Fig. 1) is based on the assumption that the adoption of recommended improved common beans technologies such as recommended fertilizers, recommended seed, recommended methods of weeding, recommended method of disease control and recommended method of harvesting is influenced by a number of independent factors (variables); like socio economic factors (age, sex, level of education, income, marital status, number of people in household, farm size and gender of head of household) and gender dynamic such as access and control over resource, gender needs and gender roles.

These factors (variables) are assumed to have direct influence on the adoption of recommended improved common beans technologies.

Independent variables **Dependent variables**

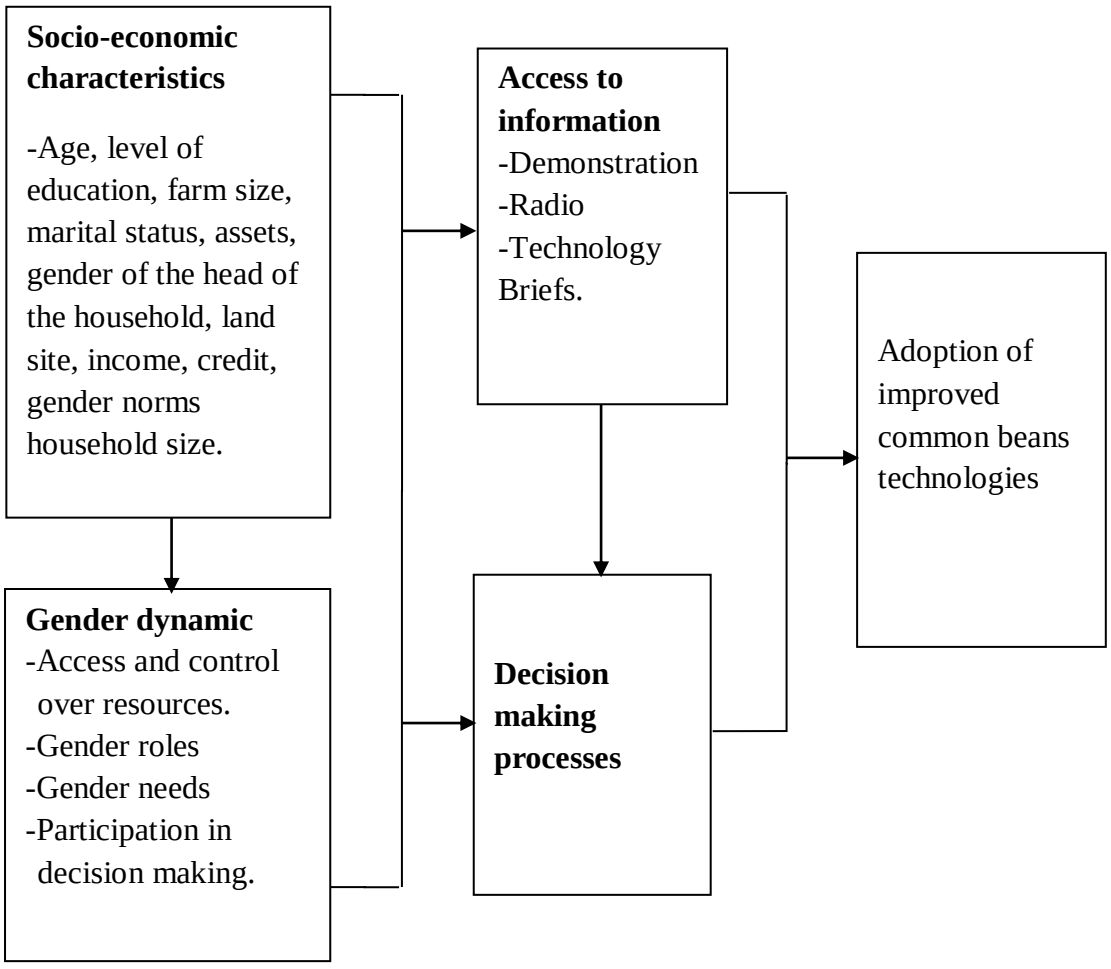

Figure 1: Conceptual framework for adoption of improved common beans

Source: Researcher's own construct survey

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Study Area

The study was conducted in Karatu District, one of seven districts of Arusha Region of Tanzania. It has an area of 3 300 square kilometer. It is bordered by the Ngorongoro District to the north, the Shinyanga Region to the west, the Monduli District to the East, and the Manyara Region to the South and South East. Administratively, the District Council is divided into 4 divisions, 13 wards, and 42 villages. The population of Karatu District is 230 166 people whereby 117 769 are males and 112 397 are females (Population and housing census, 2012).

Economic activities carried out in Karatu District are agriculture and livestock keeping. The main crops grown include common bean, sorghum, millet, maize, cassava, pigeon pees, groundnut, cowpea, castor oil, and sunflower which are commonly grown as food crop, while other crops grown as cash crops include tomatoes, Chinese, cabbage, onions, okra, eggplant, and African egg plants. The major Livestock kept are cattle, goats, sheep, pigs, poultry, and guinea fowls. Karatu District was selected because it is among the districts in Arusha Region, which is potential in common bean production and it is one of the districts where the recommended common beans production technologies have been introduced by SILT project.

3.2 Research Design

A cross-sectional research design was used in this study which allows data collection at one point in time and can be used for descriptive purposes as well as for a determination of

relationship between variables (Babbie, 2010). The design was also considered favorable due to limited resources like manpower and time for collecting data.

3.3 Study Population

The objective of the study centered on the gendered influences affecting adoption of common beans production technologies disseminated by various awareness creation methods in Karatu District. Smallholder common bean farmers of different gender categories who are in Scaling up of improved legume technologies (SILT) project and who are not in the project were the target population. The gender categories involved in this study were adult men and women and youth men and women as adopted from (Njuki *et al.*, 2011). In this study youth is a person between the ages of 15-35 years (National policy of Tanzania, 2012).

3.4 Sample Size determination and Sampling Procedure

Purposive sampling was used to select two wards out of 13 wards which are supported by SILT project. One village was selected purposively from each ward and therefore two villages under SILT project were selected. Also, one village from each sampled ward that were not involved in SILT project was selected randomly.

A sample of 400 respondents was selected by using simple random sampling procedure, where by half of the respondents were from villages with project and half were from village without project. Using the existing village household lists of each selected village (sampling frame), each member in each household were assigned a number, then those numbers were written on small piece of paper and put on a basket and shaken vigorously. Then each member was requested to pick one piece of paper from the basket where each

number corresponded to a household were included for the study. A sample of 400 respondents was determined by using the formula below proposed by (Yamane, 1967).

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

Where:
n = sample size;
N= population size of study area
e = level of precision
i.e. n=18800/1+18800 (0.0025) =400

3.5 Data Collection

3.5.1 Primary data

Both quantitative and qualitative data were collected. Quantitative data collected measured information sources, information needs, access and control of resources, decision making over resources, constraints encountered in beans production activities, means used to acquire various aspects of beans information, socio-economic characteristics of respondents and factors influencing adoption of bean production technologies. Respondents' socio-economic characteristics considered for this study included age, marital status, sex, education level, farming experience, farm size and income. Primary data were collected through face to face interviews by using a questionnaire administered to the 400 respondents by the researcher and enumerators.

Checklist was used to collect qualitative data during Focus group discussions (FGD). Four focus groups were conducted for whereby two groups were from SILT project village and two groups were from non-SILT project village. Each group was composed of 7-10 men or women, in separate and same sex groups. Also, Village Extension Officers from the selected four villages were interviewed as key informants to get their views by using a checklist.

3.5.2 Secondary data

Secondary data which were collected include information about beans production trend, institutions involving in providing beans information to growers, constraints or problems facing bean growers, various agronomic practices related to beans production, information needed to improve bean production, areas where beans is transported, availability of institutions dealing with beans growers and the role of farmers at beans selling market. These were obtained from District Agricultural Irrigation and Cooperative Office (DAICO).

3.6 Data Processing and Analysis

The collected primary data were summarized, coded and entered into the Statistical Package for Social Science version 20 (SPSS V20) computer software. Descriptive statistics particularly frequencies, cross-tabulations and percentages were obtained from the while Content analysis was used for analyzing qualitative data collected through FGDs and key informants.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

This chapter presents the findings of the study. The chapter is organized into various sections which include socio-economic characteristics of respondents; gender differences in accessing awareness creation methods for common bean production technologies, gender differences in the level of adopting improved common bean production technologies disseminated through awareness creation methods and gendered factors influencing willingness in adopting improved common bean production technologies.

4.1 Socio-economic Characteristics of Respondents

The characteristics described include age, marital status, education level, gender differences and source of income of farmers. Results as presented in Table 1 show that the predominant age group for women in the study area was 45-64 years which comprises 43.9% of female respondents and for men was 45-64 years which comprises 47.5% of male respondents. This is within the productive age group. The results match with that of Okwu and Ioorka (2011) who found the age group between 45 to 64 years as the most prevalent among farmers due to the responsibilities they have to feed the families. Also, the study results show that a fairly good number of respondents who were 89.7% young male and 96% young female aged between 25 and 44 years. This is also a working group that has responsibility of feeding the families as well as generating more income that can lead them into a better life. The elders aging 65 and above years were only (21.6% men and 2% women). This implies that the majority of interviewed respondents are in active age group that can engage in farming as their major economic activity.

On educational attainment, results presented in Table 1 shows further that the highest level of education attained by the respondents was secondary school education. However, it was found that majority (85%) being men and 76% women of respondents had completed primary education; while, 77% were young male and 77% were young female. The results further revealed that 8% of men and 19% of women had no formal education while only 1.7% of youth (boys) fall under the same category. None (00%) of the interviewed youth (girls) had no education. These results conform to the findings by Churi *et al.* (2012) who found that most of rural farmers have primary education that allows them to read, write and comprehend some technologies disseminated to them. Results presented in Table 1 show that 94% of men and 73% of women were married while only 6% of young male and 12% of young female were married. The majority of youth (boys) and girls were single as represented by 93% and 87.7%, respectively. This is supported by Mwilomo (2012) who found that majority rural youth engaging in agriculture were single. In respect to source of income, study findings in Table 1 show that 98% of men 97% of women, 88% of boys and 93% of girls drew income from farming activities. Very few respondents (2.5% men and 0.8% women) engaged in off-farm activities. It was important to note that none of the boys and girls earned their income from off farm activities, implying that they depended on agricultural activities as their main source of income.

Table 1: Socio-economic characteristics of respondent (n = 400)

Variable	Respondents (n = 400)							
	Men (162)		Women (123)		Boy (58)		Girls (57)	
	n	%	n	%	n	%	n	%
Age of respondents (yrs)								
Below 24	0	0	0	0	6	10.34	10	17
25-44	50	30.7	44	35.8	52	89.7	56	92
45-64	77	47.5	54	43.9	0	0	0	0
Above 65	35	21.6	25	2	0	0	0	0
Education level								
No education	13	8	24	19	1	1.7	3	5
Primary education	138	85	94	76	45	77	41	71
Secondary education	11	6.7	5	4	12	20	6	10
Marital status								
Single	5	3	3	2.4	54	93	51	89
Married	153	94	90	73	4	6.8	8	14
Divorced	4	2.4	15	12	0	0	0	0
Widow/widower	0	0	15	12	0	0	0	0
Source of income								
Farm activities	158	97	122	97	58	88	53	92
Off farm activities	4	2.5	1	0.8	0	0	0	0

4.2 Gender Difference in Accessing Information on Common Bean Production Technologies

The study thought to assess levels of awareness obtained through different sources used by SILT project such as radio, demonstration and technology briefs. The study investigated gender differences in accessing difference sources of information used by SILT project for awareness creation and non-project villages as the study results are summarized in the following sections.

4.2.1 Gender differences in accessing information through radio

Results presented in Table 2 show that all gender categories (men; women, boys and girls) in both villages (with and without projects) had access to information through radio on

common bean production technologies like land preparation, seed selection, weed control, fertilizer application and harvesting of common beans. However, some differences were observed among the gender categories, for example in the project villages information on weed control was more accessed by men (25%) and young (boys) (22.2%) than women (9%) and young (girls) (12.5%).The reason behind this difference is due to the fact that at the household level adult men and young males have more time of listening the radio than women and young female because women have limited time as they engage in household shores such as cooking. This situation was confirmed by adult women during focus group discussion as they claimed that:

> *"……. We are normally not allowed to stay with radio in the kitchen while men are sitting in the sitting rooms listening to different sessions of radio while waiting for food"*. (FGD participants at Changalawe village on 15th March 2017).

The results of chi – square ($\chi 2 = 6.483$; d=3, p = 0.09) show that there is no significant difference between different gender groups on the access of information on weed control through radio. These results are in line with those of Gillwald *et al.* (2010), Sife *et al.* (2010) and Mtega (2008) who found that in most households' males have high access to radio compared to females and this could be attributed by the fact that in many societies males dominate resources including radio and select stations which suit them.

Table 2: Gender differences in accessing information through radio

Variable		Men (n=75)		Women (n=61)		Boys (n=27)		Girls (n=32)		Total (n=195)		χ2	df	P
(a)Village with project		n	%	n	%	n	%	n	%	n	%			
Land preparation	Yes	12	16.0	3	4.9	5	18.5	4	12.5	24	12.3	5.000	3	.172
	No	63	84.0	58	95.1	2	81.5	28	87.5	171	87.7			
Seed selection	Yes	15	20.0	4	6.6	6	22.2	4	12.5	29	14.9	6.183	3	.103
	No	60	80.0	57	93.4	21	77.8	28	87.5	166	85.1			
Fertilizer application	Yes	16	21.3	7	11.5	6	22.2	4	12.5	33	16.9	3.310	3	.346
	No	59	78.7	54	88.5	21	77.8	28	87.5	162	83.1			
Planting and spacing	Yes	15	20.0	7	11.5	5	18.5	3	9.4	30	15.4	4.158	3	.655
	No	60	80.0	54	88.5	22	81.5	29	90.6	165	84.6			
Weed control	Yes	19	25.3	6	9.8	6	22.2	4	12.5	35	17.9	6.483	3	.090
	No	56	74.7	55	90.2	21	77.8	28	87.5	160	82.1			
Disease and pest control	Yes	16	21.3	8	13.1	5	18.5	6	18.8	35	17.9	1.571	3	.666
	No	59	78.7	53	86.9	22	81.5	26	81.3	160	82.1			
Harvesting and storage	Yes	11	14.7	7	11.5	3	11.1	5	15.6	26	13.3	.558	3	.906
	No	64	85.3	54	88.5	24	88.9	27	84.4	169	86.7			
Variable		**Men (n=87)**		**Women(n=62)**		**Boys (n=31)**		**Girls (n=25)**		**Total (n=205)**		**χ2**	**df**	**P**
(a) Village without project		**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**			
Land preparation	Yes	19	21.8	15	24.2	5	16.1	3	12.0	42	20.5	2.087	3	.554
	No	68	78.2	47	75.8	26	83.9	22	88.0	163	79.5			
Seed selection	Yes	20	23.0	16	25.8	5	16.1	1	4.0	42	20.5	5.944	3	.114
	No	67	77.0	46	74.2	26	83.9	24	96.0	163	79.5			
Fertilizer application	Yes	19	21.8	16	25.8	7	22.6	2	8.0	44	21.5	3.412	3	.332
	No	68	78.2	46	74.2	24	77.4	23	92.0	161	78.5			
Planting and spacing	Yes	19	21.8	16	25.8	3	9.7	2	8.0	40	19.5	5.883	3	.117
	No	68	78.2	46	74.2	28	90.3	23	92.0	165	80.5			
Weed control	Yes	22	25.3	16	25.8	5	16.1	2	8.0	45	22.0	4.557	3	.207
	No	65	74.7	46	74.2	26	83.9	23	92.0	160	78.0			
Disease and pest control	Yes	21	24.1	15	24.2	6	19.4	2	8.0	44	21.5	3.413	3	.332
	No	66	75.9	47	75.8	25	80.6	23	92.0	161	78.5			
Harvesting and storage	Yes	16	18.4	12	19.4	3	9.7	0	0.0	31	15.1	6.760	3	.080
	No	71	81.6	50	80.6	28	90.3	25	100.0	174	84.9			

4.2.2 Gender differences in accessing improved common bean information through demonstrations

The study results presented in Table 3 reveal that in both project and non-project villages all gender categories have less access to information through demonstration because they have free movement to attend the activities and trainings no matter the distance while their counter parts women and young female have limited freedom of movement from their husbands. Such results were also found by Mroto (2015) that women are in most cases more disadvantaged than men due to limited mobility (usually imposed by male partner), lack of access to trainings. However, across gender categories men and boys had relatively higher access to information through demonstration in land preparation, seed selection, fertilizer application, planting, weeding and disease control technologies for common bean production than women and girls in both project and non-project villages. For example, in fertilizer application, villages with projects were 10.7% of men and 7.4%of boys who had access to information through demonstration while women and girls were 6.6%, and 6.3%, respectively. In the villages without projects were 6.7% men who had access to information through demonstration while women, boys and girls were 5.2%, 3.7% and 3.1%, respectively. The results of chi– square ($\chi 2 = 1.008$; d=3, p = 0.799) shows that there is no significant difference between difference gender category and accessing of information of fertilizer application through demonstration in farmers' plots because they all use own experiences inherited from their parents.

The results presented in Table 3 further show that all gender categories in villages with projects indicated to have relatively higher access to information, through demonstrations regarding land preparation, seed selection, fertilizer application, planting, spacing and weed control technologies, than those in villages without projects. This could be due to the fact that more demonstrations are located in villages with projects thus favoring more

farmers to access information. Accessibility of members from villages without projects could have been attributed by closeness of villages and interaction of farmers in adjacent villages, which is in line with Ragasa *et al*. (2014) and thus why their accessibility to the information is low.

Table 3: Gender differences in accessing information through demonstration (n=195)

Variable		Men (n=75)		Women (n=61)		Boys (n=27)		Girls (n=32)		Total 195		$\chi 2$	df	P
(a) Project Village		**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**			
Land preparation	Yes	7	9.3	2	3.3	2	7.4	0	0.0	11	5.6	4.632	3	.201
	No	68	90.7	59	96.7	25	92.6	32	100.0	184	94.4			
Seed selection	Yes	8	10.7	4	6.6	2	7.4	1	3.1	15	7.7	1.988	3	.575
	No	67	89.3	57	93.4	25	92.6	31	96.9	180	92.3			
Fertilizer application	Yes	8	10.7	4	6.6	2	7.4	2	6.3	16	8.2	1.008	3	.799
	No	67	89.3	57	93.4	25	92.6	30	93.8	179	91.8			
Planting and spacing	Yes	6	8.0	3	4.9	1	3.7	1	3.1	11	5.6	1.415	3	.702
	No	69	92.0	58	95.1	26	96.3	31	96.9	184	94.4			
Weed control	Yes	7	9.3	3	4.9	1	3.7	1	3.1	12	6.2	2.263	3	.520
	No	68	90.7	58	95.1	26	96.3	31	96.9	183	93.8			
Disease and pest control	Yes	6	8.0	4	6.6	2	7.4	1	3.1	13	6.7	.884	3	.829
	No	69	92.0	57	93.4	25	92.6	31	96.9	182	93.3			
Harvesting and storage	Yes	5	6.7	3	4.9	1	3.7	0	0.0	9	4.6	7.353	6	.289
	No	71	94.7	58	95.1	26	96.3	31	96.9	186	95.4			
Variable		**Men (n=87)**		**Women (n=62)**		**Boys (n=31)**		**Girls (n=25)**		**Total 205**		$\chi 2$	**df**	**P**
(a) Respondents in Village without projects		**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**			
Land preparation	Yes	6	8.0	3	4.9	0	0.0	1	3.1	10	4.9	2.39	3	.494
	No	81	108.0	59	96.7	31	114.8	24	75.0	195	95.1			
Seed selection	Yes	6	8.0	4	6.6	1	3.7	1	3.1	12	5.9	.756	3	.860
	No	81	108.0	58	95.1	30	111.1	24	75.0	193	94.1			
Fertilizer application	Yes	5	6.7	5	8.2	1	3.7	1	3.1	12	5.9	1.096	3	.778
	No	82	109.3	57	93.4	30	111.1	24	75.0	193	94.1			
Planting and spacing	Yes	4	5.3	2	3.3	0	0.0	1	3.1	7	3.4	1.498	3	.683
	No	83	110.7	60	98.4	31	114.8	24	75.0	198	96.6			
Weed control	Yes	5	6.7	2	3.3	1	3.7	0	0.0	8	3.9	1.918	3	.590
	No	82	109.3	60	98.4	30	111.1	25	78.1	197	96.1			
Disease and pest control	Yes	5	6.7	3	4.9	1	3.7	1	3.1	10	4.9	.366	3	.947
	No	82	109.3	59	96.7	30	111.1	24	75.0	195	95.1			
Harvesting and storage	Yes	5	6.7	3	4.9	1	3.7	1	3.1	10	4.9	.366	3	.947
	No	82	109.3	59	96.7	30	111.1	24	75.0	195	95.1			

4.2.3 Gender differences in accessing improved common bean farming technology through technology brief

Technology brief is another important source of information for farmers as farmers are given different fliers and leaflets containing different messages on production. In this context, the study findings presented in Table 4 reveal that, there is generally low access to information disseminated through technology brief regarding land preparation, seed selection, planting and spacing for bean production to all gender categories in the village with and without project. The results also show that, in villages with project all gender categories had relatively higher frequencies than their counter parts in villages without projects. For example in village with project, accessibility of information on seed selection by men was represented by 9.3% and 6.6% by women, 3.7% by boys and 3.1% by girls, which is higher than in villages without project as indicated in Table 4.The results of chi – square ($\chi 2$ =1.884; d=3, p = 0.597) shows that there is no significant difference between gender differences and accessing of information of improved common bean variety through technology brief. Reason for the findings could be due to the fact that information through the project (fliers and leaflets) are distributed to all farmers regardless of their sex, though being aware does not mean adopting the technology. These results are in line with a study by Ragasa *et al*. (2013) who found that despite the introduction of new farming technology in rice farms was difficult because farmers were not willing to follow the instructions given. However, this use of information is more friendly for farmers with ability to read and write than those who do not know how to read (illiterate).

Table 4: Gender differences in accessing information through technology brief

Variable		Men (n=75)		Women (n=61)		Boys (n=27)		Girls (n=32)		Total		χ2	df	P
(a) Project Village		n	%	n	%	n	%	n	%	n	%			
Land preparation	Yes	5	6.7	3	4.9	2	7.4	2	6.3	12	6.2	.269	3	.966
	No	70	93.3	58	95.1	25	92.6	30	93.8	183	93.8			
Seed selection	Yes	7	9.3	4	6.6	1	3.7	1	3.1	13	6.7	1.884	3	.597
	No	68	90.7	57	93.4	26	96.3	31	96.9	182	93.3			
Fertilizer application	Yes	6	8.0	4	6.6	0	0.0	1	3.1	11	5.6	2.875	3	.411
	No	69	92.0	57	93.4	27	100.0	31	96.9	184	94.4			
Planting and spacing	Yes	4	5.3	3	4.9	0	0.0	2	6.3	9	4.6	1.601	3	.659
	No	71	94.7	58	95.1	27	100.0	30	93.8	186	95.4			
Weed control	Yes	4	5.3	3	4.9	0	0.0	2	6.3	9	4.6	1.601	3	.659
	No	71	94.7	58	95.1	27	100.0	30	93.8	186	95.4			
Disease and pest control	Yes	4	5.3	3	4.9	1	3.7	1	3.1	9	4.6	.313	3	.958
	No	71	94.7	58	95.1	26	96.3	31	96.9	186	95.4			
Harvesting and storage	Yes	3	4.0	2	3.3	1	3.7	2	6.3	8	4.1	.493	3	.920
	No	72	96.0	59	48.0	26	96.3	30	52.6	187	95.9			
Variable		**Men (n=87)**		**Women (n=62)**		**Boys (n=31)**		**Girls (n=25)**		**Total**		**χ2**	**df**	**P**
(a)Village without projects		**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**			
Land preparation	Yes	0	0.0	0	0.0	0	0.0	1	4.0	1	0.5	7.235	3	.065
	No	87	100.0	62	100.0	31	100.0	24	96.0	204	99.5			
Seed selection	Yes	1	1.1	0	0.0	0	0.0	0	0.0	1	0.5	1.363	3	.714
	No	86	98.9	62	100.0	31	100.0	25	100.0	204	99.5			
Fertilizer application	Yes	2	2.3	0	0.0	0	0.0	0	0.0	2	1.0	2.739	3	.434
	No	85	97.7	62	100.0	31	100.0	25	100.0	203	99.0			
Planting and spacing	Yes	1	1.1	0	0.0	0	0.0	0	0.0	1	0.5	1.363	3	.714
	No	86	98.9	62	100.0	31	100.0	25	100.0	204	99.5			
Weed control	Yes	2	2.3	0	0.0	0	0.0	0	0.0	2	1.0	2.739	3	.434
	No	85	97.7	62	100.0	31	100.0	25	100.0	203	99.0			
Disease and pest control	Yes	2	2.3	0	0.0	1	3.2	0	0.0	3	1.5	2.381	3	.497
	No	85	97.7	62	100.0	30	96.8	25	100.0	202	98.5			
Harvesting and storage	Yes	1	1.1	0	0.0	0	0.0	0	0.0	1	0.5	1.363	3	.714
	No	86	98.9	62	100.0	31	100.0	25	100.0	204	99.5			

4.3 Gender Differences in the Level of Adoption of Improved Common Bean Production Technologies Disseminated by Various Awareness Creation Approaches

The survey results with respect to the relationship between gender categories and adoption of improved common bean production technologies disseminated by various awareness creation approaches are presented in Table 5.

4.3.1 Bean varieties

Majority of the respondents in the village with project (99.5%) reported to have used recommended bean seed varieties. The remaining 0.5% used *kablanket* bean variety. According to the findings gender categories did not influence significantly adoption of recommended beans varieties for respondents on the village with project (χ^2=6.254, df=3;p=0.100). Majority of respondents in villages with project represented by 100.0%, 100.0%, 96.3% and 100% of men, women, boys and girls respectively adopted recommend common bean varieties such as Kablanket, uyole njano and selian 94.

Again, it was found that adoption of recommended bean varieties for respondents on village without projects was high. This is represented by 96.6% of men, 98.4% of women, 87.1% of boys and 100 % of girls. The chi square shows that there is significant difference between various gender categories on the adoption of common bean varieties represented by χ^2=8.627, df=3; p=0.035. This implied that there is significant difference between various gender categories on the adoption of common bean seed varieties. This means that women and girls have high adoption of recommended common bean varieties than men and boys. The reason behind this is particularly in the context that when common bean production is produced for the purpose of food women and girls tend to dominate as they use it for family consumptions, but when it is produced as commercial crop men and young male tend to dominate the production. This is contrary to the study by Mwangi *et al*. (2012) which found that female farmers had less adoption rate on improved seed

varieties. In this case, as per this study improved common bean productions are produced for commercial purposes.

Generally, the adoption rate of recommended bean varieties for both villages with and without project is high. High adoption of recommended bean varieties on village without projects could be influenced by the reason that farmers tend to learn and share information with their nearby villages with regard to different agricultural practices. This shows the contribution of SILT project in motivating farmers to adopt improved common beans production technologies. The findings are in line with FAO (2011) who observes that in area with agriculture intervention the rate of adoption of new technology became higher than in areas without intervention.

Table 5: Gender differences in the level of adoption of improved common bean variety

Variable		**Men (n=75)**		**Women (n=61)**		**Boys (n=27)**		**Girls (n=32)**		**Total (n=195)**		**χ2**	**df**	**P**
Respondents in Project Village		**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**			
Seed selection	Kablanket	0	0.0	0	0.0	1	3.7	0	0.0	1	0.5	6.254	3	.100
	Uyolenjano, Lyamungo 90, Jseca and Serian	75	100	61	100.	26	96.3	32	100.0	194	99.5			
Variable		**Men (n=87)**		**Women (n=62)**		**Boys (n=31)**		**Girls (n=25)**		**Total (n=195)**		**χ2**	**df**	**p**
Village without project		**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**			
Seed selection	Kablanket, Lyamungo 90,	3	3.4	1	1.6	4	12.9	0	0.0	8	3.9	8.627	3	.035
	Uyolenjano, selian and Jesca	84	96.6	61	98.4	27	87.1	25	100.0	197	96.1			

4.3.2 Fertilizer application

Results on the application of fertilizer, generally the level of adoption is low in the sense that majority of respondents on the village with project (74.9%) used lowest rate (30 kg / acre compared to only 14.9% who used the highest rate (≥ 60 kg /acre).The difference between gender categories are not significant at 5 percent probability (χ^2=4.259, df=6; p=0.642) . This implies that there is no significant different between different gender categories regarding the adoption of fertilizer. The frequency distribution indicates that only 17.3% men, 14.8% of women, 14.8% boys and 9.4% girls from village with project reported to use more than 60 kg /acre of fertilizer in bean fields.

The results further show that adoption of fertilizer among the respondents in the village without project is low. Only 12.7% used highest rate of <60kg/acre. Also, the results show that few, 14.9% and 16.1% of men and boys and 8.1%women and 12% girls from village without project reported to use more than 60 kg /acre of fertilizer on bean fields. The chi square shows that there is no significant difference on adoption of fertilizer application based on gender categories for respondents on village with project (χ^2=4.259, df=6; p=0.642) and also those from village without project (χ^2=3.681, df=6; p=0.720). This is contrary to the previous study by Kalineza (2000) who found that adoption rate among female farmers was lower than their male counterpart because women have limited access on productive resources which include fertilizer.

Table 6: Gender differences on fertilizer adoption

Variable		Men (n=75)		Women (n=61)		Boys (n=27)		Girls (n=32)		Total (n=195)		$\chi 2$	df	p
Respondents in Project Village		**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**			
Fertilizer application	<30	52	69.3	46	75.4	20	74.1	28	87.5	146	74.9	4.259	6	.642
	30 - 60	10	13.3	6	9.8	3	11.1	1	3.1	20	10.3			
	< 60	13	17.3	9	14.8	4	14.8	3	9.4	29	14.9			
Variable		**Men (n=87)**		**Women (n=62)**		**Boys (n=31)**		**Girls (n=25)**		**Total (n=195)**		**$\chi 2$**	**df**	**p**
Respondents in Project without Village		**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**			
Fertilizer application	<30	64	73.6	53	85.5	24	77.4	20	80.0	161	78.5	3.681	6	.720
	30 - 60	10	11.5	4	6.5	2	6.5	2	8.0	18	8.8			
	< 60	13	14.9	5	8.1	5	16.1	3	12.0	26	12.7			

4.3.3 Weed control

Adoption of weed control methods is low in the sense that majority of respondents on project village 51.3% use method of weeding common beans which is not recommended compared to 42.1% respondents who use the recommended method of weeding. The difference between gender categories are not significant at 5 percent probability (χ^2=13.076, df=6; p=0.742). This implies that gender categories are not significantly different in the adoption of weeding method. The frequency distribution indicates that, 38.7% men, 42.6% women, 37% boys and 53.1%girls from village with project reported to use recommended method of weeding on common bean fields as means of weed control.

Again, the result shows that adoption of weeding method among the respondents from village without project is low. Only 41.5% use the recommended method of weeding. Furthermore, the results show that only 49.4% men, 38.7% women%32.3% boys and 32.0% girls from village without project reported to use recommended method of weeding bean fields. However, the chi square shows that there is no significance difference on adoption of weeding method based on gender categories for respondents on village with project (χ^2=6.698, df=6; p=0.669) and also those from village without project (χ^2=13.076, df=6; p=0.770). This is contrary to the previous study by Kalineza (2000), which found that adoption rate among female farmers was lower than male in rice production. The difference from this study is that weeding in rice farms is generally done through the use of herbicides than it is done in common bean where hand hoe is more used.

Table 7: Gender differences in the level of adoption of weeding methods

Variable		Men (n=75)		Women (n=61)		Boys (n=27)		Girls (n=32)		Total (n=195)		χ2	df	P
Respondents in Project Village		n	%	n	%	n	%	n	%	n	%			
Weed control	One week after planting	6	8.0	2	3.3	1	3.7	1	3.1	10	5.1	6.698	9	.669
	First week after emergence second after two weeks	38	50.7	33	54.1	15	55.6	14	43.8	100	51.3			
	Two weeks after planting and second is five weeks after planting	29	38.7	26	42.6	10	37.0	17	53.1	82	42.1			
Variable		**Men (n=87)**		**Women (n=62)**		**Boys (n=31)**		**Girls (n=25)**		**Total (n=195)**		**χ2**	**df**	**P**
Village without project		**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**			
Weed control	One week after planting	1	1.1	0	0.0	0	0.0	2	8.0	3	1.5	13.076	6	.042
	First week after emergence second after two weeks	43	49.4	38	61.3	21	67.7	15	60.0	117	57.1			
	Two weeks after planting and second is five week after planting	43	49.4	24	38.7	10	32.3	8	32.0	85	41.5			

4.3.4 Diseases and pest control

Results on the pest control technologies as presented in Table 8 show that respondents in the village with project (62.1%) reported to use recommended disease and pest control which is integrated pest management. The remaining 12.3% did not use the recommended method of disease and pest and control. According to the findings gender categories influence adoption of recommended disease and pest control method for respondents on

the village with projects at 5% (χ^2=23.067, df=9; p=0.006). Majority of respondents in villages with projects 74.7%, 55.7%, 55.6% and 50.0%) of men, women, boys and girls, respectively adopted recommended disease and pest control method.

Moreover, it was found that adoption of recommended disease and pest control method for respondents on village without projects was high. The result shows that 60.5% use recommended disease control method. Furthermore, the frequency distribution indicates that 55.2% men, 64.5% women 67.7% boys and 60% girls use recommended method. The chi square shows that there was significant difference on the adoption of disease and pest control in the project village at 5% (χ^2=23.067, df=9; p=0.006). This implied that adoption of disease control was not influenced by the gender categories. This shows that women and girls have low adoption of recommended disease control method than men and boys. This is in line with the study by Mwangi *et al*. (2012) who found that female farmers had less adoption rate on improved bean technologies because it requires applications of chemical of which men are more responsible for spraying on crops than women do.

Table 8: Gender differences in the level of adoption of disease control method

Variable		Men (n=75)		Women (n=61)		Boys (n=27)		Girls (n=32)		Total (n=195)		χ2	df	P
Respondents in Project Village		n	%	n	%	n	%	n	%	n	%			
Disease and pest control	Planting earlier	6	8.0	5	8.2	8	29.6	5	15.6	24	12.3	23.067	9	.006
	Use resistance seeds	5	6.7	3	4.9	0	0.0	1	3.1	9	4.6			
	Intergraded pest management	56	74.7	34	55.7	15	55.6	16	50.0	121	62.1			
Variable		**Men (n=87)**		**Women (n=62)**		**Boys (n=31)**		**Girls (n=25)**		**Total (n=195)**		**χ2**	**df**	**P**
Village without project		**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**			
Disease and pest control	Planting earlier	17	19.5	10	16.1	3	9.7	5	20.0	35	17.1	3.939	9	.915
	Using resistance seed	4	4.6	2	3.2	1	3.2	0	0.0	7	3.4			
	Integrated pest management	48	55.2	40	64.5	21	67.7	15	60.0	124	60.5			

4.4 Gendered Factors Influencing Adoption of Improved Common Bean Production Technologies Disseminated by Various Awareness Creation Approaches

Factors investigated in this study were lack of labour, lack of income, lack of land and lack of knowledge on recommended practices, lack of market of improved beans and local belief. Each variable was assessed separately to determine its influence on the adoption behavior.

4.4.1 Lack of labour

The results from Table 9 show that, 71.0% of men, 71.5% of women 72.4% of boys and 73.7% of girls reported lack of labour as one of the factors influencing the adoption of common bean technologies. According to chi - square results, there is no significant difference ($\chi2 = 0.17$, df = 3; p = 0.98) between different gender categories regarding lack

of labour for adoption of recommended common beans technologies. This implies that all gender categories regarded lack of labour as one of the factors that affect adoption of recommended common beans technologies such diseases and pest control, applications of chemicals and use of fertilizers. This is in line with Caveness and Kurtz (1993); Kalineza *et al.* (1999) who emphasize on number of adults in the households who are able to work as a major factor influencing adoption of technologies.

4.4.2 Lack of income

Income is the main source of capital to purchase farm inputs and other household consumable goods (Tadesse, 2008). Farmers who are well off can afford the prices of new or improved technology than low income farmers (Roger, 2003). The results from the study show that, 46.6% men, 58.5% women 60.3% boys and 33.3 % girls reported that lack of income hinder adoption of common bean technologies. The chi – square ($\chi 2$ = 12.98, df = 3; p = 0.01) reveals that there is significant difference between different gender categories regarding availability of income for adoption of recommended common beans technologies. This implies that different level of income among various gender categories affect their adoption of recommended common bean production technologies. The study is in line with Diiro (2013), who reported that income influence adoption of new technologies by farmers.

4.4.3 Lack of land

Land availability has positive effects on adoption of new agricultural technologies (Mignouna *et al.*, 2011). The study results show that 60.5% of men, 50.4% of women, 50.0% of boys and 54.4 % of girls, reported that lack of land hinder the adoption of common bean technologies. The chi – square ($\chi 2$ = 3.62, df = 3; p = 0.31) reveals that there is no significant difference between different gender categories concerning land availability for adoption of recommended common beans technologies. This implies that

in this study different gender categories regard lack of land as one of the factors that hinder adoption of recommended common beans technologies.

4.4.4 Lack of knowledge on recommended practices

Knowledge improves human capital, farm management capacity, the ability to understand and adopt recommended agricultural practices (Bezuayehu *et al.,* 2002). It is expected that farmers with high knowledge are more likely to adopt recommended agricultural practices than farmers with less knowledge (Cary *et al.,* 2002). The study results show that 27.8% of men, 35.8% of women, 29.3% of boys and 33.3 % of girls, reported that lack of knowledge on recommended practices hinder the adoption of common bean technologies. The chi – square ($\chi 2 = 2.30$, df = 3; p = 0.51) reveals that there is no significant difference between different gender categories concerning lack of knowledge and adoption of recommended common beans technologies. This implies that in this study different gender categories regard lack of knowledge on recommended practices as one of the factors that hinder adoption of recommended common beans technologies.

4.4.5 Lack of market

Availability of market is important in adoption of new technology. Farmers adopt the technology which can produce high and can be sold at high price (Hardon, 2006). The study results show that 45.1% of men, 41.5% of women, 60.3% of boys and 33.3 % of girls, reported that lack of market of improved beans hinder the adoption of common bean technologies. The chi – square ($\chi 2 = 9.330$, df = 3; p = 0.025) reveals that there is significant difference between different gender categories concerning lack of market on improved common beans and adoption of recommended common beans technologies. This implies that in this study different gender categories especially boys regard lack of market as one of the factors that hinder adoption of recommended common beans technologies.

4.4.6 Local belief on new technology

Local belief is among of factors affecting adoption of improved common beans (Shikuku, 2017). The results from the study show that, 41.4% men, 77.2% women 48.3% boys and 64.9 % girls reported that local belief hinder adoption of common bean technologies. The chi – square ($\chi 2 = 39.912$, df = 3; p = 0.000) reveals that there is significant difference between different gender categories regarding local belief and adoption of recommended common beans technologies. This implies that in this study adoption of recommended common beans technologies is hindered by local belief of the people especially women and girls who considers application of fertilizer is more time consuming. The study is in line with (Shikuku, 2017), who reported that local belief such as the belief that using chemical fertilizers in the farm it destroys all necessary soil nutrients in leading to poor productivity influences the adoption of new technologies to farmers.

Table 9: Gendered factors influencing adoption of common beans disseminated by various awareness creation approaches

Variable		Men (n=162)		Women (n=123)		Boys (n=58)		Girls (n=57)		χ2	df	P
		n	%	n	%	n	%	n	%			
Lack of labour	Yes	115	71.0	88	71.5	42	72.4	42	73.7	0.17	3	0.98
	No	47	29.0	35	28.5	16	27.6	15	26.3			
Lack of income	Yes	76	46.9	72	58.5	35	60.3	19	33.3	12.98	3	0.01
	No	86	53.1	51	41.5	23	39.7	38	66.7			
Lack of land	Yes	98	60.5	62	50.4	29	50.0	31	54.4	3.62	3	0.31
	No	64	39.5	61	49.6	29	50.0	26	45.6			
Lack of knowledge on recommended practices	Yes	45	27.8	44	35.8	17	29.3	19	33.3	2.30	3	0.51
	No	117	72.2	79	64.2	41	70.7	38	66.7			
Lack of market of improved beans	Yes	73	45.1	51	41.5	35	60.3	19	33.3	9.330	3	.025
	No	86	53.1	72	58.5	23	39.7	38	66.7			
Local belief (that local is good)	Yes	67	41.4	95	77.2	28	48.3	37	64.9	39.912	3	.000
	No	95	58.6	28	22.8	30	51.7	20	35.1			

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

This chapter presents conclusions and recommendations made basing on the findings of the study. The chapter is thus divided into two sub-sections: conclusion and recommendations.

5.1 Conclusions

Based on the finding of the study, the following conclusions are made:

1) Men have higher access to information on improved common beans production technologies as compared to women, boys and girls. This implies that there is no equal access by different gender categories to key information needed to produce common beans because of gender inequalities perpetuated by patriarchal systems in the community.

ii) The level of adoption of the recommended improved common bean technologies among farmers in project village and non-project village was low. However, men and boys had higher level of adoption on technology of fertilizer application and weed control than women and girls in project and non-project villages.

iii) Most of the factors investigated in this study that is lack of labour, lack of income, lack of land and lack of knowledge on recommended practices, lack of market of improved beans and local belief are important in determining the adoption of improved common beans among various gender categories. However, lack of income, local belief and lack of market were found to affect more women and girls' categories than men. .

5.2 Recommendations

In view of the major findings of the study and the above conclusions, the following recommendations are made:

i) It is recommended that the government through extension workers and NGOs staffs should pay more attention to women, boys' and girls' farmers especially trying to reduce cultural barriers such as patriarchal system, limited mobility, and inequalities in income control that make them have less access to information on common bean technologies through radio, demonstration and technology brief. To achieve gender equality the government and NGOs need to make gender mainstreaming strategy is taken into accounts in all projects that target the community.

ii) It is recommended that extension workers and NGOs should make sure farmers are given sufficient information about the optimum level or potential of the recommended common bean technologies. This can be achieved by conducting trials, demonstration and farmer field schools of the recommended common bean technologies in their respective common bean fields.

iii) It is recommended to policy makers, administrators, agricultural researchers and extension officers that more emphasis should be on the factors affecting adoption in order to address the problem of low adoption in the study area. Both the government through extension workers and NGOs should make sure that gender equality is practiced in the study area as it was found that women and girls had low adoption rate due to a number of reasons as per each factor. For example, since women and girls have limited control on resources obtained from agriculture it is difficult for them to decide on matters that involve use of money. On the matter of market accessibility gender wise has its negative impacts especially among women and girls due to limited mobility posed by their husbands, that

means if the market is located within short distance, they are able to visit but with long distance only men have free access. Therefore, in this study is recommended that different gender categories are affected basing on their sexes. This can be achieved through inclusive education which ensures that both sexes (men and women) have access without biasness.

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APPENDICES

Appendix 1: Instrument used for data collection on: Gendered influences affecting adoption of common beans production technologies disseminated by various awareness creation approaches

HOUSEHOLD QUESTIONNAIRE
INTRODUCTION

Household Identification No……Village……..

Ward…….

Division…….Name of Enumerator…….....Date……

Section A: Background information

1. Name of respondent……
2. Age of the Respondent……Years
3. Sex of respondent [1] Male [2] Female (put tick)
4. Marital Status: [1] Single [2] Married [3] Divorced [4] Widow
5. Level of education (Put tick)

1. No education
2. Primary education
3. Secondary education
4. Certificate
5. Diploma
6. Others specify……...

6. What is your household size?..... (Number)
7. What is your main source(s) of income?

   [1]Farm activities [2] Off-farm activities [3] Family remittances [4] Business
8. What is your farm size under bean production.....(in acres)

9. Ownership/control and access to household resources: fill in the table below:

Resources	Who control the resources 1. husband 2. wife 3. children 4. others (specify)	Who have access to use resources 1. husband 2. wife 3. children 4. others (specify)	Who decides on the use of resources 1. husband 2. wife 3. children 4. others (specify)
Land			
Beans farm (acres)			

Livestock			
Radio			
Phone			
Others			

SECTION B: BEAN PRODUCTION ISSUES

10. What was the yield of common beans obtained recent season?

Type of common bean	Area cultivated(acres) 2014/15	Area cultivated (acres)2015/2016	Yield (in kg) 2014/15	Yield (in kg) 2015/16
Uyolenjano				
Lyamungu 90				
Jesca				
Selian 94				
Others(specify)				

11. Have you experienced any bean yield reduction in the last 1-2 years? 1=No 2=Yes

12. If yes, give reasons (1)…….(2)…….(3)…….

13. What are the uses of common beans cultivated? 1)……

2)……..3)……

14. Estimate your total annual income from common bean production……. (Shs).

Section c. Adoption of recommended beans production practices

Land preparation

15. Do you prepare land for common bean production?

1. No [ ]
2. Yes [ ]

16. If yes, in which months do you prepare your land?

1. In December [ ]
2. In January [ ]
3 .In February [ ]
4. Others specify [ ]

17. How do you prepare land for common bean plant?

1. Without tilling the land [ ]
2 .Plowing without harrowing [ ]
3. Plowing and harrowing by using hand hoe, oxen and tractor [ ]
4. Others specify

RECOMMENDED BEANS VARIETY

18. Which common bean variety do you plant?

    1. Kablanketi, [ ]

    2. Masukanywele [ ]

    3. Uyolenjano, or Lyamungu 90, or Jesca, or Lyamungu 85, or Selian 97 and Selian 94. [ ]

    4. Others specify

19. Who introduced that kind of common beans variety? 1)……..2)……

20. Which variety do you regard to be the best?1)……..2)……

21. Do you intend to change the common bean varieties you plant?

    1)No 2)Yes

22. If yes, which type of variety will you use?1)……2)…….3)…….

PLANTING AND SPACING

23. Which month do you plant common bean in your field?

    1. Mid-January to February [ ]

    2. Mid-February to march [ ]

    3. March [ ]

    4. Others specify [ ]

24. What spacing do you use in common bean planting?

    1.30cmx30cm, leaving three seed per hole [ ]

    2.10cmx30cm, leaving two seed per hole [ ]

    3.10cmx25cm, leaving one seed per hole [ ]

    4. Others specify [ ]

WEEDING

25. Do you weed common bean farm?

    1. No [ ]

    2. Yes [ ]

26. If yes, which methods do you use to weed your common bean farm?

    1. By using hand hoe

    2. By using chemicals

3.Others specify

27. If yes, how many times do you weedyour common bean farm?

    1. Once [ ]

2. Twice [ ]

3. Others specify

28. When do you weed your common bean farm?

1. One week after planting [ ]
2. First weeding is done one week of emergence and second is done two weeks after planting emergence [ ]
3. First weeding is done two weeks after planting and second weeding is done five to six weeks after planting [ ]

4. Others specify [ ]

29. Which method of weeding do you regard to be the best?

1. By using hand hoe
2. By using chemicals
3. Others specify

30. Do you intend to change to use that weeding method mentioned above?

1) No 2) Yes

31. If yes, which type of method of weeding will you use? 1)……2)…….3)…….

32. If you indicated chemical in qn 28, what type of chemical do you apply when weeding?

1. Round up [ ]
2. Atrazine [ ]
3. Stomp500C orGalex500EC or Pursuit plus or Fusilade [ ]

4. Others specify [ ]

33. Indicate the rate, time and frequency of chemical you apply.

(fill the table below)

Name of chemical	**Rate of application/ acre**	**Frequency of application**	**time of application**

FERTILIZER APPLICATION

34. 27. Do you apply fertilizers when planting common beans?

1. No [ ]

2 Yes [ ]

35. .If yes, what type of fertilizer did you use?(a) at planting – How much, (b) as top dressing–How much. (*Fill in the table below*

S/No	Type of fertilizers	Planting		Top dressing	
		Kgs / Acre	Total for the farm (Kgs)	Kgs / Acre	Total for the farm(Kgs)
1.	Nil				
2.	TSP				
3.	CAN				
4.	N.P.K				
5.	Minjingu phosphate				
6.	DAP or N.P.K and Minjingu phosphate				
7.	Others specify				

36. Which fertilizer do you regard to be the best?1)……..2)……

37. Do you intend to change to use that fertilizer during planting and top dressing your common beans?

1) No 2)Yes

38. If yes, which type of fertilizer will you use?1)……2)…….3)…….

DISEASE CONTROL

39. Do you experience any diseases in your common bean field?

1. No [ ]

2. Yes [ ]

40. If yes in (qn 5.0) what kind of diseases do you experience?

1. Canker

2. Fire blight

3. Haloblight or bean common mosaic virus

4. Others specify

41. Do you control diseases in your common bean field?

1. No [ ]

2. Yes [ ]

42. If yes, how do you control diseases of common bean in your field?

1. By planting earlier

2. Using resistance seed variety

3. By using integrated pest management (Culture practices and Chemical control when experience disease)

43. Indicate methods you use for disease control, rate of application and frequency. (Fill the table below)

Method for disease control	**Rate of application/ acre**	**Frequency of application**	**Time of application**
1. Traditional materials eg. Ash			
Liquid soap			
Neem seed powder			
Others (specify)			
2. Chemical used eg. Actara			
Sotiva			
Others specify			

HARVESTING, PROCESSING, AND STORAGE

44. When do you harvest your common bean?

1. After one month from planting (when leaves are green) [ ]

2. After two months from planting (when pods are green) [ ]

3.After three months from planting (when leaves and pods are dry and yellow brown)[]

4. Others specify [ ]

45. Which time do you regard to be the best to harvest your common bean?……..

46. Do you intend to change harvesting common bean during that time?

1) No 2)Yes

47. If yes, when will you harvest your common beans?.....

48. Do you thresh your common beans produce?

1. No [ ]
2. Yes [ ]

49. If yes, how do you thresh your common beans?

1. Pinching the grain [ ]
2. Dehulling [ ]
3. Beating harvested pods [ ]
4. Others specify [ ]

50. Which method do you regard to be the best to thresh your common beans?

1)……..2)……

51. Do you intend to change method used to thresh common bean?

1) No 2)Yes

52. If yes, which method will you use to thresh your common beans?

1)……2)…….3)…….

53. How do you clean common bean after threshing?

1. Washing [ ]
2. Removing dust by blowing [ ]
3. Winnowing and removing broken grain [ ]
4. Others specify [ ]

54. Which method do you regard to be the best for cleaning common beans after threshing?1)……..2)……

55. Do you intend to change method used for cleaning common bean?

1) No 2) Yes

56.If yes, which type of method will you use to clean common beans?1)…….2)……..

STORAGE

57. What facility do you use to store your common bean?

1. In basket
2. In tins
3. In plastic or metal drum or in Purdue Improved Cowpea Storage(PICS)

4. Others specify

58. Which facility do you regard to be the best for storage of common beans?

1)……..2)……3)……..

59. Do you intend to change facilities used for storage of common bean?

1) No 2)Yes

60.If yes, which type of facilities will you use to store common beans?

1)……2)…….3)…….

61.Which place do you store common bean after packaging?

1. On the floor [ ]

2. On the floor and mixed store of different farm produce [ ]

3. on a raised platform and/or wooden pallet away from the wall without mixing with other different farm produce [ ]

4. Others specify [ ]

62. Which place do you regard to be the best for storage of common beans?

1)……..2)……

63..Do you intend to change to use that place for storage of common bean?

1) No 2)Yes

64.If yes, which place will you use to store your common beans?

1)……2)…….3)…….

SECTION D: Awareness of the recommended bean production technologies

Land preparation

65.What is the recommended period (month) by SILT project for land preparation for common beans farm?

1. In December [ ]

2. In January [ ]

3 .In February [ ]

4. Others specify [ ]

66. What is the recommended method by SILT project of land preparation for common bean farm?

1. Without tilling the land [ ]

2 .Plowing without harrowing [ ]

3. Plowing and harrowing by using hand hoe, oxen and tractor [ ]

RECOMMENDED BEAN VARIETY

67. What are the recommended common bean varieties by SILT project in your area?

1. Kablanketi, [ ]
2. Masukanywele [ ]
3. Uyolenjano, or Lyamungu 90, or Jesca, or Lyamungu 85, or Selian 97 and Selian 94. [ ]
4. Others specify

PLANTING AND SPACING

68. What is the recommended month by SILT project for planting common beans in your area?

1. Mid-January to February [ ]
2. Mid-February to march [ ]
3. March [ ]
4. Others specify……

69. What is the recommended space by SILT project for planting common bean in your area?

1.30cmx30cm, leaving three seed per hole [ ]
2.10cmx30cm, leaving two seed per hole [ ]
3.10cmx25cm, leaving one seed per hole [ ]
4. Others specify……..

WEEDING

70. What is the recommended method by SILT project for weeding your common beans farm?

1. By using hand hoe
2. By using chemicals
3. Others specify

71. What is the recommended frequency for weeding common bean farm by SILT project?

1. Once [ ]
2. Twice [ ]
3. Others specify…….

72. What is the recommended time by SILT project to weed common bean farm in your area?

    1. One week after planting [ ]
    2. First weeding is done one week of emergence and second is done two weeks after planting emergence
    3.First weeding is done two weeks after planting and second weeding is done five to six weeks after planting [ ]
    4. Others specify……

73. Which chemical is recommended by SILT project to apply when weeding common bean farm?

    1. Round up [ ]
    2. Atrazine [ ]
    3. Stomp500C orGalex500EC or Pursuit plus or Fusilade [ ]
    4. Others specify……..

74. Indicate the rate, time and frequency of chemical you apply.

    (fill the table below)

Name of chemical	**Rate of application in litre/ acre**	**Frequency of application**	**time of application**

FERTILIZER APPLICATION

75. What are the recommended types of fertilizer(s), rates of application for planting and top dressing beans in your area? (Fill in the table below).

S/No	Type of fertilizers	Planting		Top dressing	
		Kgs / Acre	Total for the farm (Kgs)	Kgs / Acre	Total for the farm(Kgs)
1.	Nil				
2.	TSP				
3.	CAN				
4.	N.P.K				
5.	Minjingu phosphate				
6.	DAP or N.P.K and Minjingu phosphate				
7.	Others specify				

DISEASE CONTROL

76. What is the recommended method by SILT project for disease control of common bean in your farm?

1. By planting earlier

2.Using resistance seed variety

3. By using integrated pest management (Culture practices and Chemical control when experience disease)

4. Others specify……

77. What is the recommended method of pest management, rate of application and frequency of application in your area? (Fill the table below)

Method for disease control	Rate of application/ acre	Frequency of application	Time of application
1. Traditional materials eg. Ash			
Liquid soap			
Neem seed powder			
Others (specify)			
2. Chemical used eg. Actara			
Sotiva			
Others specify			

HARVESTING, PROCESSING, AND STORAGE

78. What is the recommended period (month) by SILT project for harvesting your common bean?

1. After one month from planting (when leaves are green) [ ]

2. After two months from planting (when pods are green) [ ]

3.After three months from planting (when leaves and pods are dry and yellow brown) [ ]

4. Others specify……..

79. What is the recommended method by SILT project for threshing your common beans?

1. Pinching the grain [ ]

2.Dehulling [ ]

3. Beating harvested pods [ ]

4. Others specify…….

80. What is the recommended method for cleaning common bean after threshing?

1. Washing [ ]

2. Removing dust by blowing [ ]

3. Winnowing and removing broken grain [ ]

4. Others specify…….

STORAGE

81. What is the recommended facility by SILT project for storing common bean?

1. In basket [ ]

2. In tins [ ]

3. In plastic or metal drum or in Purdue Improved Cowpea Storage (PICS) [ ]

4. Others specify……

82. Which place is recommended by SILT project to store common bean after packaging?

1. On the floor [ ]

2. On the floor and mixed store of different farm produce [ ]

3. on a raised platform and/or wooden pallet away from the wall without mixed with different farm produce [ ]

4. Others specify……

Section E: Access to common beans information

83. Do you have access to information on bean farming? 1) No 2) Yes

84. If yes, how do you access information on bean farming? What kind of information do you get from the following sources? How useful is each source of information?

Source	Technologies disseminated 1.land preparation 2.Seed selection 3.Fertilizer application 4.Planting and spacing 5.Weed control 6.Disease and pest control 7.Harvesting and storage 8.Others specify	2015		How does the information access in 2015 is compared to 2013 0=poorer 1=same 2=better
		Frequency of access to information per week 1. once 2. twice 3. thrice 4. others (specify)	Rank the usefulness of source in information provision from, 1.Unuseful 2.Least useful 3.Useful 4.Very useful	
1=Radio				
2=extension office				
3=Fellow farmers				
4=Demonstration				
5=News papers				
6= Phone SMS				
7=Technology brief				
8 =Others specify…				

85. What are the factors influencing access of information on common beans farming from various approaches/sources mentioned in qn 84.above?

Sources	Factors influencing access of information
1.Technology brief	1.Unable to read printed materials 2.Lack of awareness of the importance's of comics 3.Comics seems to be less important 4.Easy to get these materials 5.Others specify
2.Demonstration	1.No enough time to participate to the demonstration 2.Lack of awareness on the function of demonstration 3.Demonstration is important 4.Others specify
3.Extension officers	1.Enough number of extension officer 2.Few number of extension officers 3.Long distance to access extension officer 4.No extension officer 5.Others specify
4.Phone	1.Lack of money to buy phone 2.Unstable power/electricity to charge the phone 3.Lack of knowledge to access information by using a phone 4.Others specify
5.Radio	1.Easy to own and to use 2.Language barrier 3.Poor radio coverage 4.Others specify

86. Are there differences between men and women in accessing information for common bean production technologies?1.No 2.Yes

a)If yes, why?.....

b)If no why?.....

87. Do you use the information obtained on common bean production technologies?

1) No 2) Yes

a) If yes give reason……

b) If no why…….

88. What are the factors influencing use of the information obtained indicated in qn.67 above.1)……..……..2)…… …….3)……..

Factors that influence adoption of common beans disseminated by various awareness creation approaches.

89. What are the major factors influencing adopting improved beans production technologies? Fill in the table below.

	Factors	True	False
01	Lack of labour.		
02	I have too much work and so do not have time to learn about new technologies.		
03	Women do not have access to their own land.		
04	I do not know how to get information through radio, comic or phone		
05	Lack of money for buying radio and phone		
06	Lack of knowledge of improved technologies.		
07	Lack of land.		
08	I own enough land to try out new technologies.		
09	Lack of market of improved common beans		
10	Local belief on improved common beans		

THANK YOU FOR YOUR COOPERATION!!!

Appendix 2: Checklist for FGDs and key informants' interview

1. What are your main sources of information on common bean technologies?
2. What type of improve bean production technologies is available in this village
3. Who is the main provider of this information?
4. Is information provided on the radio?
5. Is information provided in demonstration?
6. Is information provided using briefs?
7. Are there any other types of information sources, e.g. farmer groups? Neighbors?
8. Are any of these sources of information easier for women to access? Why/why not For men to access? Why/why not
9. What roles do think information plays in helping people decide to adopt
10. What other factors might make a person more willing to adopt new bean technologies?
11. Do you think these factors differ for women and men? Why/why not?
12. Would you say that poor households face different challenges to gaining access to information than better off households? Why/why not
13. Are their differences between different social and cultural groups in the society or community?
14. Which responsibilities do women and men have in agriculture?
15. Are there any differences between men and women in growing beans?
16. What factors influence men's decisions to adopt technologies of using improved common beans?

THANK YOU FOR YOUR CORPORATION