IMPACT OF ADOPTION OF IMPROVED LOCAL CHICKEN PRODUCTION METHODS IN TANZANIA: CASE STUDY OF UMADEP AND ILRP SUA PROJECTS

HEAVENLIGHT ELINAJA LYIMO

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ABSTRACT

This study was conducted to evaluate the impact of adoption of improved local chicken production methods case studies of UMADEP and ILRP SUA projects. The study was conducted at Kinole ward in Morogoro and Maneromango ward in Kisarawe District, Coast Region, of Tanzania. The objectives of this study were to assess the extent of adoption of improved LC keeping methods, to assess the effect of intervention to the household income and to identify constraints to adoption of improved LC production methods. In a cross-sectional survey, 110 LC keepers were purposively selected based on implementation of interventions, 52 from Maneromango and 58 from Kinole wards. A control group with 20 households, where no intervention was done were randomly selected from two villages at Maneromango ward. Through a questionnaire study data was collected from December 2011 to February 2012. Although there was statistically significant difference ($p < 0.001$) in adoption between the two groups where intervention was done adoption was in general low, and none of the LC keepers adopted a full intervention package. The findings further showed that the mean income of the intervention group was statistically significant ($p < 0.05$) higher than that of control group. Major challenges mentioned to hinder LC keepers from adopting the recommended practices were lack of capital (66.4%), chick mortality (41.8%) and unavailability of feeds (40.9%). LC production is an important income generating as well as it is very helpful to cover nutritional need of the resource poor farmers hence there is a need to facilitate LC keeper in the formation and participation in the groups aimed at enhancing social capital. Extension agents should be encouraged to have frequent contact with the farmers with adequate information on new technology.

DECLARATION

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

…….. ……

Heavenlight Elinaja Lyimo Date

(MSc. MNRSA)

The above declaration is confirmed by,

…….. ……

Prof. Muhairwa, A. P Date

(Supervisor)

…….. ……

Dr. Magayane, F. T Date

(Supervisor)

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DEDICATION

This work is dedicated to my beloved son, the late Douglas Victor Pius. May almighty GOD rest your soul in peace AMEN

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LIST OF ACRONYMS

BA	Black Australorp
FAO	Food and Agriculture Organization
GIT	Gastro-Intestinal Tract
ILRP	Improvement of Livelihood of the Rural Poor
RIR	Rhode Island Red
LC	Local Chicken
ND	Newcastle Disease
NGO	Non Governmental Organization
Tsh	Tanzania shilling
UMADEP	Uluguru Mountains Agricultural Development Project
URT	United Republic of Tanzania
USD	United States Dollar

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

In most developing countries, local chickens (LC) are kept by households using family labour and locally available feed resources and occasionally use commercial feeds (Alibi *et al.,* 2007; King'ori *et al.,* 2010). LC are usually kept under scavenging (extensive) production system often with very limited application of improved management interventions (Kitalyi, 1998). Scavenging management system is usually characterized by continuous exposure to diseases, inadequate quantity and quality feeds, poor housing and health care (Guèye, 2003).

The role of LC in poverty alleviation and the promotion of gender equality in developing countries is well documented (Guèye, 2000). LC production represents an appropriate system to contribute towards feeding the fast growing human populations and provision of income to poor small farmers, especially women (Alders, 1996). It makes good use of locally available resources and requires low inputs. LC products can be sold or bartered to meet essential financial family needs such as medicine, clothes and school fees (Alders *et al.,* 2003). Chickens and chicken products such as meat and eggs are important foods for improving nutritional and health status particularly for risk populations, like children, pregnant women and debilitated persons (Olaniyi *et al*., 2008).

Generally, village communities lack the required chicken husbandry skills to effectively improve their household chicken production that could benefit them by increasing financial and food security (Kwaghe *et al.*, 2009). The majority of village community members hardly realize improved LC productivity, because they have not adopted improved management practices. The improved management practices designed to improve productivity of LC include housing, feed supplementation, vaccination, brooding, and chick rearing (Njue *et al.*, 2006). Adoption of improved management practices should improve productivity and hence commercialization of the LC sector (Ochieng *et al.*, 2011).

In realization of the importance of LC in providing additional income and high quality animal protein, various projects have been implemented in different rural villages of Tanzania aiming at transforming the poultry sector from a conventional subsistence activity into a commercial enterprise. Despite efforts done by Government, research institutes and NGOs to promote LC, studies done on this aspect show that productivity indices are relatively low among LC (Mfaume, 2008). Among the projects which have been promoting LC production in rural areas include the Uluguru Mountains Agricultural Development Project (UMADEP) in Morogoro district, Morogoro region and Improvement of the Livelihoods of the Rural Poor (ILRP) in Kisarawe district, Coast Region. The overall goal of UMADEP was to improve the livelihood security of rural communities of Uluguru Mountains and adjacent communities in Morogoro (UMADEP, 2008). LC activities under UMADEP in Morogoro were implemented from 2006 to 2010. These activities were implemented through networking, market linkages, training, workshops, exchange

visits, field and home visits. Interest groups were identified and linked to LC market followed by training on improved LC husbandry practices (improved housing, provision of chicken feeds, watering, health care and disease control, breeding activities and chick rearing). UMADEP facilitated and linked LC farmers to local microfinance banks for loan. LC keepers were required to construct chicken houses by using locally available materials such as mud bricks. Materials which were not locally available such as roofing material, cement and nails were provided by the project. UMADEP also facilitated availability of improved cocks to cross breed with the indigenous chickens (UMADEP, 2008).

ILRP on the other hand conducted LC extension activities in Kisarawe from 2006 to 2009. The objective of the project was to improve the livelihood of the rural poor through education on management and marketing of free range LC. The approach used by ILRP involved conducting formal training to village extension officers and some few LC keepers in the targeted villages, and to provide public education through meetings and radio programmes. Awareness creation through role play in open markets and distribution of extension materials such as calendars, booklets and fliers was also done. Trained individuals were supposed to train their fellow villagers regarding advantages of LC keeping, housing, feeding, chicks production and rearing, diseases control, and LC production enterprises as a source of income (ILRP, 2010). This research therefore was designed to asses the effect of these projects in improving productivity of chickens and livelihood of people.

1.2 Problem statement

Crossbreeding promises to improve productivity of LC by increasing egg production and size of chickens. Educational programmes using the existing genome is potentially useful in developing the already present chickens in the area. Combined inputs and crossbreeding has a high potential for adoption and quick improvement. Different project interventions have been introduced to increase productivity of LC as a source of income and food security for rural poor. However, adoption of technology delivered its success and sustainability is not well known. Thus, evaluation of adoption of improved LC activities will lead to recommending the most efficient approaches for improved LC for good production in Tanzania.

1.3 Justification of the study

Much research has been conducted to find solutions for improving productivity in agriculture especially LC production, but in fact, those farmers who are expected to be the end users utilize very few research results. The important element of any innovation is the appropriate adoption of such technology. However, despite different innovations which have been generated in various parts of Tanzania, little or no research has been done to assess adoption and subsequent impact of these interventions. This study was therefore designed to evaluate the adoption and impact of LC recommended production practices, constrains to adoption of recommended practices, and household income from LC. Results obtained will provide suggestions and recommendations for the proper and sustainable intervention approach to be conducted to improve LC production. Constraints to adoption need to be identified to

help intervention providers to select the most appropriate approach for local chicken production improvement.

1.4 Objectives

1.4.1 Main objective

The main objective of the study was to assess adoption of improved LC methods and its effect on household income in Morogoro and Kisarawe, districts.

1.4.2 Specific objectives

The specific objectives of the study were to:

i. Assess adoption of the recommended LC practices
ii. Assess the effect of project interventions on the income of LC keeper
iii. Identify the constraints to adoption of recommended practices

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Overview

Local chickens in developing countries consists of indigenous domestic fowls *(Gallus domesticus)* variously referred to as indigenous chickens, local or rural chickens, village chickens and or native chickens (Moreki *et al.*, 2010; Nnadi and George, 2010). These refer to breeds/strains/ecotypes with no improvement history. Generally, there are various LC production systems in developing countries. These include the free-range system or traditional village system or extensive system, the backyard or subsistence system; the semi intensive system (Gueye, 2000).

The most common production systems found in African LC production are the scavenging (extensive) and backyard production systems, which constitute approximately 80% of the chicken population (Alibi *et al*., 2007). Under this study scavenging or extensive production system will be used. Furthermore, LC are mainly owned and managed by women and are often essential elements of female-headed households (Mekonnen, 2007; Ochieng *et al.,* 2011). Similar results have been reported in Dodoma Tanzania in which it was seen that chickens were predominantly owned by women (Minga *et al*., 1996). Contrary to that, Okitoi *et al.* (2007) reported that women and children did daily routines in LC management while men are involved in activities such as purchase of inputs and sale of chickens.

Housing is generally not provided, but the birds may be housed in the family dwelling at night or roost on the roof and in trees near the homestead. If provided, housing is made of local materials and in rudimentary stage. Under extensive production system farmer makes no attempt to control the flock feeds or water intake although occasionally throws a food scrap or handful of grains (Kabatange and Katule, 1989). Under this system LC receive minimal support and little input on disease control, as a result low output and high losses are experienced (Tadelle and Ogle, 2001).

In general, there is no systematic marketing operation for LC and their products in the rural areas. The major channels through which producers/farmers sell their chicken is direct sales to consumers and/or to small retails that take the chicken to large urban centres (Mekonnen, 2007). However, farmers do have little knowledge on how the market works and why price fluctuates and have virtually no information on market conditions (Sonaiya, 2000). Thus, most farmers sell chickens within their vicinity which attribute to the small number of chickens offered for sale.

The constraints facing LC production in Tanzania include diseases which are known to be the major causes of mortality in LC production (Tadelle and Ogle, 2001; Mekonnen, 2007). Other constraints to increasing LC production in rural areas are losses due to predators, insufficient feeding and poor housing. However, addressing any one or several of these constraints without attention to all will do little to improve LC production.

Despite the existing constraints, LC keeping has been a source of immediate income and animal protein for rural people. LC plays an important role in meeting economic and social obligations for the household, especially in poor families. According to Melewas (1998) all of the eggs and chicken meat consumed in rural areas of Tanzania are supplied by LC. But the LC are also sold to raise money for purchase of food, medicine, clothes, payment of school fees and farm implements (Moreki *et al*., 2010; Olwande *et al.*, 2010). In Nigeria, Kwaghe *et al*. (2009) reported that LC is the third most important income generating opportunity in influencing women's income. Improving LC management practices shall lead to increased LC production and thus high revenue to farmers that shall lead to cash income and poverty reduction in LC keepers.

2.2 Adoption of improved LC practices

Adoption is defined as the degree of use of a new technology in long run equilibrium when a farmer has full information about the new technology and it's potential (Grepprud, 2003). A particular technology is adopted when the anticipated utility from it exceed that of non adoption (Douthwaite *et al.*, 2001). According to Ochieng *et al.* (2011) rate and extent of adoption can be affected by various factors including farmer's age, family size, education and access to inputs.

Young age may positively influence both extent and decision of adoption. This could be due to less experience they have thus have greater likelihood of adopting a new technology (Okitoi *et al.*, 2007). Family size as a proxy to labour availability may positively influence adoption of technology as its availability reduces labour

constraints faced in poultry production (Ochieng *et al.,* 2011). Education is one of the important factors which accelerates growth and development of any enterprise. Level of education increase ones ability to receive and understand information relevant to making innovation decision. Education results in changes in overall behaviour, since, it is the process of imparting or acquiring knowledge and habit through instruction or study (Mandal *et al*., 2007).

Availability of interrelated inputs such as vaccines, extension services, market access and supplementary feeds for chickens may also enhance the efficiency of making adoption decisions (Ngeno *et al.,* 2010). The intervention practices imparted to farmers such as housing, feeding, disease control, breeding practices and chick rearing requires large amount of inputs, thus making many farmers shy away from adopting the interventions management package. However, efficient use of interventions management with limited wastage of resources would lead to higher productivity of indigenous chickens (Alibi and Aruna, 2006; Ochieng *et al.*, 2011). Therefore adoption of innovations related to improved management will result in an increase in productivity of that production system.

2.2.1 Housing and shelter

Housing in LC production is an important input (Mwalusanya *et al.,* 2002) and accounts for a major component of the initial capital investment. In modern chicken production the structures are constructed and designed in consideration to chicken welfare and efficiency of production (Adebayo and Adeola, 2005). However housing observed in different African countries, ranged from no housing at all whereby

chicken roost on trees or roofs of houses or overnight housing within the main house to simple shelters (Mekonnen, 2007). Chicken shelters used at night time are normally small with a door just enough for chicken passage (Kitalyi, 1998; Ochieng *et al*., 2011). As such, ventilation is poor and maintenance of cleanliness becomes difficult. With such poor housing facilities, diseases, parasites, predators and theft lead to considerable losses of chickens (Sonaiya, 1990).

Report by FAO (2009) revealed that housing of LC is not a priority for farmers. These findings are in line with Ssewanyana and Rees (2004) who showed that only 37% of farmers in Uganda housed their chickens. It was realized that this low adoption was due to low level of knowledge of respondents, few sources utilized for acquiring information, low level of education and income.

2.2.2 Supplementary feeding in scavenging LC

Feed is an input of major concern and the supply of adequate feed supplement is critical. Under the scavenging system, chickens are able to acquire part of their diet by natural feed resources like flying insects, snails, worms, seeds and vegetables (Mekonnen, 2007). The nutrients intake of scavenging birds varies from place to place according to seasons, crops grown and the natural vegetation available (Sonaiya, 2000). In most cases farmers don't offer balanced or standard feeds instead they provide supplements of grains and food residues (Ali, 2012). Standard recommended commercial feed has shown to be too costly to farmers and cannot therefore be supplied on regular basis (Ja'afar-Furo *et al.,* 2007). Thus high cost and unavailability of feed seems to hinder adoption of standard feed to the LC sector.

Despite the envisaged benefits, feed supplementation is rarely provided to LC. A study in Tanzania by Mwalusanya *et al*. (2002) showed that only cereals may be provided as supplementary feed. Alternatively LC is supplemented on spoilt grains or bran whose nutrients benefits are questionable (Muchadeyi *et al*., 2007; Ja'afar-Furo *et al*., 2008). Competition for grains with human beings also compromises supplementation where there is no self sufficiency in feed grains.

2.2.3 Disease control and sanitation in LC

Disease risks are high in extensive production systems. In most African countries, LC has no regular health control programme. Research from different countries such as Burkina Faso (Bourzat and Saunders, 1990), the Niger (Aboud and Bell, 1992), Togo (Aklobess, 1990) and the United Republic of Tanzania (Yongolo, 1996) revealed that there is no health care and disease control programmes in rural LC. In India, Khandait *et al.* (2011) reported that only 27.44% of the interviewed respondents adopted health care practices and in Tanzania, Mfaume (2008) reported that 69% of farmers occasionally clean the chicken night shelter.

Lack of vaccination programme, cleaning and hygiene of the chicken shelter and feeding equipment could predispose chickens to external and internal parasites and other diseases. Training is essential in the areas of disease control, hygiene of chicken house and equipment to provide a basis for understanding the effects of these activities on LC production and therefore assist in adoption. Productivity in LC has been low partly due the prevailing poor management practices.

2.2.4 Genetic improvement programmes

LC is deemed less productive but appears to be adapted to local harsh free-ranging rearing environment. Improvements of the genetic potential of the LC have been done through selection within and/or up grading with exotic breeds (Mekonnen, 2007). The aim is to combine the adaptive attributes of the LC with the high producing abilities of the exotic chickens (FAO, 2009). LC keepers lack proper breeding programme. According to Olaniyi *et al.* (2008) LC keepers hardly practice structured selection to improve traits of economic importance like egg and meat production.

In Ethiopia, a local breed (Fayoumi) crossed with exotic breed was reported to perform well even under extensive chicken management condition (Maphosa *et al.*, 2005). Likewise, in Nigeria Alibi *et al.* (2007) reported that cross breeding LC to commercial Rhode Island Red (RIR) chicken produced Fulani-ecotype chicken that is superior to other local ecotypes within Nigeria in terms of egg traits, hatchability, growth performance and live weight. In contrary, research conducted in Malawi where Black Australop (BA) were crossed with LC showed that up to 29 weeks, BA chickens have larger live weights and growth rates than LC when fed from intensive but have similar live weights to LC under free range conditions (Gondwe and Wollny, 2003). Crossbreeding and adoption of improved management practices should go hand in hand so that high performance can be achieved.

2.2.5 Chick rearing

In scavenging production system chicks are left to move freely around the village with their hens from the first day. Confinement housing, supplementary feeds, water and health care is rarely provided which attribute to high chick loss. According to Kitalyi (1998) chicks starve to death because of high competition for the available scavenging feed resource. There is clear distinction between LC and commercial chicken production. Advanced technology is used in commercial chicken production especially in chick rearing where housing is an important input, accounting for a major component of the initial capital investment (Mekonnen, 2007). In commercial chick rearing health care, standard commercial feeds and water are also provided.

Natural brooding of chicks is the main method used by rural people in developing countries. According to Khandait *et al.* (2011) 50.42% of LC keepers in India are brooding chicks naturally. Improving husbandry, especially confinement of chicks and supportive feeding, would likely protect chicks from these major causes of death.

2.3 Role of LC in rural household income

Nearly all rural households keep a small flock of chickens and the practice has been for many generations for different social and cultural reasons (Gueye, 2003). However, the most common purpose for keeping chickens is as a source of food, income and cultural purposes. This is evidenced by studies in Southern parts of Ethiopia which showed that about 71.4% and 28.6% of chickens raised by the rural community were used for eggs and meat production purposes, respectively (Tadelle *et al.*, (2003). Therefore, improved productivity of the LC would have direct positive impact on farmers' income and nutrition.

2.3.1 Nutritional role of LC

Village chicken products are often the only source of animal protein for resource-poor households. Surveys in some African countries such as Tanzania (Kabatange and Katule, 1989) and Niger (Aboud and Bell, 1992) have reported that the main function of LC from farmer's perspective is the provision of meat and eggs for home consumption. Another research in Ethiopia (Tadelle 2003) found that 32% of the animal protein needs of the household are obtained from LC. Chicken meat and eggs are reported to complement staple food of rural Africa due to their higher nutrients concentration (Mfaume, 2008). Thus, any development actions that promotes the smallholder chicken production system in one way or another helps to secure food at household level (Mekonnen, 2007). Future prospects for rearing LC is believed to be promising as there is traditionally high demand for their meat and eggs that are perceived to be flavoursome and of higher quality than that of exotic breeds (Kperegbyi *et al.,* 2009). Therefore providing the necessary support to the development of LC in rural areas is essential in improving nutritional status of the rural household.

2.3.2 Social economic role

Normally LC keeping provides off-farm employment and income generating opportunity and source of gifts and religious sacrifices (Sonaiya, 2000; Tadelle and Ogle, 2001). Sometimes farmers give birds and eggs as gifts to visitors and relatives while others are reserved for special guests, ceremonial gathering and funerals (Muchadeyi *et al.,* 2007). Although, rural chickens in Africa is believed to be a viable and promising alternative source of cash income for the rural resource poor,

estimating LC economic value is difficult because of the lack of reliable production data (Alibi and Aruna, 2006; Mekonnen, 2007). The cash income so generated is used to meet household needs such as buy food stuffs, clothing and farm inputs. It is also used to pay school fees, buy books and pay transport for school children (Mekonnen, 2007). Although chickens are important in providing food and income, their monetary contribution to household economy is not very much realized (Ja'afar-Furo *et al*., 2007). The low returns of LC production in rural areas can be attributed to insufficient empirical case studies and failure to consider all uses of chickens and their products and by-products.

2.4 Constraints to adoption of recommended practices

There are many constraints to the development of LC production that need to be addressed (Mack *et al*., 2005). Among these are lack of credit, high incidence of diseases, chick mortality and extension services (Olaniyi, *et al.,* 2008; Ovwigho *et al*., 2009). Diseases are easily contracted under scavenging system due to chicken's scavenging habits. Furthermore, it is very difficult to carry out disease control under unconfined management and is therefore rarely practiced by owners.

2.4.1 Diseases and chick mortality

Although indigenous chicken is believed to be disease resistant and adapted to their environment, diseases have been a major cause of mortality in LC and consequently loss of production (Kyarisiima *et al.*, 2004; FAO, 2009). Several diseases and in particular Newcastle Disease (ND) is usually the major constraint inhibiting rural chicken development (Spradbrow, 2001, Byarugaba, 2007). Other diseases

mentioned to limit LC development are fowl pox, fowl typhoid and parasites such as worms, fleas and mites (Permin *et al.,* 1997; Spradbrow, 2001).

ND is identified as a major constraint for LC production throughout the developing countries (Permin *et al.,* 1997). When outbreak occurs is usually accompanied by high mortality ranging from 50 to 100% (Muchadeyi *et al.,* 2007). According to Kitalyi (1998) and Ali (2012) ND has been reported to cause mortality up to 100% in the United Republic of Tanzania, Ethiopia, the Gambia and Sudan. Although ND has been reported to be mass killer in LC, vaccination in LC production is rarely done. FAO (2009) reported that only 28.2% of households in Uganda vaccinated LC against ND. Fowl pox may cause problems in LC leading to secondary bacterial infections. The disease is probably very prevalent, but has rarely been reported in disease surveys (Aini, 2000). According to research conducted in Ethiopia by Negussie *et al.* (2006) fowl pox was reported to cause mortality of 31.6%. Vaccination is effective, but is rarely or never practiced (Permin *et al.,* 1997).

Parasites both internal and external are common in the tropics where the standard of husbandry is poor yet climatic conditions are favourable for the development of parasites. Gastro-intestinal tract (GIT) worms are known to cause poor feed conversion and utilization. Past investigations have shown that GIT worms are a problem to chickens in feed-scarce rural scavenging production systems as they rob nutrients and some transmit pathogens resulting in stunted growth and reduced reproductive capacity (Nnadi and George, 2010). Study by Permin *et al*. (1997) indicated up to 100% prevalence of worms in scavenging LC in Tanzania. Common

ectoparasites in chickens include lice, fleas, mites and fowl ticks. Ectoparasites themselves may cause clinical problem, and may transmit a number of infectious pathogens (Percy *et al.*, 2012). They may also act as intermediate hosts of a range of helminths infections (Permin *et al.,* 1997).

Chick mortality represents a major loss in scavenging LC production. Reports from different countries show that 50-70% chicks die between hatching and the end of brooding (Tadelle *et al.,* 2003). In Tanzania, Msami (2000) reported high chick mortality of 60%, while an earlier study by Minga *et al*. (1989) reported an average of 50% chick mortality up to eight weeks of age. Chick mortality is attributed to different causes such as combination of poor nutrition, predators, diseases and environmental factors (Roberts, 1992; Henning *et al.,* 2005). Farmer's reluctance to invest in improvements of housing, feeding and health care is not only due to lack of resources but also to the risk of disease outbreaks.

2.4.2 Access to credit

Improved management intervention is required to achieve increased productivity of LC for mitigating constraints such as diseases, poor feeds and housing. The management intervention package designed to improve productivity of LC include housing, feed supplementation, vaccination, brooding, and chick rearing (Njue *et al*., 2006; Olwande *et al.,* 2010). These management interventions require more labour and capital input than the extensive system and makes greater demands on unpaid labour (Ngeno *et al.,* 2010). The large amounts of input required cause many farmers to shy away from adopting management intervention package due to lack of enough

capital (Ochieng *et al.*, 2011). Access to capital according to Olaniyi *et al.* (2008) has been a severe constraint to utilization of LC production technology. A recent study on adoption of chicken breeds in the highlands of Ethiopia indicated that adoption has been limited by a set of factors including lack of credit (Tadelle *et al.*, 2003). Therefore it is envisaged that access to credit would help LC keeper to adopt improved management practices hence improve production.

2.4.3 Lack of extension education

Ovwigho *et al*. (2009) noted that lack of extension services is among the constraints that hinders development of poultry industry in developing countries. Although extension and research are well-organized systems that design and disseminate technological innovations to farmers, little emphasis has been given to LC research and extension (Olaniyi *et al.*, 2008; Ali, 2012). While extension institutions and various sources of information exist in almost every developing country, the coverage of farm families is still very limited (Fawole, 2006). Research conducted in Ethiopia (Mekonnen, 2007) revealed that extension linkage between research output and the ministry of livestock and the farmers are found to be extremely weak. According to Ja'afar-Furo and Gabdo (2010) extension education rank the first among the constraints reported by farmers. Further investigation in Nigeria revealed that farmers depended on information from fellow farmers and the few that can read got such information from books and related publications (Ovwigho *et al*., 2009). Extension services regarding LC should be made available to farmers.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study area

This study was conducted in two districts; Morogoro and Kisarawe (Figure 1). Morogoro district is located in the North East of Morogoro region between 6º00′ to 8º00′ South and 36º00′ to 38º00′ East with total area of 11,925 km². It is bordered by Bagamoyo and Kisarawe districts (Coast region) to the East, Kilombero district to the South and Mvomero district to the North and West. Kisarawe is located between 6º00′ to 7º30′ South and 38º30′ to 39º10′ East with total area of 3535 km^2. It is bordered by Mkuranga district to the East, Morogoro region to the West, Dar es Salaam to the Northeast, Kibaha and Rufiji districts to the North and South respectively.

3.1.1 Administration and population size

Morogoro district is divided into 6 divisions, 29 wards, 142 villages, and has 56,723 households (URT, 2002) and Kisarawe district is divided into 4 divisions, 14 wards and 77 villages and 25,826.69 households (URT, 1997). Morogoro district has a population of 263,920 (males 129,285, females 134,635) while Kisarawe has a total of 95,323 people (males 47,863, females 47,460) (URT, 2002).

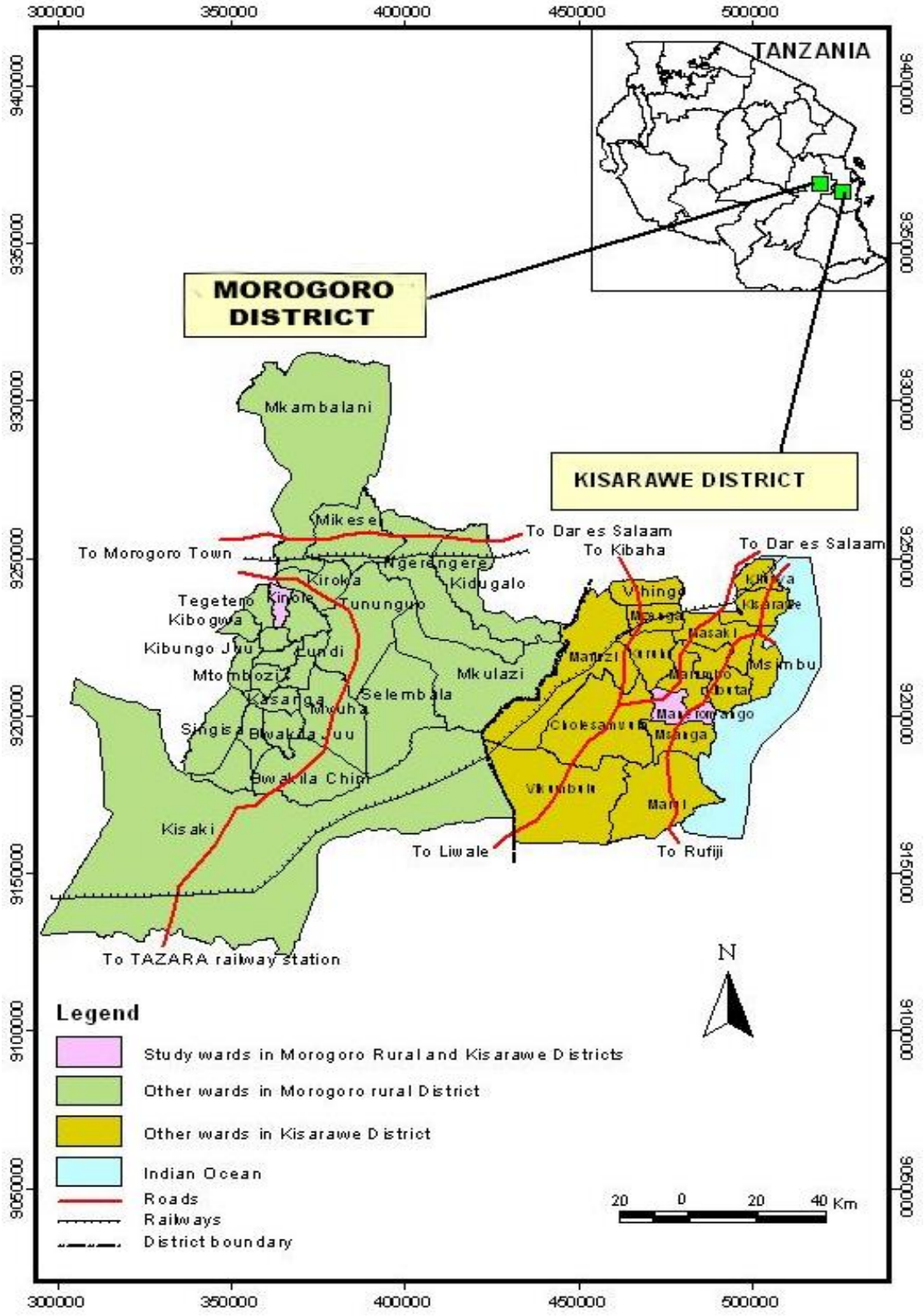

Figure 1: A Map of Kisarawe and Morogoro Districts

3.1.3 Climate and soils

In Morogoro temperature normally ranges from 20ºC to 30ºC. Rains reach 600mm in the mountainous areas and 300mm in flat areas. Heavy rain is experienced from March to May and between January and February is dry while August to November is a hot dry season. Soil types include sand, clay and loam. Kisarawe has a bi-annual rainfall ranging from 800mm to 1000mm per year and an average temperature of 28ºC. Long rain falls between March and June and short rains falls between October and December. Kisarawe district is found on the highland plateau that rises from 100m to 480m with sandy loam and sandy clay soils.

3.1.4 Economic activities

Morogoro district depends mainly on crop production and livestock keeping. The major food crops are maize, paddy, cassava and sorghum. Main cash crops produced are cotton and sisal. Livestock keeping is another economic activity where numbers of livestock kept are cattle 141,184, goats 295,404, sheep 14,200 and poultry 431,782 (URT, 2002). The major economic activities of Kisarawe district are farming, livestock keeping, fishing and forest. Food crops are cassava, paddy, maize, sorghum and fruits. Cash crops are coconut, cashew nuts and cotton. Livestock kept are cattle 880, goats and sheep 3526 (URT, 1997).

3.2 Research design

A cross-sectional design was adopted during data collection. Two wards, Kinole from Morogoro and Maneromango from Kisarawe districts were selected. These two wards were selected based on the number of villagers received the intervention. Four

villages from Kinole ward and two villages from Maneromango ward were purposively selected based on the UMADEP and ILRP chicken projects interventions. Supported and trained chicken keepers (household) were purposively selected from among villages under UMADEP and ILRP. Also non intervened LC keepers were randomly selected from two villages without intervention in Maneromango.

3.3 Sampling and sample size

Samples (households) from intervened villages were selected purposively whereby control group from non intervened villages were randomly selected. One hundred and thirty respondents were selected, 58 households from Kinole (UMADEP) Morogoro district and 72 (52 with intervention and 20 without intervention) households from Maneromango (ILRP), Kisarawe district.

3.4 Data collection and analysis

Primary and secondary data were collected. Primary data were collected by using a pretested questionnaire. Open and close ended questions were used to interview chicken keepers in their respective areas. Data on adoption of recommended methods were obtained by asking whether or not one used production practices such as housing, feeding, watering, breeding practices, health care and disease control. A score of one was given to one who used the improved practice and a zero for one who did not use the improved practice. Also data on income and constraints to adoption of recommended practices were obtained from respondent's interview (Appendix 1). Checklist was used to interview ward executive and extension officers

on type of support provided and contribution of these projects in poverty reduction in the study areas (Appendix 2).

Secondary data were collected from ward extension offices and from project reports. Information obtained included training approach, training materials used and number of trained and supported farmers. The data were organized, coded and analyzed by using Statistical Package for Social Sciences (SPSS); descriptive statistical analyses such as frequencies, percentage and mean were used. ANOVA was used to test the adoption levels between groups.

3.6 Limitations of the study

Research regarding adoption of the improved LC practices production has not been carried out in Tanzania. Thus it was difficulty to access relevant materials pertaining to that part of this study. Most data were obtained mainly through interviewing producers whose replies could be subject to error due to inadequate knowledge, or faulty memory or because of untruthful replies involved by consideration of pride or being suspicious.

CHAPTER FOUR

4.0 RESULTS

4.1 Respondents characteristics

One hundred and thirty LC keepers were interviewed, of which 55.4% were males and 44.6% were females. It was also found that 40.8% of the respondents were between 36 – 46 years compared to other age groups 18 – 35 years (29.2%), 47 – 56 years (19.2%) and >56 years (11.5%). About 76% of the respondents had primary school education. Distribution of respondents by sex, age and education among the three groups is shown in Table 1.

Table 1: Respondents characteristics of interviewed chicken keepers

		ILRP n=52	UMADEP n=58	Control n=20	Total n=130
		n(%)	n(%)	n(%)	n(%)
Sex	Male	28(53.8)	37(63.8)	7(35)	72(55.4)
	Female	24(46.2)	21(36.2)	13(65)	58(44.6)
Age	18 - 35	15(28.8)	16(27.65)	6(30)	38(29.2)
	36 - 46	22(42.3)	22(37.9)	9(45)	53(40.8)
	47 - 56	8(15.4)	13(22.4)	4(20)	25(19.2)
	>56	7(13.5)	7(12.1)	1(5)	15(11.5)
Education	No formal	9(17.3)	4(6.9)	6(30)	19(14.6)
	Adult	1(1.9)	3(5.2)	1(5)	5(3.8)
	Primary	36(69.2)	50(86.2)	13(65)	99(76.2)
	Secondary	4(7.7)	0(0.0)	0	4(3.6)
	College	2(3.8)	1(1.7)	0	3(2.7)

4.2 Adoption of recommendations for improving LC productivity

4.2.1 Permanent night shelter/house, drinkers and feeders for chickens

In the non intervened group none of the respondents had permanent night shelter for the chickens. In the intervened groups 63.6% of respondents had permanent and separate housing for chickens. Furthermore, 77.6% of Kinole residents who were supported by a grant from UMADEP adopted permanent structure for their chickens, which was statistically significant ($p < 0.001$) higher than those of Maneromango (ILRP supported farmers) whose adoption was 48.1%. Provision of drinkers and feeders was highly adopted in both intervened groups and there was no statistically significant difference at ($p < 0.05$) in the adoption between ILRP and UMADEP whereas non intervened group 30% had drinkers, which was statistically significant lower ($P < 0.001$) than the intervened groups. There was poor adoption for litter provision in the chicken house at ILRP 9.6% and UMADEP 12.1% and none of the chicken keepers in non intervened group was using litter.

Table 2: Permanent night shelter/house, drinkers and feeder for chickens

	ILRP(n=52)	**UMADEP(n=58)**	**Control (n=20)**	**Intervened group (n=110)**
	Adopter n(%)	**Adopter n(%)**	**Adopter n(%)**	**P value**
Permanent Structure	25(48.1)	45(77.6)	0(0)	0.001**
Litter provided	5(9.6)	7(12.1)	0(0)	0.68NS
Drinkers provided	41(78.8)	42(72.4)	6(30)	0.43NS
Feeders provided	29(55.8)	39(67.2)	0(0)	0.22NS

NS= Not Significant at $p < 0.05$, **= Significant at $p < 0.01$

4.2.2 Provision of supplementary feeds, clean water, vitamins and minerals

Results for adoption to prescribed feeds, clean water, vitamins and minerals provision to chickens showed that there was statistically significant ($p < 0.001$) difference between the intervention groups and non intervened group. Comparison between ILRP and UMADEP showed that there was no statistically significant difference at ($p < 0.05$) for the prescribed feeds, drinking water, vitamins and minerals provision to the chickens. Results also indicate that 16.4% of respondents adopted the recommendation for provision of supplementary feed to the chickens with ILRP having 15.4% and UMADEP 17.2% adopters. No adoption for provision of supplementary feeds for non intervened group. On average 68.2% provided drinking water to chickens (ILRP, 69.2% and UMADEP 67.2% of the respondents). Intervened group only 25% of respondents adopted provision of drinking water to the chickens.

4.2.3 Health care and disease control

Generally, UMADEP supported group adopted health care and disease control practices more than ILRP supported chicken keepers. The adoption of vaccination against Newcastle disease, ectoparasites control and prevention of coccidiosis for UMADEP beneficiaries was statistically significant higher ($p < 0.05$) than those of ILRP beneficiaries. However, Fowl pox vaccination was not adopted in both groups. Cleaning of chicken houses and equipments was equally adopted in both wards. Significantly, in the interviewed groups vaccination and hygiene practices were minimum (Table 2) and some practices not in place at all.

Table 3: Health care and disease control

	ILRP (n=52)	UMADEP (n=58)	Control (n=20)	Intervened groups (n=110)
	Adopter n(%)	Adopter n(%)	adopter n(%)	p value
ND vaccination	32(61.5)	48(82.8)	2(10)	0.012*
Fowl pox vaccination	0(0.0)	0(0)	0(0)	
Ectoparasites control	14(26.9)	26(44.8)	0(0)	0.05*
Deworming	11(21.2)	19(32.8)	0(0)	0.17NS
Coccidiostat use	5(9.6)	20(34.5)	0(0)	0.002**
Chicken house hygiene	26(50.0)	33(56.9)	0(0)	0.47NS
Feeding equipments hygiene	29(55.8)	38(65.5)	2(10)	0.30NS

NS= Not Significant at $p < 0.05$, *= significant at $p < 0.05$, **= Significant at $p < 0.01$

4.2.4 Breeding practices and chick rearing

Recommended breeding practices and chick shelter provision results show that there was no statistically significant difference ($p < 0.05$) in the adoption of most of the recommended breeding and chick rearing practices between ILRP and UMADEP groups. However, the UMADEP group practiced frequent collection of eggs and proper storage at a statistically significant higher proportion compared to ILRP (Table 3).

Table 4: Breeding practices and chick rearing

	ILRP (n=52)	**UMADEP (n=58)**	**Non intervened (n=20)**	**Intervened groups**
	Adopter	**Adopter**	**Adopter**	
Activity	**n(%)**	**n(%)**	**n(%)**	**P value**
Laying nests provided	15(28.8)	15(25.9)	0(0)	0.72NS
Egg set for hatching within 10 days	6(11.5)	7(12.1)	0(0)	0.93NS
Dusting of broody hens	11(21.2)	15(25.9)	0(0)	0.56NS
Frequent collection of eggs	16(30.8)	34(58.6)	0(0)	0.003**
Storage of eggs	14(26.9)	33(56.9)	0(0)	0.001**
Cleaning of hatching eggs	3(5.8)	10(7.2)	0(0)	0.10NS
Provision of chick shelter	12(23.1)	15(25.9)	0(0)	0.08NS

NS= Not Significant at $p < 0.05$, *= Significant at $p < 0.05$, **= Significant at $p < 0.01$

4.3 Production indices

4.3.1 Mean number of LC and eggs sold at household/ annum

Mean differences of the LC and eggs sold at household/annum are presented in Table 5.

Table 5: Mean number of LC and eggs sold at household/annum

	ILRP	UMADEP	Non intervened
	Mean(S.E)	**Mean(S.E)**	**Mean (S.E)**
Number of sold hens	8^{a}(±0.96)	8^{a}(±1.02)	1^{b}(±0.19)
Number of sold cocks	8^{a}(±0.82)	8^{a}(±0.90)	2^{b}(±0.21)
Number of sold chicks	0	2(±0.50)	0
Number of eggs (30 eggs/tray)	0	8(±3.7)	0
Number of eggs/clutch	14^{a}(±0.43)	13^{a}(±0.36)	9^{b}(±.39)
Hatchability	90^{a}(±1.32)	90^{a}(±1.15)	72^{b}(±2.44)

Means with different superscript are statistically significant different at $p < 0.05$

There was no statistically significant difference between ILRP and UMADEP for the mean number of sold hens, cocks and eggs per clutch and hatchability at ($p < 0.05$). Chicks and eggs were sold at Kinole only while at Maneromango and non intervened group none were sold. However, comparison with non intervened group showed that number of chicken and its products sold at household per annum, eggs/clutch and hatchability for non intervened group were significantly lower than intervened groups.

4.3.2 Effect of intervention of LC on household income

Respondents were asked to mention the number of chickens and eggs sold during year 2011 and the price per unit of product obtained. Due to lack of records by some of respondents estimation was used. It was found from the results that there was no statistically significant difference between the mean income generated from selling culled hens and cocks for ILRP and UMADEP at $p < 0.05$. The mean income from selling chickens for ILRP and UMADEP were statistically significant higher at $p < 0.05$ than mean income from selling chickens for non intervened group (Table 5).

Table 6: Effects of intervention to household income generated from LC

	ILRP (n=52)	**UMADEP (n=58)**	**Non intervened (n=20)**
Income from	**Mean(S.E)**	**Mean(S.E)**	**Mean**
Sold hens (Tshs)	53 021[a](±7357.9)	43 474[a](±6129.8)	5 100[b](±1005.0)
Sold cocks (Tshs)	75 729[a](±8381.6)	81 782[a](±10297.7)	12 200[b](±1716.6)
Sold eggs (Tshs)	0	16 768(±4089.2)	0

Means with different superscripts are significantly different at $p < 0.05$.

1USD= 1500Tshs

4.4 Constraints to adoption of recommended practices

Constraints to adoption of the recommended practices as perceived by farmers are presented in Table 7.

Table 7: Constraints to adoption of recommended practices

Project in place	**ILRP(n=52)**	**UMADEP(n=58)**	**Total(n=110)**
	n(%)	n(%)	n(%)
Lack of capital	40(76.9%)	33(56.9%)	73(66.4%)
Chick mortality	5(9.6%)	41(70.7%)	46(41.8%)
Unavailability of feeds	9(17.3%)	36(62.1%)	45(40.9%)
Unavailability of vaccines	4(7.7%)	22(37.9%)	26(23.6%)
Inadequate extension services	22(42.3%)	2(3.4%)	24(21.8%)
Lack of breeding stock	3(5.8%)	1(1.7%)	4(3.6%)
Lack of enough time	1(1.9%)	1(1.7%)	2(1.8%)

Lack of capital was reported to be a major constraint to adoption by ILRP farmers whereas chick mortality, unavailability of feeds and lack of capital were each reported by UMADEP farmers. Less than half of the respondents reported unavailability of vaccine, lack of extension services, lack of breeding stock and lack of enough time to be constraints to adoption of methods for improving chicken production.

CHAPTER FIVE

5.0 DISCUSSION

The present investigation show that intervention projects in free range chickens can have impact on adoption of improved LC practices hence increased productivity and household income. This is evidenced by adoption rates seen in loan provided group (UMADEP), formally trained group (ILRP) and in villages where intervention was not done. Improved management practices require material and financial inputs, thus making many farmers unable to adopt management interventions package. Management interventions which were more adopted by UMADEP supported group than ILRP and non intervened group included provision of permanent and separate housing, ND vaccination, control of ectoparasites and coccidiosis, frequent collection and proper storage of hatching eggs. Approach used by the intervention providers seems to influence the adoption rate. Where material, extension services and training were provided by UMADEP project, adoption rate was shown to be higher than where only training on management was provided by (ILRP). However, both interventions significantly increased productivity and introduced entrepreneurship mindset compared to areas where no intervention had been done.

5.1 Personal characteristics

The present findings show that more than half of chicken owners in the villages are males; this is contrary to the general notion that chickens are a property of women in the villages and women are the ones responsible for husbandry (Ngeno *et al.*, 2010). These findings are similar to Kwaghe *et al*. (2009) who reported that with the LC

becoming a major source of income in some of the households, men take over the project from women and children. In Ethiopia Mekonnen (2007) and Fisseha (2009) found that management of chickens was fully in the domain of women and children, where as construction of chicken house, selling of chickens and eggs is done by men. According to Alders (1996) in a number of African countries ownership of resources and decision making is controlled by men while women and children take care of flock management such as feeding, cleaning, watering, disease control/treatment and protect chickens against predators. This may contribute to the low rate of adoption because men receive the training and own the enterprise instead of women who take care of chicken husbandry activities.

Majority of the interviewed respondents were found to have the age of between 36 and 46 years with primary level of education. This indicate that LC production engage a large number of economically active population. Although comparison of age and adoption in rural chicken management has not been done widely, the general perception is that young age may positively influence both extent and decision of adoption (Ochieng *et al.,* 2011). This could be due to less experience they have thus have greater likelihood of accepting a new technology. Low level of education can impair ability to receive and understand information and make a proper decision (Mandal *et a*l., 2006) and thus explain the low level of adoption of management practises seen in this work.

5.2 Adoption of recommended methods

5.2.1 Permanent shelter, litter and equipments for chickens

The present findings show that support grant to housing help raise adoption of permanent shelter for chickens. However, despite having structures for this purpose some farmers at Kinole were not using houses for keeping chickens instead, houses were used for keeping ducks and goats, others were used as storage for harvested crops. This was observed where LC keepers sold all chickens to repay loan. Majority were using them as a night shelter likewise Maneromango people were using chicken houses as a night shelter while others were sleeping in the main house. These findings are in line with those of Ssewanyana *et al*. (2004) which showed that less than 37% of LC keepers at Lira, Uganda use night shelter for chickens. Generally low adoption of permanent housing for chickens goes in line with the lack of provision of litter material for chickens. These findings correspond with the research findings by Khandait *et al*. (2011) and Mandal *et al.* (2006) who reported that no litter materials were provided for chickens.

Regarding the use of water drinkers and feeders, the present findings show more than fifty percent adoption among the trained groups. It was found that many LC keepers in the intervention groups provided drinkers and feeders obtained from locally available materials such as pots, bowls, and basin for feeding the chickens. However, for non intervened group adoption for these practises were very low compared to the former group. The findings are in line with the observations made in India by Khandait *et al*. (2011) and Mandal *et al*. (2006) who reported that 77.5% and 100.0% of the interviewed LC keepers provided drinkers to their chickens. On contrary, Ali

(2012) reported that no drinkers were provided by LC keepers in Sudan. Extension education can be provided to the LC keepers on the use of locally available materials such as poles and timber from the bush to construct chicken houses and manufacture small equipments, like feeders.

5.2.2 Feeding and drinking water provision

During interview respondents revealed that they experience swollen eyes, blindness and death of the chickens during dry season which may be due to lack of proper nutrition. The findings of the present work show that adoption of ready made feeds, minerals and vitamins provision was very low in both intervened (UMADEP and ILRP groups) and non intervened group, because they were not available. The findings are in agreement with the results obtained in India (Mandal *et al.*, 2006; Khandait *et al.*, 2011), Ethiopia (Mekonnen, 2007) and Sudan (Ali, 2012) which showed that ready-made feed is not provided to chickens. LC keepers can be helped to identify locally available food materials in their respective areas and be assisted with recommendations for proportions required to make a balanced diet.

5.2.3 Health care and disease control

Adoption of hygienic and healthcare practices showed that vaccination against ND disease was most widely adopted irrespective of extension method used. Furthermore, despite low adoption of control methods for coccidiosis and parasites the trained group performed higher than places where no intervention was done. Similar to the present finding Khandait *et al.* (2011) showed that practices for control of coccidiosis and endoparasites were not in place in India. Despite low adoption to

controlling diseases other than ND, the finding implies that repeated efforts are needed to increase the level of adoption. Thus other parties involved in development and mass education should be brought in the promotion of improved LC production. Despite being notably a mass killer of chicks (Spradbrow, 2001) no adoption has been done for fowl pox vaccination. The high cost of the vaccine (approx. 6USD/vial of 1000 chickens) and the method of administration by injection could be a major contributing factor if compared to the widely adopted ND vaccine. It is thus recommended that supply of cheap and farmer friendly application preparations be encouraged. Although this may involve high cost for scientific research, the results might improve adoption, as how thermostable vaccine for ND has contributed to the control of ND (Msami, 2000).

Insufficient knowledge on the effect of ectoparasites in LC could be the reason for low adoption. Therefore extension education is required to educate people on the importance of control of ectoparasites and deworming which will eventually increase production in LC. Provision of anthelmintics is uncommon practice in developing countries. Research conducted for non trained LC keepers in Ethiopia and India (Mekonnen, 2007; Khandait *et al.,* 2011) showed no adoption of control of worms in LC. The results from interviewed respondents indicate that adoption was low especially in Maneromango. During interview farmers revealed that they normally use local remedy such as paraffin, and ashes to control ectoparasies. In the non trained group it was found that no adoption was done for the control of ectoparasites. This is contrary to the report by Khandait *et al.* (2011) where 62.08% of the respondents were controlling ectoparasites.

5.2.3.1 Control of coccidiosis, cleanliness of LC house and feeding equipments

Results from interviewed respondents show that adoption for control of coccidiosis is very low especially for Maneromango (9.6%), Kinole (34.5%) and non intervened group (0%). Lack of knowledge about the disease and its effects could be the reason for the low adoption for the control of coccidiosis. Khandait *et al.* (2011) interviewed non trained LC keepers and the results were in line with the findings from non intervened group. It was revealed from the study that majority of the respondents were cleaning LC houses and feeding equipments. There was high statistically significant difference between intervened and non intervened groups in the adoption of cleanliness of feeding equipments ($p < 0.001$). These findings from non intervened group contradict with the results in India by Mandal *et al.* (2006) and Khandait *et al.* (2011) who interviewed LC keepers and found that majority of respondents were cleaning the chicken house. Cleanliness of chicken house and feeding equipments is an important practice in chicken rearing. Cleaning of the chicken house and feeding equipments help in the control of some diseases such as coccidiosis and also reduces parasitic load hence reducing susceptibility to diseases and parasites.

5.2.4 Breeding practices and chick rearing

Egg production, hatchability and chick survival are probably the main determinants of flock increase in scavenging (extensive) LC production system. However, adoption of the recommended practices by LC keepers has been low especially for ILRP and for non intervened group nothing is been done. The results correspond with the results from other developing countries such as India (Khandait *et al.,* 2011) and Ethiopia (Mekonnen, 2007) where storage of eggs at uniform cool temperature

were practiced by minority of the interviewed respondents. Increased effort is still required as it has been shown that productivity in the intervened groups is higher than where no intervention has been done.

Despite the taught advantages of provision of laying nests, hatching eggs collection and storage adoption rate was lower for ILRP than for the grant supported farmers at Kinole. However, where no training was done these practices were not in place. Results for chick rearing indicate low level of adoption which was less than 25% average for intervened group while in non intervened group the practice was not in place. Dusting of broody hens and cleaning of hatching eggs adoption level was low for intervened group and for non intervened group practice was not in place. The results are in line with the finding from India by Khandait *et al.* (2011) who reported that less than 50% of the respondents adopted laying nests, collection and storage of hatching eggs. Adoption of these practices will improve hatchability and reduce mortality rate of the chick hence improve productivity of LC. More training through extension staff is needed to help people understand the importance of these practices.

5.2.4.1 Provision of laying nests, collection, storage and setting of hatching eggs

Traditionally in scavenging system a hen is left to find its laying place mainly in the kitchen or main house then a farmer adjusts a nest by providing rags of cloth, dry grasses or sand soils. During interview it was found that LC keepers are not well clear with the breeding practices despite the training provided. The results for intervened groups concur with those of Khandait *et al.* (2011) which show that 38.33% among the interviewed respondents provide laying nests. Collection and

storage of eggs in a cool dry place normally helps to improve hatchability. During the study some of the LC keepers especially in Maneromango revealed that laid eggs are left on the nests until the time of brooding. Khandait *et al.*, (2011) reported that 36.25% of respondents were frequently collecting and storing hatching eggs. The findings are also in agreement with the findings of Mekonnen (2007); Sasidhar *et al.* (2008). Eggs laid are supposed to be stored in a cool dry place to avoid contamination, cracks and temperature fluctuation so that hatchability can be improved. During discussion LC keepers also argued that if you remove eggs from the nests chickens will not brood them. It means that people still believe in their traditional practices. More stakeholders in this industry should provide training through demonstration to debunk the myth.

5.2.4.2 Improved chick rearing practises

Poor housing makes chicken and more so the small chicks vulnerable to predators on the ground and from the air. High mortality and high parasitic load due to inadequate housing and health care are also problems of extensive LC production (Mekonnen, 2007). During the study it was found that adoption level on chick rearing in the study areas was below 30% for intervened group and for non intervened group the practice was not in place. Further investigation revealed that LC keepers do not confine chicks after hatching due to lack of feeds, which lead to very high mortality of chicks before eight weeks. Lack of capital for construction of chick shelter is another reason for LC keeper's inability to confine chicks. These findings are similar to the findings of Mandal *et al.* (2006) and Khandait *et al.* (2011) in India who reported that few of the respondents provided chick shelter. More extension education on the importance

of chick rearing and on the use locally available materials for construction of chick shelter is needed to increase the flock size.

5.3 Production indices

5.3.1 Number of eggs per clutch and hatchability

The present findings show that intervention measures resulted into increase in the number of eggs/clutch/hen. The number of eggs/clutch in this study is relatively greater than the values for other African countries such as Ethiopia where national average eggs/clutch/hen are 12 (Mekonnen, 2007) and slightly lower than the value of 15 eggs/clutch/hen obtained previously in Tanzania (Minga *et al*. 1996). These values for intervened group falls within the range of 10-14 average egg production/clutch/hen reported in Uganda by Ssewannyana and Rees (2004). These results also show slight difference from studies carried out in Ethiopia (Fisseha, 2009) observed a clutch size of about 9–19 eggs/clutch/hen. The number of eggs/clutch/hen in the non intervened group was found to be lower than intervened group. Similarly, the results indicate increase on hatchability where intervention has taken place. These findings are higher (90%) than 83.6% reported by Mwalusanya *et al*. (2002), 54% by (Malago and Baitilwake, 2009) for Tanzania, 70% and 81% by (Olwande *et al.*, 2010) in two locations in Kenya. But it falls within the range reported in low income food-deficit countries of Africa, which is 60-95% (Gueye, 2003). The significant difference between eggs produced in the intervened and non intervened group could be contributed by the management practices such as feed supplementary, vaccination, watering and housing adopted by some of the respondents.

5.3.2 Impact of LC intervention on household income

Selling of eggs and chickens in the villages normally done occasionally when there is an urgent need of money in the household because all eggs are used for hatching and the surplus is used for consumption. The findings showed that mean income for intervened groups from selling of chickens and eggs were significantly higher than non intervened group. These results imply that training on production and marketing of LC instils entrepreneurship to the chicken keepers. Although the obtained income does not add significantly to the income of LC keepers these results underlines the fact that LC sector is viable and promising alternative source of income for rural households (Mekonnen, 2007).

5.4 Constraints to adoption of recommended practices

According to interviewed chicken keepers, a major constraint to adoption of recommended measures was lack of capital. Other constraints mentioned included chick mortality, unavailability of feeds and inadequate of extension services. These results correspond with research finding from India (Mandal *et al*., 2006) and in Nigeria (Olaniyi *et al*., 2008; Ja'afar-Furo, 2010; Oyeyinka *et al.,* 2011) which reported lack of capital to be constraint in adoption of the scientific methods for poultry production. Variations were observed in the other investigations such as high chick mortality, unavailability of feeds which were more important in Kinole than in Maneromango farmers. Maneromango farmers thought that lack of extension services were also more important than in Kinole. At Kinole respondents reported to have a very high chick mortality which have caused some of the LC keepers unable to invest in such a risky enterprise. The findings are in line with the report from India

Khandait *et al.* (2011) reported that 100% of the respondent reported mortality as a constraint to adoption of LC keeping. Confinement of chicks and supportive feeding would likely protect chicks from these major causes of death. Findings indicate that more respondents from Kinole acknowledged that unavailability of feed stuffs has been the constraints to the adoption of the recommended practices. Also it has been the implication to the scavenging system practiced by LC keepers in the study areas.

Inadequacy of extension services was reported by 42% of the interviewed respondents to be a constraint in the adoption of the recommended practice at Maneromango. The results correspond with the observation made in Nigeria (Ovwigho *et al*., 2009; Ja'afar-Furo, 2010), Sudan (Ali, 2012) which reported that inadequate extension contact has been a constraint to chicken production. According to Adebayo and Adeola (2005) inability to access extension services is an indication of unfavourable government policies. Accessibility to extension service significantly improves LC production systems therefore any intention to improve household income of the rural people need to make sure that extension service is available.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The findings show that LC producers selectively adopted intervention practices as none of the respondents adopted all management intervention package. The study further revealed that despite the disadvantage of being more expensive and thus reaching a smaller number of chicken keepers, grant supported LC keepers had higher adoption rate than non supported LC keepers. Management practices adopted by LC keepers from UMADEP project than ILRP project and non intervened group are provision of permanent and separate house, ND vaccination, control of ectoparasites and coccidiosis, frequent collection and storage of hatching eggs. Some recommended practices require large capital input which could be the reason for low adoption rate for LC keepers at Maneromango where no grant was provided.

The findings indicate that mean number of sold chickens and eggs were significantly higher for intervened group than for non intervened group. Also mean income for the intervened group was significantly higher than non intervened group which indicates that intervention has an effect on the income of the household. Capital support which would results into decreased chick mortality, improvement of extension services and unavailability of feeds were the main constraints for the low adoption of the proposed management intervention.

6.2 Recommendations

- Extension education should be provided to the farmers repeatedly and continuously to make them understand the important practices for improved production.
- On-farm training is an appropriate method which can be used to train LC keepers on improved housing, disease control and feeding of the LC.
- Improving housing should go together with education on the use of litter inside the houses.
- Frequency of extension contact with the farmers with adequate information on new technology should be encouraged among the extension agents.
- All stakeholders should help farmers get access to credit in the form of soft loan or they can be facilitated in the formation of groups aimed at enhancing social capital.
- Any development intervention should primarily focus on youths and women who can be easily motivated and ambitious to change but have no capital.
- Chicken feeds should be made available in these areas through investment by private individuals or educating rural farmers to compound their feeds. Both conventional and alternative feed resources that are readily available to farmers should be identified.

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APPENDICES

Appendix 1: Household questionnaire for evaluation of impact of adoption of improved LC practices

HOUSEHOLD INTERVIEW

Identification variables

Name of respondent…….

Questionnaire

number……

Village……

Ward……

Beneficiaries tick appropriate – UMADEP: -full/ / part/ /

ILRP / /

Non intervention / /

INDIVIDUAL CHARACTERISTICS

What is your age? …… (years)

Sex (tick)

1= male ( ) 2= female ( )

Marital status

1 = single ( )

2 = married ( )

3 = divorced ( )

4 = widowed ( )

Level of education (tick)

1 = no formal education ( )

2 = adult education ( )

3 = primary education ( )

4 = secondary education ( )

5 = college ( )

6 = others specify ( )

Adoption of recommended methods

What are the LC practices you have adopted?

Assign “one” for adopted method and “zero” for non adopted

Housin***g***	Practice	Score
	Permanent structure	
	Litter provided	
	Drinkers provided	
	Feeders provided	

	Practice	**Score**
i) Feeding		
	Ready made feed offered	
	Provision of Adequate clean water	
	Minerals and vitamins supplements	
ii) Health care and disease control	Vaccination against - Newcastle Fowl pox	
	Control of parasites - Ectoparasites - Deworming - Coccidiostat	
	Cleanliness - Poultry house - Feeding equipments	
iii) Breeding practices	Laying nests provision	
	Egg set for hatching within 10 days	
	Dusting of broody hens	
	Frequently collection of eggs	
	Storage of eggs on cool dry place	
	Cleaning hatching eggs	
iv) Chick raring	Provision of chick shelter	
v) Divide income from LC into three parts	33% own use	
	33% project development	
	34% saving	

Change attitude towards the recommended practices

1. How do you rate the following statement with regard to recommended practices to increase LC production?

Recommended practice	Attitude		
	Agree	Disagree	Non
Improved housing increases LC production			
Local chicken production is determined by having good shelter			
Supplementary feeds can increase LC production			
Production can be high even if LC are left to scavenge without supplementary feeds			
Productivity in LC is determined by providing routine vaccination			
Vaccination has no effect on LC production]			
Control of parasites in LC increases production			
Parasites has no effect on LC production			
Provision of chick housing reduce chick mortality			
Chicks mortality can reduced by leaving the to scavenge with hen			
Frequently collection of eggs, good storage and cleaning of hatching eggs can improve hatchability			

Chicken Production Information

Indicate the details of flock composition as shown in the table below;

Category and number	Breeds			
	Exotic	Cross	Local	Total
No. of layers				
No. of pullets				
No. of cocks				
No. of chicks				

2. What is the level of production?

Product	After intervention
Number of eggs per clutch	
Hatchability	

3. What are the main diseases facing your chickens?

Disease	After intervention
New Castle	
Fowl pox	
Fowl Typhoid	
Coccidiosis	
Ectoparasites	
Endoparasites	
others	

A. Effect of intervention of lc to household income

4. What is the amounts of LC and its products sold at household (per annum)

Product	After intervention
Culled hens (number of birds)	
Cocks	
Chicks	
Eggs (number of trays)	
Manure	
others	

5. Give marketing information

products	Amount sold (unit price)	Revenue
Eggs		
Culled hens		
Cocks		
Chicks		

B. Constraints to adoption

6. Is there any constraints hinder you from adopting the recommended practices

Yes / / No / /

i) If yes mention (from below assign number in order of significance)

- Housing ( )
- Diseases ( )
- Unavailability of vaccines ( )
- Lack of Feeds ( )
- Lack of capital ( )
- Lack of breeding stock ( )
- Lack of extension services ( )
- Chick mortality ( )
- Time ( )
- Labour ( )

C. Miscellaneous information

24. How often are you visited by extension officer?
    1 = very frequently
    2 = frequently
    3 = less frequently
25. Where does extension officer come from?

1 = UMADEP
2 = ILRP
3 = Government staff
4 = others

26. What specific aspects are covered by extortionists? Explain

27. Do you find Extension services helpful (yes/no) why?

……
……
……

Do you have problems of obtaining inputs (yes/no) if yes what are they?

……
……
……

How do you solve those problems?

……
……
……

Do you keep records (yes/no) if yes mention them

……
……
……

If no, why?

……
……
……

Appendix 2: Ward and village extension and executive officers checklist for adoption and impact of LC intervention on household income in Morogoro and Kisarawe Districts.

Date of interview…….

Name of interviewer……

1. Please may I know your official title?
   Designation……
2. When did UMADEP/ILRP started in your area? Month
   ……year……
3. Do you know the number of households keeping LC supported by UMADEP/ILRP project in your area?
4. What kind of support is provided by UMADEP/ILRP project to the farmers particularly LC keepers?
   ……
   ……
5. What conditions are given to the farmers who implement projects under UMADEP/ILRP
   ……
   ……
6. Can you describe the success for individual and community projects
   ……
   ……
   Did you face any problem during the implementation of the project? Yes / / No / /
   If yes what are
   they?**.....**
   .....
   .....
7. Do you think UMADEP/ILRP project has reduced the poverty in your area? Yes / / No / /
   If yes what
   how……
   ……
   How much money was given to the farmers during implementation of the project
   ……
8. Do you think support received by farmers was sufficient for them to run their project? Yes / / No / /

THANK YOU FOR YOUR COOPERATION