

**SOCIO-ECONOMIC IMPACT OF FREE RANGE LOCAL CHICKENS
VACCINATED AGAINST NEWCASTLE DISEASE IN MTWARA RURAL
DISTRICT, MTWARA REGION**

**BY
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**A DISSERTATION SUBMITTED IN PARTIAL FULLFILLMENT OF THE
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ABSTRACT

Poultry industry is an important sector with substantial contribution to the community, nation economy and social welfare. Newcastle disease (ND) is the main constraint for village chicken production in Tanzania, and chicken vaccination is the only effective way to control ND. This study was carried out to evaluate ND vaccination project. The objective of the study was to assess the socio-economic impact of ND vaccination project to communities that keep Free Range Local Chicken (FRLC) at three villages in Mtwara Region. Specifically, the study assessed socio-economies contribution of FRLC to household, examined effects of the project interventions on the level of knowledge, attitude and practices that poultry keepers pose for enhancing the productivity of FRLC, examined gender issues in implementation of ND vaccination project and its sustainability. Focus group discussions (FGD) and a structured questionnaire were used to collect data. A total of 210 households which were in the project were randomly sampled the heads were subjected to the questionnaire. The study used descriptive statistical and inferential methods to analyze data. This was accomplished by Statistical Package for Social Science's (SPSS version 13.0). Result from the study revealed a statistical lower ($P<0.05$) significant association between number of FRLC kept before the project and after the project. In addition, the study revealed statistical significance of project interventions ($P<0.05$) on management of FRLC which means there was increase in number of FRLC. All respondents reported FRLC to be an income supplementing activity to the household. Also the study revealed FRLC rearing was mainly a female domain (61%), though men were the decision makers on the income earned. In the study area decision on the household properties held strongly with gender

relationship in the household. The study recommends that the farmer's socio-economic status, incentives like credit facilitation, market access and group formation should be considered in implementation of interventions for improving FRLC.

DECLARATION

I, Gibonce Andrew Kayuni, declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work and has neither been submitted nor being concurrently submitted for a degree award in any other institution.

Gibonce Andrew Kayuni
(M.A Candidates)

Date

The above declaration is confirmed

Dr. Emanuel Emilian Chingonikaya
(Supervisor)

Date

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DEDICATION

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LIST OF ACRONYMS

| | | |
|-------|---|---|
| BOT | - | Bank of Tanzania |
| BTC | - | Belgium Tanzania Cooperation |
| CBO | - | Community Based Organization |
| DSI | - | Development Studies Institute |
| FAO | - | Food and Agriculture Organization of the United Nations |
| FGD | - | Focus Group Discussion |
| FRLC | - | Free Range Local Chicken |
| GDP | - | Gross Domestic Product |
| HPAI | - | Highly Pathogenic Avian Influenza |
| ILRI | - | International Livestock Research Institute |
| LIT | - | Livestock Institute of Training |
| MDG | - | Millennium Development Goals |
| ND | - | Newcastle Disease |
| ND-AF | - | Newcastle Disease and Avian Flu |
| NGO | - | Non Government Organization |

| | | |
|---------|---|---|
| NSGRP | - | National Strategy for Growth and Reduction of Poverty |
| SANDCAP | - | Southern African Newcastle Disease Control Project |
| SPSS | - | Statistical Package for Social Sciences |
| SUA | - | Sokoine University of Agriculture |
| Tsh | - | Tanzania shillings |
| URT | - | United Republic of Tanzania |

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

Poultry industry is an important sector with substantial contribution to the nation economy and social welfare of different countries in the world. Worldwide, commercial and free-range local chicken (FRLC) contribute to about 29% of the total world meat production and 93.3% of the poultry industry is FRLC (Minga *et al.*, 2001).

In Tanzania, just like in many other developing countries in Africa, Asia, Central and South America, FRLC are important and represent a significant economic potential as well as a source of protein in form of meat and eggs (Ellis, 2000; Minga *et al.*, 2001). FRLC constitute 80% of the total world chicken population, which is approximately 14 000 billion (Buza., 2001).

The population of free-range local chicken in Tanzania as per 1998 National livestock census comprises of 30 million chickens (FAO/IAEA, 2005). Chicken production in Tanzania largely depends on FRLC constituting up to 94% of the total poultry population (FAO/IAEA, 2005). More than 80% of local chickens are kept under free-range system in rural areas with an average flock size of 23-30 birds per household (Msoffe, 2003).

Despite the impressive numbers, the productivity per unit bird is extremely low leading to production of chicken products, country wise and at individual family

level to be inadequate supply of chicken products to meet demands for protein and income (Minga *et al.*, 2001; Mwalusanya, 2001). This among other factors contributes to the high levels of malnutrition and poverty in rural communities where cases of undernourished children and women are common. Furthermore, all economic indicators show low contribution from the livestock sector to the nationals' economy. For example at factor cost in the year 2001 in Tanzania, the livestock industry, which includes the chicken industries contributed 73 695 million Tanzanian shillings only, which is equivalent to 5.7% of the total monetary national Gross Domestic Product (GDP) of 1294.768 millions (1361.48 million US\$) (Economic survey, 2005). However, it has been argued that if the FRLC were properly managed and effectively utilized they could have more significant economic impact (Minga *et al.*, 2001). The total annual loss in the FRLC production system may reach up to 80%, whereby 50% of chicks that hatch die at the age of two to four months, (Minga *et al.*, 2001; Mwalusanya, 2001).

Newcastle disease (ND) is a major factor limiting poultry production worldwide (Alexander, 2001). The disease is caused by a *Paramyxovirus* and named after Newcastle-upon-Tyne, England, where the agent was first isolated (Yongolo, 1997). The disease is prevalent world wide and almost all commercial and traditional flocks of chicken are influenced by ND through either control or infection (Alexander, 2001). Although ND has been singled out as the main reason for high chicken losses in FRLC production system (Minga, 2005; Minga *et al.*; 2001; Yongolo, 1997), limited data is available to substantiate the actual impact of ND to the overall production. The reasons why there are insufficient data on ND include lack of records and poor disease record keeping systems.

Tanzania is a poor country with about 35% of its population live below the basic needs poverty line and about 18% live below food poverty line. Poverty is widespread and concentrated in the rural area. It is for that reason different development programmes and projects have continued to be at the centre of peoples' development. For example, ND Vaccination Project in Mtwara has been facilitating poultry keepers to control and prevent ND. Since its introduction the project aimed at increasing poultry productivity, profitability, food security and women empowerment through vaccination of poultry and capacity building since 2004.

1.2 Problem Statement

Worldwide, poverty generally has a rural face. Three quarters of the world's poor live in rural regions, often in extreme abject poverty and without adequate means to achieve food security for themselves or their families. Income generation opportunities are limited, with most people in rural regions making a living from farming and livestock keeping (SANDCP 2005). Chickens are the most significant livestock species in terms of level of ownership, access to animal protein, and the potential for earning cash income in rural communities. Apart from caged, commercial poultry production, Tanzanian smallholders have "village poultry" here by referred to as FRLC production systems that are generally owned and managed by rural poor people, mostly women. Village chickens are most often kept under a free range, low input management system (SANDCP 2005; Mtambo, 2000).

In Tanzania the village chickens play an important role in the livelihood of rural population (Yongolo, 1997, Mtambo, 2000). Losses in poultry negatively impact the

livelihoods of poor rural communities that rely on them for meat and eggs. The village-level FRLC production system is very complex and, due to its complexity it presents significant challenges to implement effective prevention, detection and outbreak response strategies for different diseases like Highly Pathogenic Avian Influenza (HPAI) and for the endemic ND. Moreover, ND is a complicating factor for field diagnosis of HPAI (Minga *et al.*, 2001), because clinical signs in chickens for ND and HPAI are similar. Since ND is the main constraint for village chicken production in Tanzania and worldwide, it is therefore considered that chicken vaccination is the only effective way to control ND.

Newcastle disease control and its vaccination strategies have been in and implemented in various places in the world. In Tanzania many efforts to combat ND dates back 1970's. Such effort include vaccination against ND by using live lentogenic vaccine (lasota, F strain and V4), live mesogenic vaccine (Roakin, Kamarov and H vaccine), and velogenic inactivated vaccines (Katule, 1990, Boki, 2003 and Wambura, 2008).

Despite of programmes and projects which have been implemented to prevent and control ND in Tanzania, yet very little is known about its socio-economies impact among communities keeping local chicken. The Socio-economic impact studies of investments on ND vaccination programmes are necessary and can help policy makers to assess the value of past investments and to prioritize alternative future investments. Evaluation studies of past, current and proposed development programmes are indeed very crucial for effective and efficient use of available

resources. Despite the relevance of this kind of study in Tanzania and its potential for the researchers and policy makers, it is unfortunate that very few studies of evaluation of the ND control programmes have been conducted in Tanzania and elsewhere. This study intends to generate information on socio-economic impacts of village level of ND vaccination programmes in Mtwara Region.

1.3 Justification

The ND Control Project (NDCP) is in line with various policies and ongoing government reform programmes to improve food security for households, poverty alleviation through economic benefit and women empowerment. The policies and programmes include Millennium Development Goals (MDG) and National Strategy for Growth and Reduction of Poverty (NSGRP) as well as the 2025 National Vision.

As many projects instituted to most communities lack follow up on the socio-economic impact assessment. ND vaccination which was accompanied by training to livestock extension officers was instituted in Mtwara Region, but there have been no studies on socio-economic impact assessment of the project. The project spent millions of money and long time aimed at creating awareness on the disease and control measures including vaccinations. Despite the success of ND vaccination project in the control of the disease in FRLC in Mtwara, there is a dearth of information on socio-economic impact assessment of the project. Therefore this study was conducted to assess community attitudes, benefits and costs of vaccination and outlook on the chicken change in production and general contribution of the campaign to changes of community livelihood. The study generated important data

which contribute to literature and can be used by policy makers, development agencies, government, donors, Non-Governmental Organizations (NGO's) and community based organization (CBO's) in Mtwara Region and Tanzania at large. In addition, this study provides information on return of investments on ND control at the regional level. The findings of this study also provide information about the profitability of ND control to farmers and to society in general. This information will be helpful in providing insights relevant for expansion of ND disease control to the other regions and for prioritization of development activities which compete for scarce resources.

1.4 Objectives

1.4.1 Overall objective

The general objective of this study was to assess the socio-economic impact of ND vaccination project to communities that keep free range local chicken within project area in Mtwara Rural District.

1.4.2 Specific objectives

The following were the specific objectives;

- (i) To evaluate contribution of FRLC to socio-economic welfare of respective households;
- (ii) To examine the effects of the ND vaccination project interventions on the FRLC keeping households' level of knowledge, attitude and managerial practices;

- (iii) To evaluate the level of participation of men and women in implementation of ND vaccination project; and
- (iv) To assess sustainability of ND vaccination project.

1.4.3 Research questions

- (i) Has there been any significant contribution of FRLC to socio-economic welfare of rural households?
- (ii) Have there any effects of the project interventions on the level of knowledge and attitudes to rural FRLC keepers?
- (iii) What is the level of participations of men and women in implementation of ND vaccination project?
- (iv) Have there any actions taken by the community for sustainability of the ND vaccination project?

1.5 Conceptual Framework

In order to achieve the information of the above stated objectives and identify the variables for data collection, a conceptual framework was developed. The conceptual framework prevents fragmentation of knowledge into diverse segment of unconnected statements. Also framework can bind facts together and provide guidance towards realistic collection of data and information.

The conceptual framework for this study is a narrative outline presentation of variables studied and hypothetical relationships between and among variables. It details the variables examined and their relationship. It groups the variables into

background, independent and dependent variables. The types of variables shown in the conceptual framework are; background variables, which include age, sex, marital status and ethnicity of the head of households. The independent variables are community support, attitude to ND vaccination, ND vaccination benefits, cost of vaccination, change in chicken number per year, change in chicken sales per year, change in number of eggs per year, change in egg sales per year, information about chicken, total number of chickens/chicks, number of chicks/ chickens owned past years in periods like these, care givers for chickens, vaccination schedule of chickens, income from chickens, Income from eggs and method of chicken rearing.

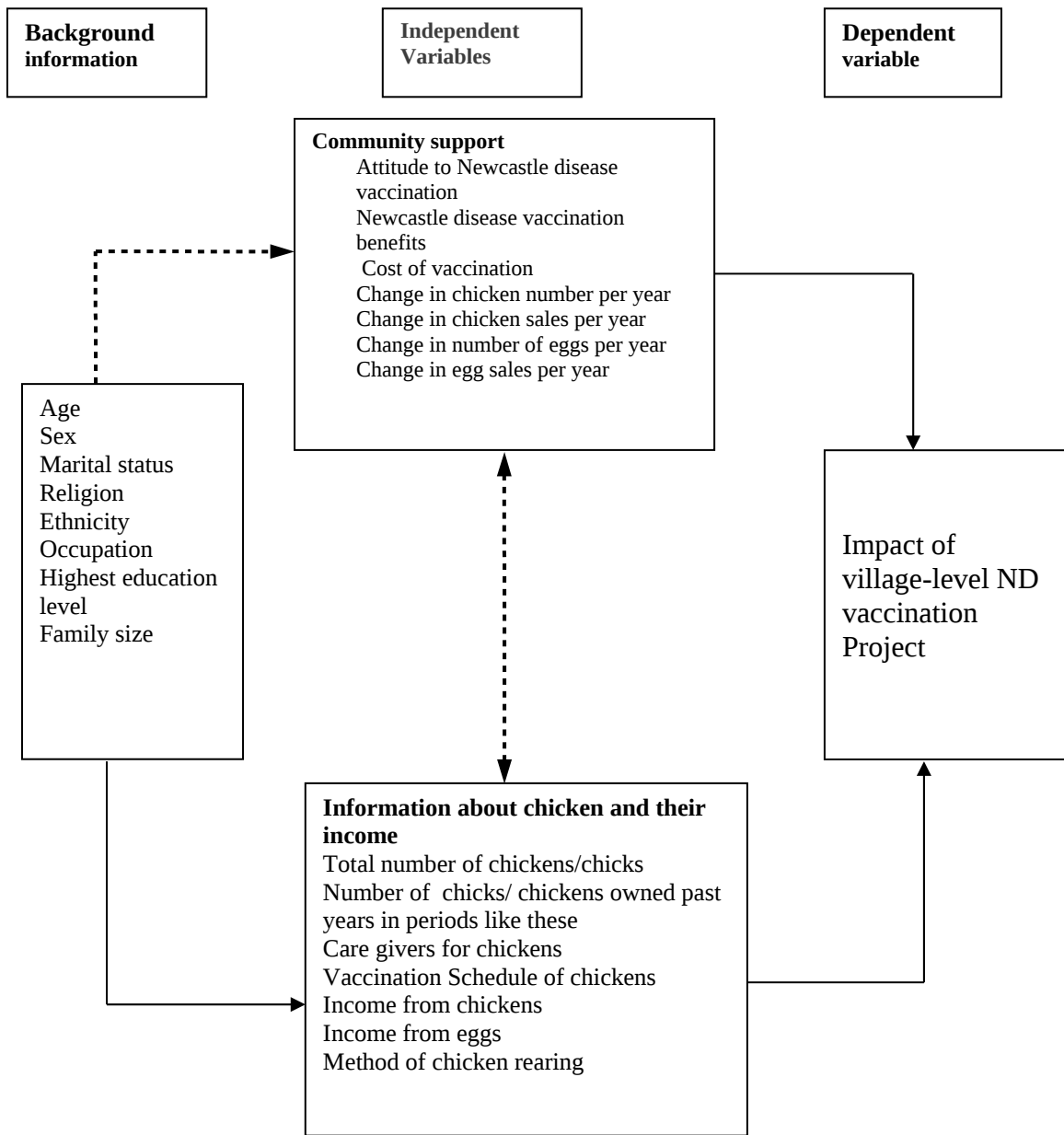


Figure 1: Conceptual Framework

—————> = Relationship for primary analysis
 - - - - -> = Relationship for secondary analysis

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Overview

The local chicken sector constitutes a significant contribution to human livelihood and contributes significantly to food security of poor households in most African countries (Mlozi *et al.*, 2003; Shindey *et al.*, 2004). It is an important agricultural activity of almost all rural communities in Africa, providing scarce animal protein in the form of meat and eggs as well as being a reliable source of petty cash, savings, investment, insurance and serve in traditional medicine (Mlozi *et al.*, 2003). The importance of FRLC in the national economy of developing countries and its role in improving the nutritional status and income of many smallholder farmers and landless communities has been very significant (Spradbrow, 1993; Minga, 2005; Mwalusanya *et al.*, 2001).

The importance of FRLC does not end only to rural communities but rather the entire population in Tanzania. In fact, the big market for FRLC meat and eggs is in urban areas where consumers from such urban markets are hotels, restaurants and some affluent city dwellers (Mlozi *et al.*, 2003). Like many other developing countries; chicken production largely depends on FRLC constituting up to 94% of the total poultry population in Tanzania (Msami and Kapaga., 2002).

Poultry production system in developing countries are classified into three groups namely, village or scavenging or free-range system (backyard), semi scavenging (semi- intensive) and intensive (industrial) (Kitalyi, 1998). But the most dominant

production system, are the scavenging (backyard) system and the semi – intensive system, which have developed with higher input and output (Kitalyi,1998). In Tanzania more than 80% of local chickens are kept under free-range system in rural areas with an average flock size of 23-30 birds (Msoffe *et al*, 2003).

2.2 FRLC Production

It is generally believed that in developing countries FRLC supplies close to 100% of all poultry meat and eggs consumed in rural areas and about 20% in urban areas. They are generally owned and managed by women, children and the rural poor and are often essential elements of female-headed households (Msami, 2005). They are usually run under a free-range, low-input management system. The local chickens raised in the villages are characterized by a great variety of types and colours and low production, but they are well adapted to the environment and resistant to many common diseases. The output of village chickens is lower than that of intensively raised birds but it is obtained with a minimum input in terms of housing, disease control, management and supplementary feeding. Data on traditional husbandry is very scanty and generally limited to small samples in localised ecological zones. Management practices in Tanzania are not atypical of the rest of black African countries (Kitalyi, 1998; Minga *et al.*, 2001; Msami, 2000; Mwalusanya *et al.*, 2002).

In FRLC production, management is minimal and simply involves keeping the birds under free-range and scavenging conditions around the homesteads. The family of the individual households owns the birds and the day-to-day care are provided by women and children with little or no inputs for housing, feeding or veterinary care.

The little care best owed upon the birds includes provision of table food scraps and/or limited amounts of grain or bran each morning. Villagers perceive these scavenging chickens as a natural low grade crop that offers very desirable meat on occasions. However production is too unreliable to warrant committing investment of their time, financial or other resources. There is no incentive to improve husbandry because frequent outbreaks of ND cause total or partial exterminations of the village flocks. The husbandry practiced is unimproved and traditional and there is no deliberate effort to improve the chicken genetically (Mwalusanya *et al.*, 2002).

(Msoffe *et al.*, 2003) and Payne (1990) reported that a free range- system requires an area of between five and eight meter square per chicken for good nutrition. However, the major advantage of this system is that, there is little or on inputs used as the birds acquire most of their diet from the surroundings (Kitalyi, 1997).

2.3 Housing and Shelter for FRLC

The majority of households provide night shelter to their flocks, however for some households, birds are not provided with housing at all. Permanent housing of local chickens under normal circumstances is very rare in some villages. Complete confinement is similarly rare except for some households in urban centres. There are occasions when villagers are forced to confine their birds to avoid destruction of young crops, particularly in densely populated areas. Chicken shelters are generally small and constructed from sun-dried clay and in some instances birds are housed in the owner's house/hut. Shelter constructed using chicken wire mesh exist in very few homesteads. Common poultry houses found around the lake zone and northern zone

are raised huts placed on poles and the birds access the huts with a help of a ladder. The huts are fenced out by use of thorn shrubs to repel predators. Designing of appropriate housing using locally available materials was attempted in the study by Msami and Kapaga. (2002).

The birds were only housed at night and left to scavenge for their feed during the day, thereby getting exposed to various predators. Lack of protection of young birds from predators (birds of prey, rodents and domestic dogs and cats), cold and heavy rains contribute to the losses which could be reduced considerably if proper housing was provided and husbandry practices improved Mwalusanya *et al.* (2002).

Host (1990) emphasize on the importance of housing in protecting FRLC against disease, predators, adverse temperature, radiation, rain and chilling weather. He suggested that the construction of houses be in such a way that they are easy to clean, well- ventilated and cheap to construct. Most studies of FRLC production have indicated no housing at all, where by chicken roost on trees or roof tops of houses, to simple shelters (Mtambo,2000; Wilson *et al.*, 2004; Gunaratne *et al.*, 1993; Minga *et al.*, 2001; Yongo,1997; Mwalusanya *et al.*, 2001). Poor quality shelter, which is mostly used at night, is made from local building materials such as tree poles and thatch grass. Such shelters are usually small with a door just enough for chicken to pass (Mtambo, 2000; Kuit *et al.*, 2001). Chicken are also kept in kitchens or human quarters at night or covered in woven baskets (Yongolo, 1997). Njue *et al.* (2001) suggested that the designing of village chicken housing would go way into controlling parasitic disease and losses associated with predation.

2.4 Feeds and Feeding of FRLC

In FRLC production, chickens depend on scavenging around the homesteads as the method of feeding their birds. The supply of drinking water is sometimes neglected and water from a clean source which is free from potential contamination is not supplied. In general, the birds have low nutritional status as reflected by the low growth rates, chick and grower mortalities, low hatchability and low mature body weight. In Tanzania the average weight at slaughter (at 5 – 6 months) ranges between 0.6-1.2 kg (Boki, 2003) which is comparable to the situation in Mozambique of 1.3 Kg (Sonaiya and Swan, 2004).

According to Minga (2005), households reported that FRLC feeds on insects, leftovers, greens, coconut cake, cereals, bran and fruits as the major ingredient of the scavenged feed, which is generally abundant in rainy season. There is provision of some supplementary feed by mostly women and children. The types of food vary depending on what is available from crop residues and by-products of grains and table scraps. Along the coastal region, the type of supplementary feed include coconut cakes, food leftovers such as stiff maize porridge (*ugali*), maize bran and cereals. Use of beetle larvae developing in decaying cattle manure is not uncommon in farmers practicing the agropastoral system of farming. During scavenging, the birds come into contact with inanimate objects (fomites) that are contaminated with disease organisms, impure water, such as surface drainage water, rodents, wild animals and free-flying birds, insects and contaminated feed. These are among the methods by which infectious diseases can be transmitted and spread from one farm to another.

Several researches done in Tanzania and other parts of the world have found that there is poor FRLC nutritional status for optimum growth and egg production. The study on the nutritional status of crops contents of local chicken in Tanzania revealed that the dietary status of local chicken varied according to season, age and Zone (Mwalusanya *et al.*, 2002). It was found that the difference in nutritional status probably corresponds with the difference in the availability of feeds on the sounding. The availability feeds in the surroundings varies with season, climate of the area, and with whether it is a planting or harvesting season (Mwalusanya *et al.*, 2002). A study on the performance of growing and laying chicken in cafeteria and balanced feeding in Bangladesh under semi-scavenging conditionals recommends that feeding levels should be adjusted to season, giving less supplementation during harvest, where scavenging feeds are readily available in the fields (Das, 2005).

The study by Minh *et al.* (2004) found out that feed (bran) given to chicken could not supplement the deficiencies observed especially with regard to calcium. The study recommended for the variation in nutritional status according to season and climate when planning improving feeding standard for local chicken. In Northern Vietnam, a study on the effect of scavenging and protein supplementation on the feed intake and performance of improved pullets and laying chicken, found that pullets and layers were getting about 28% and 22% respectively of their nutrients requirement from scavenging feed source, while a similar study done by Gunaratne *et al.* (1993) in Sri Lanka showed that village chicken were getting 72% of its daily nutritional requirement from scavenging feed sources.

However various authors have suggested that, through scavenging, chicken meet their requirement for vitamin and minerals and some of their protein requirement but not their requirement energy (Das, 2005;). In Zimbabwe a study on free ranging hybrid chicken under smallholder conditions, showed an improved production on supplementation of some form. A production of 170 eggs per bird per year was observed when the free-range chicken were supplied with 75g of maize per chicken, together with better management and disease control (Das, 2005).

2.5 FRLC Flock size and Structure (Composition)

There have been many studies of the traditional village poultry system in Tanzania and throughout Africa (Minga *et al.*, 2001; Msami, 2000; Sonaiya and Swan, 2004; Mwalusanya, 2002). A typical flock structure in villages would have 5 to 15 adult birds, of which one or two would be cocks and 4 to 12 would be hens. The flock would also have 8 to 20 chicks and 4 to 10 growers. Village chickens are kept under extensive low input - low output production systems.

The total number of egg production per hen per year range from 6-20. In general, egg productivity of scavenging poultry in Tanzania is low, chick mortality is high (30-80%) and hatchability is high (50-100). This low egg production is largely due to genetic effect and poor management (Minga, 2005).

2.6 Poultry Disease

According to Jordan and Yongolo (1997) and Poulsen *et al.* (2002) poultry diseases in developing countries on backyard or free-range system conditions can be divided into five groups, namely; bacterial, viral, fungal, parasitic and nutritional diseases. A

wide variety of these diseases are expected to occur under village conditions. Some of these diseases are age-specific, whereas others are encountered in all age groups.

In a study about the poultry industry in Tanzania (Boki, 2003), it was reported that poultry disease are a major constraint to the quick increase in chicken production. The study found out, that, Newcastle disease (ND), fowl typhoid and infectious coryza, are the major poultry diseases in Tanzania. Muhairwa *et al.*(2001) reported that fowl pox, infectious coryza, Newcastle disease (ND), Marek's disease, chicken infectious anemia and ectoparasites are the causes of mortalities; but chicken infectious anemia and Marek's disease were reported for the first time in FRLC. A study on poverty alleviation through free-range poultry improvement, which was done in Uganda, reported that the poor productivity of FRLC was caused by extremely high mortalities due to disease and predator. Also in a survey on village chicken losses in Africa, farmers mentioned Newcastle disease (ND) as the main source of chicken loss (Kusina *et al.*, 2001). Study on FRLC on the Accra plains of Ghana, 80% of the respondents mentioned Newcastle disease (ND) as the most important health issue (Aboe *et al.*, 2006). Other constraints pointed out in these studies include poor feeding, poor housing and marketing (Muhairwa *et al.*, 2001).

Newcastle Disease

According to Mwalusanya *et al.* (2002), in Tanzania ND is locally known under different names such as: "Kideri, Mdonde, Mdondo, and Sotoka ya kuku". ND is a major problem in the development of village chickens in Tanzania. The mortality rate due to ND can reach as high as 90% and sometimes devastates whole flocks

during outbreaks. Control of ND in village chickens in the past had very limited success. Most of the vaccines used were heat sensitive and supplied in vials with large number of doses (usually 1000 doses), which were not affordable for most rural farmers. Moreover, the effective cold chain system required for the distribution of these vaccines is lacking or deficient in most rural areas. However this obstacle has recently been overcome through the development of a thermo-tolerant ND vaccine I-2 that was developed in Australia and is extensively used in Tanzania. Administered by eye droppers, the I-2 vaccination techniques are easy, effective and sustainable. I-2 vaccine can be stored without refrigeration for up to two weeks and is in small vials so that large losses are eliminated.

2.7 Factors Influence FRLC Production System

The FRLC production system is very complex and is controlled by a number of factors namely:- Environment, farmer's management and decision, market situation, and farmers characteristics.

2.7.1 Environment

Village chickens scavenge in the vicinity of the household to find their own feed. For good nutrition, health and growth, the chicken are very dependent on the amount and quality of feed available in the area. Rahman *et al.* (1997) in a study on the effect of cropping patterns on egg production of hybrid hens in semi-scavenging conditions, observed that feed availability in the area depends on climatic conditions. The climate conditions have an impact on the vegetations and insects available for feeding. The study also found that, the farming system, which depend on the type of

crops grown and the intensification level, has an effect on the edible grain spillage in the fields as well as the amount of vegetation cover. The number of chicken and species of other livestock in the farming system influence the level of competition for feeds and water, and the number of predators in the area effects chicken survival. However, sufficient feeding available for scavenging depend on the area's capacity, which influence the level of competition for feeds and water, and the number of predators in the area effects chicken survival. However, sufficient feeding available for scavenging depends on the area's capacity, which is influenced by factors such as cropping production patterns and the density of birds. For instance, an on-farm study was done in Nicaragua on supplementing poultry diet with tree leaves or seed of *Crescentia alata* by mixing with sorghum. Also, most poultry peasants mainly kept scavenging chicken, which were fed additional sorghum grown on the farm. The results of this study showed an increase in flock size in years of good harvest (Kyvsgaard and Urbina, 1996).

2.7.2 Farmer's management and decision

The level of chicken production is highly dependent on the farmer's management level, which includes supplementing chicken with feed and water, provision of shelter and the farm's management level, which includes supplementing chicken with feed and water, provision of shelter and the prevention or cure of diseases. However, in Pedersen and Kristensen's (2004) study on the dynamic modeling of traditional African chicken production level of chicken were associated with financial cost, where the farmers were always concerned with whether the increased production could cover the cost. Farmer's decision making covers the cost of egg and

chicken, that is, whether the eggs are hatched, sold or consumed and, similarly, whether the chicken are sold, consumed, used as gifts or kept as replacement birds. Pedersen and Kristensen (2004) also found out farmer's wealth influence management practice and decisions. On a study on the Productivity and husbandry of FRLC on the Accra plains of Ghana, the variance in flock size is influenced by the sex of the respondent, the scavenging area, the number of family member and number of other livestock (Aboe *et al.*, 2006).

2.7.3 Market situation

Farmers manage chicken flock not only according to the environment, but also according to the market demand for chicken. Higher demand lead to higher prices hence higher returns. In many African countries, the traditional system gives low output thus the market is not a problem to the farmer. However, if larger production considered, many questions related to marketing such as price, customers, input price and input availability will suddenly become important and will influence the farmer's strategy and decision making (Pedersen, 2002; Mlozi *et al.*,2003; Kitalyi,1998)

2.7.4 Household characteristics

Household characteristics include the farm size, household size, education level of household members, income level, experience in poultry production and the farming system. In a study on the status of smallholder poultry production in the Alfred District of Kwazulu- Natal South- Africa, numeric data were analyzed with Statistical Analysis System (SAS) using descriptive statistics. The means for different variables were then compared to establish whether household income and

farming size influence the number of chicken kept and the level of chicken consumed (kilogram of protein intake/person/month). The results showed that there is generally a linear increase in the number of other livestock kept and the gross household income with an increase in the number of chicken kept per household (Swatson *et al.*, 2001). The study by Swatson also showed that, as the family income increase, and the family size decrease, the protein security increases.

The study by Feineman and Finelshitain (1996) that introduced socio-economic characteristics in a production analysis, revealed that wealthier, experienced farmers in poultry production and small family sizes were more willing to take risks in poultry production. Pedersen and Kristensen's (2004) study on the dynamic modeling of traditional African chicken production system, found out that wealth influences the management practices and decisions in FRLC production, and which in turn affects its output. Similarly, another study on the production function analysis of smallholder semi-subsistence and semi-commercial poultry production system in three agro-ecological regions in Northern provinces of Vietnam found out that the level of farm poultry output a farmer produce varied with the farms and farmer's conditional (Tung and Rasmussen, 2005). However, the same study showed that the education level could have a negative impact on poultry production which was due to the fact that highly educated farmers usually involved themselves in other social and economic activities, resulting in little attention to FRLC production. The experience in FRLC keeping was seen to be an important variable affecting productivity and management practices.

2.8 Impact of the Interventions

Tung and Ramussen (2005) used a Cobb-Douglas production function in their study on the production function analysis of semi- subsistence and semi- commercial farmers in three agro – ecological regions. They assumed that they poultry production output at farm level depended on the number of birds on the farm, the amount of various feed inputs provided by the farmer, the garden area where the birds could search for feed, the amount of labor, and capital and veterinary inputs. The results showed that the flock size, the feed amount per bird the labor per bird, the household income level, and veterinary cost coefficients were highly significant in the two models (Semi –subsistence versus Semi-commercial). On the other hand, the garden size had only a significant influence among the poultry farmers in the midland regions. However, regardless of the region (Lowland, Midland, or high-land)and the production system (Semi- subsistence VS semi- commercial),the results indicated that the feed amount per bird coefficient was the most responsive variable and the regions.

In another study on the performance of Zimbabwean local chicken in a controlled environment, chicken from one communal farming area was studied (Pederson, 2000). The results showed that chicken in a controlled improved management environmental performed better than what was found on- farm (unimproved environment). But in comparing the economic performance between the traditional on-farm conditions and the improved on-farm conditions, the improved on-farm conditional showed a negative pay back on feed cost and that the net profit could be more skewed if labour and housing cost were added (Pedersen, 2002). Low feed

costs were reported to be crucial in increasing the economic benefits; this could be obtained through lowering of the slaughter age and through the use of home made feed or use of a different breed with higher feed efficiency (Pedersen, 2002).

In a study on the dynamic modeling of traditional African chicken production system, a dynamic stochastic model (Simflock) of the traditional African chicken production was developed as a supplement to on-farm and on-station trials. The study found that by collecting eggs for home consumption or sale, egg production could be doubled and growth of chicken could be improved conditions (Pedersen and Kristensen, 2004).

Udo *et al.* (2006) did a study on the evaluation of interventions (daytime housing, ND vaccination, supplementing feeding, crossbreeding and control of broodiness) in village poultry system and found out that, over a simulated period of three years, crossbreeding had a highly negative effect on bird off- take, egg production, egg off- take and flock size.

However housing showed the greatest increase in flock size; followed by ND vaccination, feed supplementation and control of broodiness. Udo *et al.* (2006) then did a cost-benefit analysis in determining the economic effect of the interventions. The results of the analysis showed that the ND vaccination and broodiness control were the most economical interventions, while feed supplementation; crossbreeding and daytime housing had a negative effect on the net-return.

Das (2005) carried out a study on the performance of growing and laying chicken in cafeteria (free-choice feeding) and balance feeding under semi-scavenging conditions. Three supplementary levels (40g, 60g and 80g) of two feeding system (commercial balanced feeding, cafeteria feeding) were randomly allocated to 18 selected farmers (three farmers in each treatment). The effect of the feeding systems and supplementary levels on growth, production and profitability were determined. The profit on the basis of the expenditure during the experiment period was calculated through an economic analysis and result showed clearly that cafeteria feeding was profitable than balanced feeding. The result also showed that, irrespective of the feeding system, 40g and 60g supplementation were profitable than higher lever. In the study, it was recommended to farmers to reduce the feed cost by using local available conventional and non conventional cheap feed ingredients.

The famous Bangladesh poultry Model (BPM) used poultry as a tool for poverty eradication and as a promotion for gender equity (Kristensen *et al.*, 2004). The strategies of the Government of Bangladesh (GoB) in making village poultry rearing more profitable included the provision of improved breeds, motivation, group organization, training on poultry management and vaccination, supply of small credit, and regular supervision and advice. On evaluating the impact of the program, village poultry rearing activities generated varying amounts of income from USD 60 to USD 375 per annum (Kristensen *et al.*, 2004). From the survey results, the poultry mortality rate fell from 21.3 percent to 7.6 percent in the project areas; yearly consumption increased from 1.6 to 16.7 chicken and 43 to 186 eggs, and yearly income from sales of chicken and eggs raised from TK 400 to TK 2919 (USD 8-60)

(Kristensen *et al*, 2004). During the study the average per capital income in Bangladesh was USD 250-280, which was several times higher than before than model was introduced .This was due to the introduced poultry breeds and more time spent in chicken production activities (Kristensen *et al.*, 2004).

A study on the economy of different poultry systems was done in Kenya (Njue, 2004). Thirty poultry farmers rearing chicken for income and household nutrition under different poultry production systems was were randomly selected Information on flock production; disease control and marketing were collected by a semi-structured questionnaire. The study results showed all production systems were viable for the poultry project (return), the returns on investment were 1.52, 1.72 and 1.09 for intensive layers, broilers, semi scavenging and scavenging production systems respectively. However the cost-benefit analysis results showed that, the profit per bird was higher (USD 5.84) for the intensive egg production systems fallowed by broilers (USD 1.33). The profit margin for the semi scavenging system was almost half of that of the scavenging system (YSD 0.57 / bird / year) due to high feed costs (Mukiibi-Muka *et al.*, 2000).

2.9 Project Sustainability

Kyvsgaard and Urbina (1996) on a study on the supplementation of poultry diets with tree leaves and seeds of *Crescentia alata* investigated the effect of the *Crasentia alata* seeds on the daily egg production, pauses between clutches, shell thickness and color of the yolk. Also before the study was conducted training on the general nutrition and disease was done to participants. Productivity before the intervention

was used in comparing and evaluating the effect of the innovation. The participants reported to have a higher daily egg production, shorter pauses between clutches, increased shell thickness and improved color of the yolk. In evaluating the technology acceptance, lack of grain was often mentioned as the *crescentia alata* were mixed with sorghum grain. In the first evaluation on the acceptance of the technology, seven out of fifteen families interviewed tried the new feed formulation and the practice stopped just before the sorghum was harvested. However, two years after the initial study, 300 families (25% of the farms) were practicing one or more of the methods. The number had increased to 398 by the end of the other year. The range of supplementation was extended to include leaves of other tree species and legume seeds of *Crescentia alata*. Different methods of feed preparation were also developed by the farmers (Kyvsgaard and Urbina, 1996).

2.10 Attitude and Behavioural Change

Attitude is a subjective or mental state of preparation for action and it may be defined as a state of mind of the individual toward a value. Social values are created by the attitudes that are common to many men, and these attitude in time, depend upon pre-existing social values (Allport, 2004). Attitude is also define as an implicit response, which is anticipatory and mediating in reference to patterns of overt responses, which are evoked by a variety of stimulus pattern as result of previous learning or of gradients of generalization and discrimination. It is cue- and drive- producing, and it is socially significant in the individuals' society (Chein, 2002). According to Tesfaye (2003) attitude is the disposition to respond favorably or unfavorably to an object, person or institution. He adds that the characteristics of attributes are its evaluation

that reflects a positive or negative evaluation of the attributed object. Attitude is non-overt and can only be inferred from verbal or non-verbal responses.

There is conclusive evidence that an individual's attitude towards any object like ND vaccination, is a function of his or her beliefs about that object and the evaluative aspects of those beliefs. There is also enough evidence that there is a stable and high correlation between attitude and behavioral intentions. Attitudes are a fundamental determinant of behaviors with respect to that object. It may also be expected that an individual's attitude towards a given stimulus would influence his motivation to comply with a given norm. Also, there is a positive relationship between the relative advantage and rate of use of new ideas. However, relative advantage can be in the form of degree of economic profitability, low initial cost, lower perceived risk, decrease in discomfort, saving in time and cost, immediacy of the reward etc (FAO, 2000).

Researches on behaviour pointed out a number of factors that influence the attitude of livestock keepers. For instance, Bagachwa (1994) identified individual characteristics such as education, access to change agents, size of flock; regional characteristics of rural change agencies and population densities; change characteristics in accordance with local norms and economic advantages as influencing the decision towards ND vaccination to exotic and FRLC. FAO (2000) stated that if the behavior change promoted through use of incentives is not profitable from the livestock keepers' point of view, will not be sustainable and it is highly possible that it will be abandoned as soon as the program phases out, and no

replication beyond the boundaries of the lifetime of project can be expected. Furthermore, rapid economic benefit is a very important condition for success and it is most probably much more important than the use of incentives in terms of achieving genuine, durable change in attitude.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Overview

This chapter presents the research methodology which comprises of description of the study area, research design, sampling procedures, sample size, data collection, and data analysis.

3.2 Description of the Study Area

The study was conducted in three villages namely; Mae, Mtambala and Naliendele at Matengo/Ufukoni ward of Mtwara Rural District in Mtwara Region, which is located in southern part of Tanzania. The region covers land area of 16 720 km² which is equivalent to 1.9% of Tanzania mainland. Geographically, Mtwara Region is located between 10⁰05" and 11⁰25" latitudes and 38⁰ and 40⁰30' longitudes. To the north Mtwara Region borders with Lindi Region, to the east is Indian Ocean, to the south is Mozambique and in the west is Ruvuma Region.

Climatically, Mtwara Region has unimodal rainfall falling in November/December to April/May. The rainfall ranges between 830 mm. to 1120 mm per annum. Temperatures moderated by Indian Ocean, with the peak temperature of 27°C along the Coast in December while the lowest temperature is 23°C in July.

Mtwara Region comprises of five districts namely: Mtwara/Mikindani(Mtwara Urban), Mtwara Rural, Masasi, Newala and Tandahimba. The region has 21 divisions, 98 wards and 554 villages. Mtwara Urban District comprises of two

divisions, six wards and 13 villages. Ufukoni/Matengo ward is one of 13 wards of Mtwara Urban District which comprises of 4 634 households with human population of 18 871. The whole district has a total of 22 992 households with population of 92 602 (Mtwara Rural District Planning Report, 2008). Figure 2 shows location of Mtwara Region.

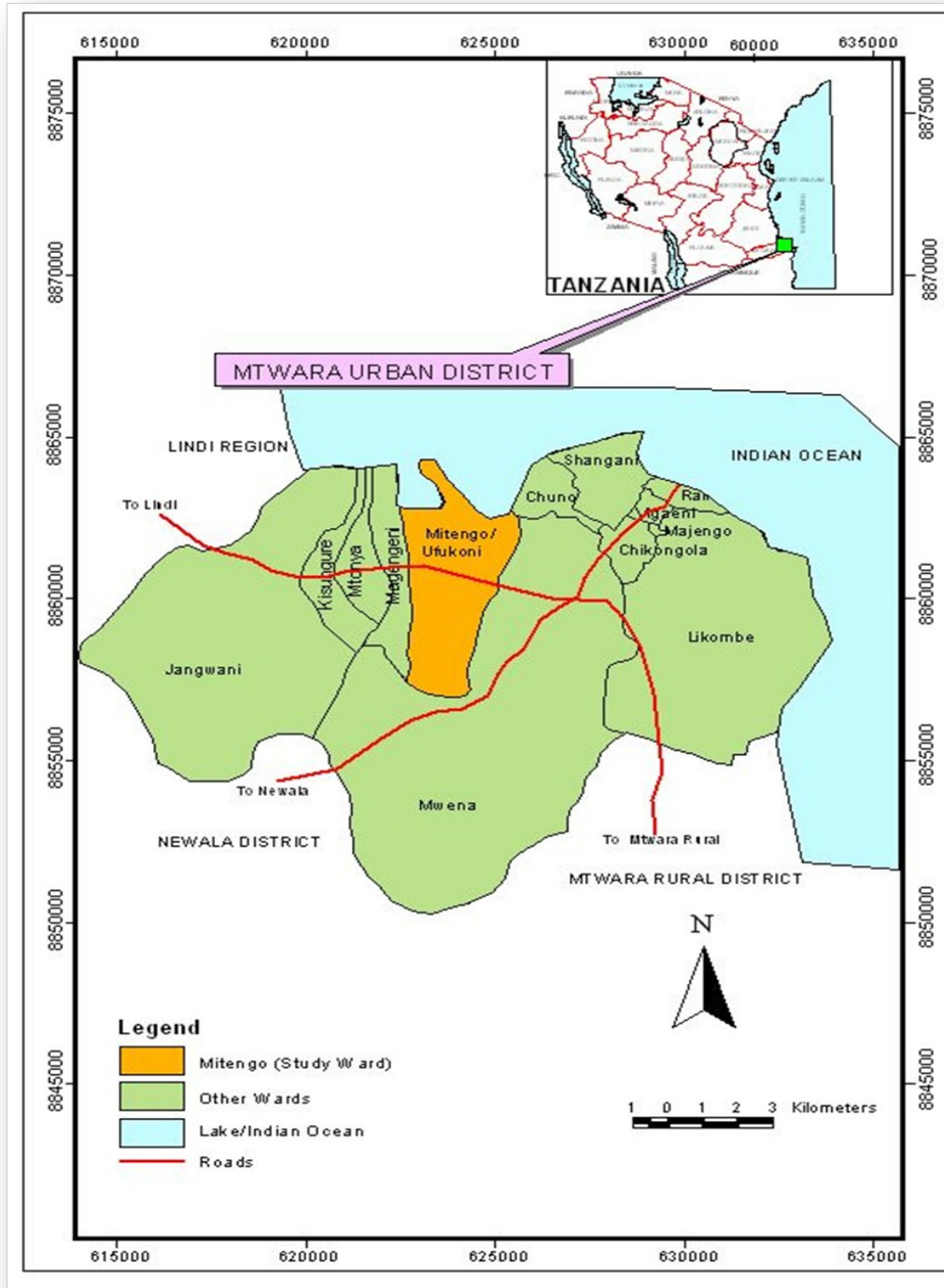


Figure 2: Location of Study Area

3.3 Research Design

A cross sectional research design was used in this study. The design allows data to be collected at a single point in time and can be used for a descriptive study as well as

determination of relationship between variables (Krishnaswami, 2006). The study objective, limited resources and time justify the use of the selected design.

3.4 Sampling Procedures and Sampling Size

3.4.1 Sample population

The target population for this research study was households that keep poultry. According to the Population and Housing Census of 2002, the area was found to have a total of 198 000 people (Mtwara Rural District Planning Report, 2008).

3.4.2 Sample size

A sample size of 210 households from three villages was used in this study to represent the whole population in project area based on probability sampling procedures. The sample size is arrived at in accordance to Bailey (1999), who proposed a sample size of 100 or more individuals to be significant for statistical analysis.

3.4.3 Sampling method

Purposive sampling design was employed. The design was used to obtain three villages which were under project area. Random sampling techniques were then adopted to obtain groups from each sampled village, where systematic sampling was used to obtain 70 heads of households (respondents) from each village. A village list comprising names of all heads of households was used as a sampling frame. This list was obtained from the village executive officers. The sampling interval was obtained by dividing the total number of head of households in the village by the required

sample size from each (N). The starting points were randomly selected, and then every n^{th} head of the household in the list was selected until the required sample in the village completed. A similar procedure was repeated in each village to get the total sample size of respondents that was used in the study.

3.5 Data Collection Procedures

Consent of interviewee was requested before beginning the interviews. Privacy and confidentiality of collected data were maintained. Both primary and secondary data were collected using respective methods.

3.5.1 Primary data

Primary data collection was mainly based on an interview schedule, where heads of households were subjected to questionnaire. The questionnaire contained of both closed and open ended questions. The questionnaire was designed to permit acquisition of both quantitative and qualitative information. The questionnaire was in a form of English language, but it was translated to Swahili language during interview to facilitate easy communication. The questionnaire contained questions for capturing information on the socio-economic impact of ND vaccination project. The process of data collection was preceded by a pilot study, which was done to test the clarity, sequence of questions and to reveal potential field problems. The information obtained was used to modify the questionnaire to fit the objectives of the study. Data collection was done by the principal researcher who was assisted by five enumerators. In addition, Focus Group Discussions (FGD) were conducted in all three villages to capture more information.

3.5.2 Secondary data

Secondary data were used to improve the primary data source, and was obtained from existing published and unpublished information/literature. These accessed from livestock officers, village offices as well as from SUA library and websites.

3.6 Data Processing and Analysis

Data collected were coded, entered into Excel software, verified and cleaned before analysis. The Statistical Package for Social Sciences (SPSS) version 13 was used for data analysis. Both qualitative and quantitative methods were used in analyzing the data. Descriptive statistics such as mean, frequencies and percentages were computed. Cross tabulation was used for bivariate analysis to test association between different pairs of variables to assess the impact of village-level ND vaccination project. The 5% level of significance was used for testing effect of project in period of time before and after the project. Consequently, the impact of village-level ND vaccination project was assessed.

3.7 Limitation of the Study

An anthropological approach could have been appropriate to this study. However, this needs more time and resources to spend while carrying out the research to explore their cultural dynamics with respect to adoption to ND vaccination regime. Most of the data for this study were obtained mainly from interviewing smallholder farmers, whose replies were subject to errors due to inadequate knowledge on certain issues or faulty memory or due to, sometimes, farmers' suspicion of the outsiders.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1. Overview

This chapter presents the results and discussions of the findings from the research. The chapter introduces the subject matter of what was done on the data collection. The collected data are hereunder presented summarizing the various responses from the questionnaires, interviews and focus group discussion.

4.2. Project Interventions

The ND control project (NDCP) basically aimed at controlling ND and increase FRLC production in pilot areas of Avian Flu Control. These pilot areas in Tanzania were established in Mtwara Region in March 2007 (Mtwara Rural District, in Ufukoni ward, Mbae, Mtambala and Naliendele villages), Iringa Region in October 2006 (Kilolo district) and Morogoro in October 2006 (Mvomero District).

In these pilot areas, the project trained selected farmers and livestock extension officers on ND prevention control and strengthened ND vaccine regime. Chicken production is highly depending on the farmer's management skill levels, which includes supplementing chicken with feed and water, provision of shelter and disease prevention (Sonaiya and Swan, 2004).

4.3 Demographic Characteristics

4.3.1 Household size

Distribution of household size of respondents is summarized in Table 1. The result indicates that about 56% of households had 5-8 members. The mean household size

was 7.7 members with standard deviation of 3.08. This figure is higher than the one reported in the national census of 2002 which was 5.3 for Mtwara Rural (URT, 2006). According to World Bank (2000), larger households are more likely to be poor. However, large household size is common in many poor countries in a society as it provides labour for livestock keepers and crop cultivators (Morton, 1990).

Table 1: Distribution of respondents by HH size (n=208)

| Member of households | Frequency | Percent |
|-----------------------------|------------------|----------------|
| 1 to 5 members | 44 | 21.2 |
| 5 to 8 members | 116 | 55.8 |
| Above 8 members | 48 | 23 |

4.3.2 Distribution of respondents by age

Age is an important factor, which influences decision-making (URT, 2004; World bank, 2000). In this study most of the respondents interviewed in the study area aged between 36 and 55 years old corresponding to 45% and others above 55years constituting 28% and where as 18 and 35 years old accounted for 27%, (Table 2). This implies that, the majority of the selected FRLC keepers are energetic group aged between 36 – 55 years old. According to Shindey, *et al.* (2004), this age is normally considered to be active by providing potential labour-force for community development.

Table 2: Distribution of respondents by Age (n=210)

| Age group (Years) | Frequency | Percent |
|--------------------------|------------------|----------------|
| 18 - 35 | 56 | 27 |
| 36 - 55 | 95 | 45 |
| Above 55 | 59 | 28 |

4.3.3 Distribution of respondents by sex

In livestock keeping, sex is among of the most important factor, as in the agro-pastoral households. It is used as basis for distribution of the labour among family members like keeping large animals in grazing lands, collecting animal to watering points and keeping small animals (Morton, 1990).

In this study, it was depicted that a large number of women were involved in keeping FRLC as compared to male members. As shown in Table 3, out of all respondents, 61% were females involved in keeping FRLC where as males constituted only 39%. Jensen and Dolberg (2003) collaborate similar findings that in livestock keeping community, small ruminants and poultry are kept by females, because they are easy to handle and in community they have less value compare to large animals. Tung and Rasmussen (2005) also supported these findings when they observed that in the community FRLC were sold to meet household problems which mainly involve women.

Table 3: Distribution of respondents by Sex (n=210)

| Sex of respondents | Frequency | Percent |
|---------------------------|------------------|----------------|
| Female | 128 | 61 |
| Male | 82 | 39 |

4.3.4 Marital status of respondents

It is generally assumed that married people constitute most farmers. Results on marital status of FRLC keepers are presented in Table 4. These studies revealed that majority of the respondents were married. Out of all respondents interviewed, single interviewed respondents constituted 9.1%, married respondent, constituted 54.7%,

widow/widower constituted 30.5% and divorced respondents in this category constituted 5.7%. Marital status is closely related to age and stages of life, married people are likely to be middle or old aged, while single people will mostly be younger even when age is controlled for the rate of self-employment (Msami, 2005).

Table 4: Distribution of respondents by marital status (n=210)

| Marital status | Frequency | Percent |
|-----------------------|------------------|----------------|
| Single | 19 | 9.1 |
| Married | 115 | 54.7 |
| Widows/widower | 64 | 30.5 |
| Divorced | 12 | 5.7 |

4.3.5 Level of education

Education develops competencies required in farming industry as it fosters creativity, curiosity, open mindedness and good interpersonal skills as well as technical education. Education is important to careers and ventures using or creating advanced technology (Semboja, 1994,). Results obtained in this study suggest that the level of education of these farmers ranged from illiterate to secondary school, however majority of the respondents had primary education and no formal education. Of all respondents, 37.9% had completed primary education, 36.8% had no formal education, and 19.6% did not complete primary education due to customs and beliefs while only 0.9% has education above secondary school.

Table 5: Distribution of education level of respondents (n=209)

| Education status | Frequency | Percent |
|------------------------------------|------------------|----------------|
| No formal education | 77 | 36.8 |
| Did not complete primary education | 41 | 19.6 |
| Completed primary education | 79 | 37.9 |
| Secondary | 10 | 4.8 |
| Above secondary | 2 | 0.9 |

4.4 Farming systems

In this study, farming activities were divided into two systems; Livestock production and crop production. Livestock productions were further divided into three types: FRLC and other poultry production, small ruminants (goat and sheep) and FRLC production finally larger animals (cattle) and FRLC production while crop productions were sub-divided further into cash crop (cashew nuts, coconuts and simsim) and food crop production (cassava, maize, paddy and sorghum) (Table 6).

Table 6: Distribution of respondent's farming (n=210)

| Type of production | Frequency | Percentage |
|-----------------------------|-----------|------------|
| Cropping system | | |
| Food crop | 79 | 37.6 |
| Food crop and Cash-crop | 131 | 62.3 |
| Livestock system | | |
| Poultry | 83 | 39.5 |
| Poultry and Small ruminants | 58 | 27.6 |
| Poultry and Large ruminants | 69 | 32.9 |

Table 6 shows that 79 respondents (37.6%) cultivated food crop only, while 131 respondents (62.3%) cultivated both food crop and cash crops. Eighty three (39.5%) kept poultry only of which 74 poultry keepers (89.2%) kept FRLC only. However, 58 respondents (27.6%) kept poultry and small ruminants and 69 respondents (32.9%) kept poultry and large ruminants. Furthermore, the results from this study revealed that there was a statistical significant difference in the adoption of improvement program between respondents practicing different crop patterns. Hence, the cropping pattern had a significant effect in influencing the use of interventions, which in turn influence FRLC production. The respondents who practiced commercial farming, were probably wealthier, educated and have large

area for FRLC to scavenge. Tung and Rasmussen (2005) reported that the level of farm poultry output varied with farms and farmer's conditions and farming systems that means farming systems affect FRLC productivity, since farming system depends on the type of crops grown and the intensification level. Aboe *et al.* (2006) also reported that the variance in FRLC flock size was caused by the sex of the respondents, the scavenging area, the number of family members and the number of other livestock.

Apart from different cropping system Table 6 also shows livestock keeping system of respondents where the study showed that livestock systems had no significant effect on the adoption of the interventions. The improved FRLC management practices were not influenced by the livestock systems. However, other livestock and number of FRLC could have influenced the availability of scavenging feeds. The number of chicken and species of other livestock in the farming system influence the level of competition for feeds and water, and the number of predators in the area affects chicken survival (Nielsen, 1996).

4.5. FRLC and household income

4.5.1 FRLC kept in the study area

In the study area (Mbae, Mtambala and Naliendele villages) total number of FRLC kept varied each year (Table 7). In this study, 2006 was the baseline data which shows real situation before project and 2007 taken as a result after project 2008 and 2009 as continuing year after project.

Table 7: FRLC kept in the study area

| Number of FRLC | 2006 (n=197) | | 2007 (n=210) | | 2008 (n=178) | | 2009 (n=175) | |
|----------------|--------------|------|--------------|------|--------------|------|--------------|------|
| | frequency | % | frequency | % | frequency | % | frequency | % |
| <10 | 119 | 60.4 | 19 | 9.0 | 53 | 29.8 | 78 | 44.6 |
| 10 – 20 | 26 | 13.2 | 64 | 30.5 | 47 | 26.4 | 53 | 30.3 |
| 21 – 30 | 19 | 9.6 | 71 | 33.8 | 15 | 8.4 | 14 | 8.0 |
| 31 – 40 | 8 | 4.1 | 25 | 11.9 | 28 | 15.7 | 8 | 4.6 |
| 41 – 50 | 15 | 7.6 | 17 | 8.1 | 5 | 2.8 | 2 | 1.1 |
| 51 - 60 | 3 | 1.5 | 1 | 0.5 | 11 | 6.2 | 13 | 7.4 |
| >60 | 7 | 3.6 | 13 | 6.2 | 19 | 10.7 | 7 | 4.0 |

Chi-square=114.73, P=0.0002 *. (Note:* Significant at p=0.05)

Results obtained in this study (as summarized in Table 7 and Figure 3) show that in year 2006 (before project) 119 respondents (60%) were keeping FRLC below 10, while 26 respondents (13.2%) were keeping 10 – 20 FRLC and 19 respondents (9.6%) were keeping 21 – 30 FRLC. This implies that 164 respondents (83.2%) were keeping FRLC below 30. Out of 164 respondents who kept FRLC below 10, 84.1% of them were from Ntambala and Mbae villages. This is probably due to the fact that Naliendele village is near to Naliendele Livestock Institute of Training and there is diffuse of livestock keeping knowledge from households in which members are working in the Institute.

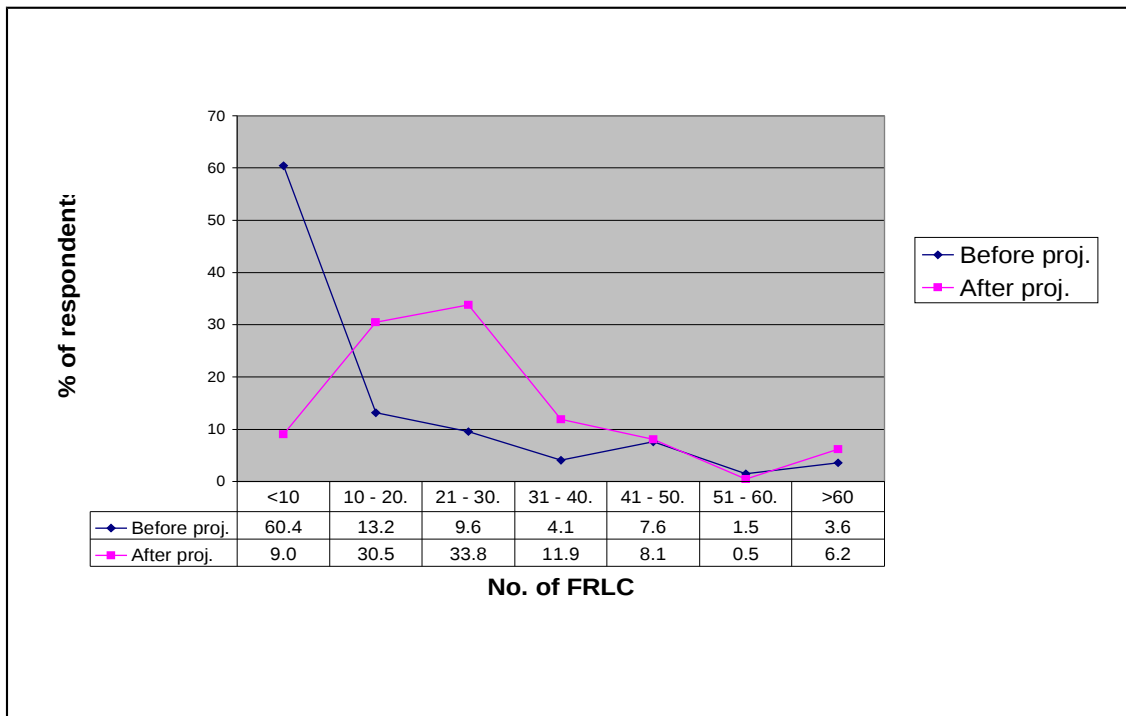


Figure 3 : Distribution of FRLC kept by respondents

Furthermore, one year after the project (in 2007) the study revealed that 19 respondents (9.0%) were keeping FRLC below 10, and 13 respondents (6.2%) were keeping more than 60 FRLC. In year 2008, the study revealed that 53 respondents (29.8%) kept below 10 FRLC and 19 respondents (10.7%) were keeping FRLC above 60 and in year 2009 study revealed that 78 respondents (44.6%) kept FRLC below 10 while 7 respondents (4.0%) kept more than 60 FRLC. Although there was an increase in FRLC during project, this trend was not sustained since there was a decline of FRLC as years increases. The result summarized in Table 7, revealed a statistical significant ($P < 0.05$) association between number of FRLC kept in the study area and period before and after project. That is the number of FRLC kept before project by respondents is less than that kept by respondents after project.

4.5.2 Egg of FRLC sold by respondents

In order to establish number of eggs sold, respondents were asked to mention number of eggs sold per annum. Table 8 shows number of eggs sold per annum. Results show that in year 2006 (before project) 41 respondents (36%) sold eggs below 50, while 64 respondents (56.6%) sold eggs between 51 and 100. This implies that about 93% of the respondents were selling eggs below 100 per annum.

Table 8: Egg of FRLC sold by respondents

| Number of Eggs | 2006 (n=113) | | 2007 (n=164) | | 2008 (n=209) | | 2009 (n=177) | |
|----------------|--------------|------|--------------|------|--------------|------|--------------|------|
| | frequency | % | frequency | % | frequency | % | frequency | % |
| <50 | 41 | 36.3 | 19 | 11.6 | 53 | 25.4 | 97 | 54.8 |
| 51 - 100. | 64 | 56.6 | 50 | 30.5 | 113 | 54.1 | 65 | 36.7 |
| 101 - 200 | 5 | 4.4 | 87 | 53.1 | 15 | 7.2 | 14 | 7.9 |
| >201 | 3 | 2.7 | 8 | 4.9 | 28 | 13.4 | 1 | 0.6 |

Chi-square=78.4, P=0.0004 *. (Note:* Significant at p=0.05)

Furthermore, the results summarized in Table 8 and Figure 4 revealed that during and after the project only 19 respondents (11.6%) sold egg below 50, which implies that there were a decrease in the number of respondents who sold less than 50 eggs and increase number of respondents who sold more than 50 per annum though there was increasing number of respondents who sold number of eggs below 50 as number of years increase. During Focus Group Discussions (FGD) in Mkambala and Mbae villages, it was revealed that a drop of number of eggs sold in the year 2009 was due to massive death of FRLC due to an outbreak of ND which occurred early in April compared to other year (usually occur in June). Probably this was due to introduction of FRLC from other areas through the main regional market which is closer to these villages and therefore acting as the source of ND outbreak.

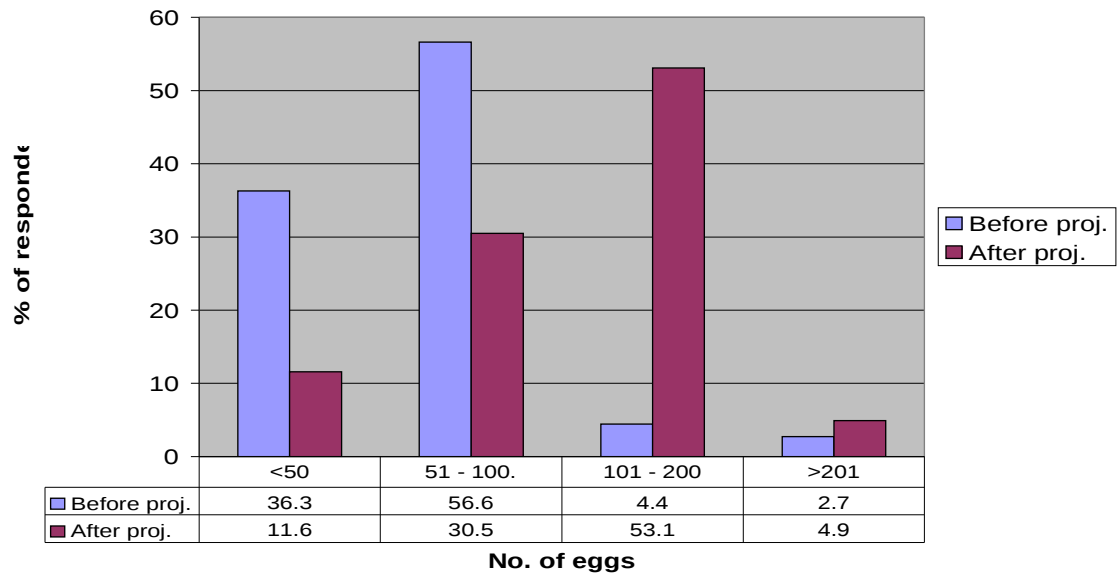


Figure 4 : Eggs of FRLC sold by respondents

4.5.3 Income from selling eggs by respondents

Table 9 shows the respondent's income from selling eggs. The findings show that the number of respondents with income below Tsh. 5000 decreased in year 2007 to 5 (2.5%) compared to the same category in year 2006 which was 97 (52.4%), also the number of respondents with income of above Tsh. 20000 increased in year 2007 to 20 (9.8%) from 15 (8.1%) of year 2006 though there was a number dropout in the following years; in 2008 dropped to 7 (3.5%) and 1 (0.5%) in 2009.

Table 9: Income from selling eggs by respondents

| Income in Tsh. | 2006 (n=185) | | 2007 (n=204) | | 2008 (n=201) | | 2009 (n=204) | |
|----------------|--------------|------|--------------|------|--------------|------|--------------|------|
| | frequency | % | frequency | % | frequency | % | frequency | % |
| <5000 | 97 | 52.4 | 5 | 2.5 | 94 | 46.8 | 113 | 55.4 |
| 5001 - 10000 | 52 | 28.1 | 132 | 64.7 | 81 | 40.3 | 76 | 37.3 |
| 10001 - 20000 | 21 | 11.4 | 47 | 23.0 | 19 | 9.5 | 14 | 6.9 |

| | | | | | | | | |
|--------|----|-----|----|-----|---|-----|---|-----|
| >20000 | 15 | 8.1 | 20 | 9.8 | 7 | 3.5 | 1 | 0.5 |
|--------|----|-----|----|-----|---|-----|---|-----|

Chi-square=127.8, P=0.0001*. (Note:* Significant at p=0.05)

4.5.4 FRLC sold in the study area

Livestock, especially FRLC is the main source of income at the study area. During interviews with the livestock ward extension officer, it was revealed that due to low income of people living in Mbae, Mkangala and Naliendele villages depended on FRLC to a large extent when they had immediate needs. Such needs include; food, clothes, school needs and contributions to development project. However, despite the importance of FRLC as immediate resource for household income people are not putting much effort on improved FRLC management (Jitihada Mohamed Sudi., personal communication). Table 10 summarizes a trend of FRLC sold by respondents where in year 2006 (before project) 129 respondents (65.5%) sold less than 5 per annum and only 7 respondents (3.6%) sold above 150 FRLC, after project 2007 and 2008 there was increase of number of FRLC sold though there was slightly drop in 2009 due to ND outbreak as pointed out earlier.

Table 10: FRLC sold by respondents

| Number of FRLC sold | 2006 (n=197) | | 2007 (n=210) | | 2008 (n=178) | | 2009 (n=197) | |
|---------------------|--------------|------|--------------|------|--------------|------|--------------|------|
| | frequency | % | frequency | % | frequency | % | frequency | % |
| <5 | 129 | 65.5 | 9 | 4.3 | 25 | 14.1 | 98 | 49.7 |
| 6 - 50. | 37 | 18.8 | 51 | 24.3 | 132 | 74.2 | 71 | 36.0 |
| 51 - 100 | 19 | 9.6 | 78 | 37.1 | 11 | 6.2 | 17 | 8.6 |
| 101 - 150 | 5 | 2.5 | 62 | 29.5 | 3 | 1.7 | 9 | 4.6 |
| >150 | 7 | 3.6 | 10 | 4.8 | 7 | 3.9 | 2 | 1.0 |

Chi-square=191.26, P=0.00001 *. (Note:* Significant at p=0.05)

4.5.5 Income from selling FRLC

Results for the income gained from selling FRLC are summarized in Table 11 and Fig. 10. The results show that total income in year 2006 and 2007 was Tsh. 8 925 000.00 with average of Tsh. 56 847.13 and 14 800 000 with average of 89 696.97, respectively. The study revealed that in year 2006 (before project), 81 respondents (51.6%) got income below Tsh. 50 000, while in year 2007, only 47 (28.5%) respondents reported to earn income below Tsh. 50 000, this shows improvement in household income probably due to project interventions.

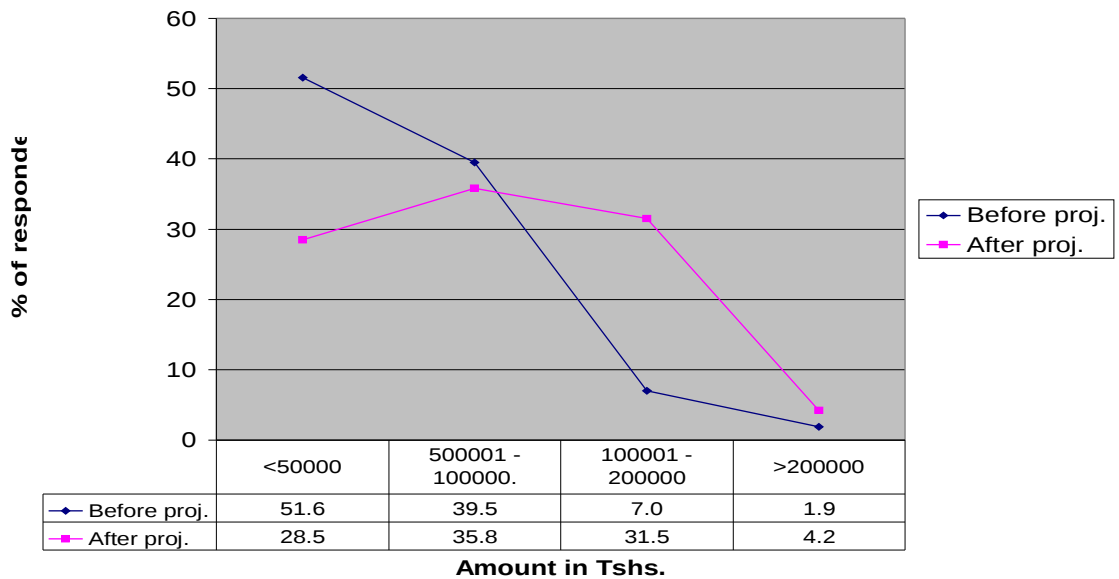


Figure 5 : Income from selling FRLC by respondents

In addition, the study also revealed that there was statistical significance of project interventions ($P < 0.05$) on management of FRLC, which means there were increase in number of FRLC which sold by respondents. The increased number of FRLC sold per year probably was due to increase in number of FRLC of respondents which was caused by project interventions. In year 2009 there was decreased number of FRLC

sold, this was revealed during FGD at three villages where by respondents said that apart from outbreak of ND in 2009 which caused massive death of FRLC also the project terminated free vaccines which were given to households that made it difficult.

Table 11: Income from selling FRLC by respondents

| Income in Tsh. | 2006 (n=157) | | 2007 (n=165) | | 2008 (n=123) | | 2009 (n=163) | |
|-----------------|--------------|------|--------------|------|--------------|------|--------------|------|
| | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| <50000 | 81 | 51.6 | 47 | 28.5 | 79 | 64.2 | 95 | 58.3 |
| 50001 - 100000. | 62 | 39.5 | 59 | 35.8 | 26 | 21.1 | 52 | 31.9 |
| 100001 - 200000 | 11 | 7.0 | 52 | 31.5 | 17 | 13.8 | 14 | 8.6 |
| >200000 | 3 | 1.9 | 7 | 4.2 | 1 | 0.8 | 2 | 1.2 |

Chi-square=37.21, P=0.003 *. (Note:* Significant at p=0.05)

4.6 Health status of the FRLC in the study area

4.6.1 Common diseases affecting FRLC

FRLC provide important sources of animal protein and immediate source of income in the study area. Diseases of FRLC are therefore of major concern because are different species which affects FRLC at different areas. According to Sonaiya *et al* (2004), the low productivity of the FRLC in traditional systems is mainly due to high mortality, caused by ND, this is in agreement with the result obtained in this study (Table 12). In this study common diseases that affect FRLC were categorized into ND, intestinal worms and fowl pox.

Results summarized in Table 12 show that ND was highly affecting FRLC in the study area where 137 respondents (65.6%) mentioned it to be the most common disease, 42 respondents (20.1%) mention endoparasites and protozoa which include (Protozoa; Coccidiosis, Blackhead) and (Endoparasites;- Nematodes, Histomoniasis, Haemoparasites and round worms) while Typhoid and Fowl pox were 17 (8.1%) and

13 (6.2%), respectively. During focus group discussions in all three villages, respondents mentioned that after ND vaccination to less than two months chick old they frequently developed signs of Fowl pox.

Table 12: Diseases affecting FRLC in the study area (n=209)

| Type of disease | Frequency | Percentage |
|--------------------------|------------------|-------------------|
| ND | 137 | 65.6 |
| Endoparasites & Protozoa | 42 | 20.1 |
| Typhoid | 17 | 8.1 |
| Fowl pox | 13 | 6.2 |

4.6.2 ND Vaccine program in the study area

Results on the ND vaccination status before and after the project are summarized in Table 13. It further shows how many respondents were vaccinating FRLC in different years. Indeed the results from this study show that in year 2006 (before program), 72 respondents (68%) were not vaccinating FRLC against ND, 17 respondents (16.2%) were vaccinating once while only 1 respondent (1.0) were reported to carry out regular ND vaccination regime. According to Shindey *et al.* (2004), poor performance of traditional poultry practices in the villages was due to lack of good knowledge on poultry management, vaccines and medicine. Figure 6 revealed that there was increase in number of ND vaccination after project intervention.

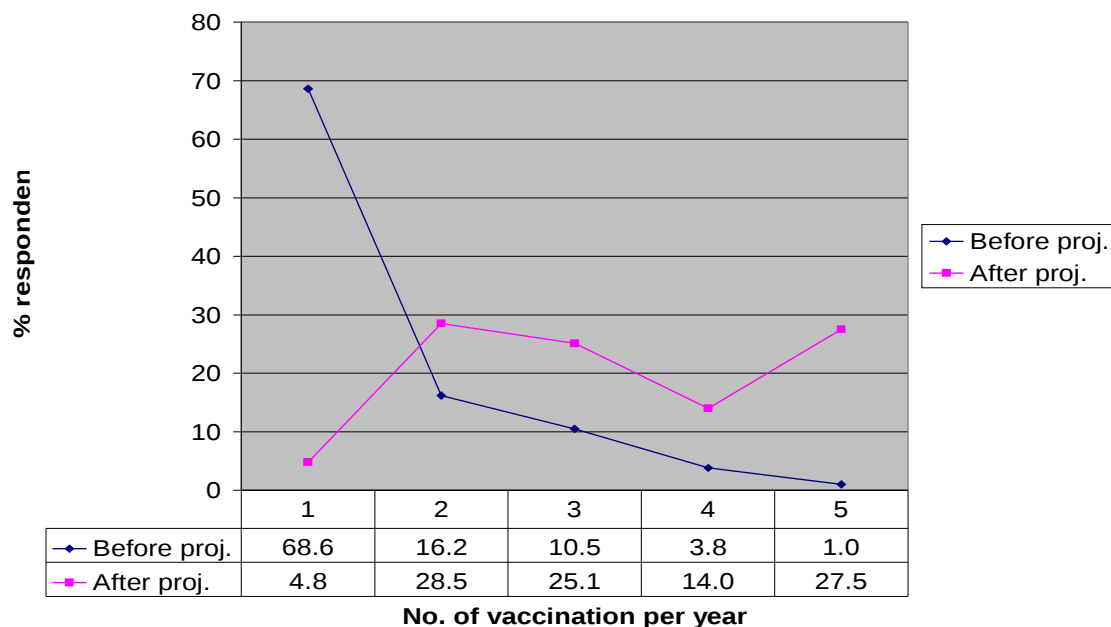


Figure 6: ND vaccination regime in the study area

Also the result in Table 13 show that there is increase of number of ND vaccination after project interventions, in year 2007 (after project) 57 respondents (27.5%) vaccinated 4 times per annum, 29 respondents (14%) vaccinates 3 and only 10 respondents (4.6%) were not vaccinating. Further the results show that there was a decrease in number on respondents vaccinating regularly in year 2009 where 79 were not vaccinating at all.

Table 13: ND vaccine regime by respondents

| No. of vaccination | 2006 (n=105) | | 2007 (n=207) | | 2008 (n=136) | | 2009 (n=155) | |
|--------------------|--------------|------|--------------|------|--------------|------|--------------|------|
| | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| <1 | 72 | 68.6 | 10 | 4.8 | 61 | 44.9 | 79 | 51.0 |
| 1 | 17 | 16.2 | 59 | 28.5 | 26 | 19.1 | 52 | 33.5 |
| 2 | 11 | 10.5 | 52 | 25.1 | 17 | 12.5 | 14 | 9.0 |
| 3 | 4 | 3.8 | 29 | 14.0 | 13 | 9.6 | 2 | 1.3 |
| 4 | 1 | 1.0 | 57 | 27.5 | 19 | 14.0 | 8 | 5.2 |

Chi-square=151.33, P=0.00006 *. (Note:* Significant at p=0.05)

4.7 Socio-relations within households

Family poultry is rarely the sole means of livelihood for the family but it is one of the integrated and complementary farming activities contributing to the overall well-being of the household. Poultry provide a major income-generating activity from the sale of birds and eggs. Occasional consumption provides a valuable source of protein in the diet. Poultry also play an important socio-cultural role in many societies (Tadelle *et al.*, 2000). According to Sonaiya and Swan, (2004), Poultry keeping uses family labour, and women (who often own as well as look after the family flock) are major beneficiaries. Women often have an important role in the development of family poultry production as extension workers and in vaccination programmes.

4.7.1 FRLC sleeping at night

In this study places for keeping FRLC at night were classified as; the same with human, poultry house and in the tree. Results summarized in Table 11 shows that 121 respondents (62.7%) slept in the same house with FRLC, 63 respondents (32.6%) had FRLC houses and 9 respondents (4.7%) their FRLC were sleeping in the trees. According to Minga *et al.* (2001), sleeping places of FRLC are important in growth and productivity, that means favored places can increase performances of FRLC in growth and production. According to Pedersen and Kristensen (2004), sleeping in the same house with poultry can result into easily transmission of Highly Pathogenic Avian Influenza (HPAI) and other zoonotic diseases.

In group discussion and probing interview with farmers it was revealed that sleeping with FRLC was done for security purposes.

Table 14: Sleeping of FRLC at night (n=193)

| Places | Frequency | Percentage |
|---------------------|------------------|-------------------|
| The same with human | 121 | 62.7 |
| Poultry house | 63 | 32.6 |
| In the tree | 9 | 4.7 |

4.7.2 Housing and shelter

The result from this study shows that all respondents agreed that they have received training on housing management though only 63 respondents had FRLC house. During survey, it was observed that the conditions of the FRLC houses that the respondents were using for FRLC were more or less the same in all three villages. Respondents either keep their FRLC in their own homes or built a separate FRLC house made of break wall and grass roof and polled, mud walled with grass roof, data in Table 15 summarizes different housing management practices used by respondents. 50 respondents (79.4%) built FRLC houses polled, mud walled with grass roof and 13 respondents (20.6%) built brick walled and grass roof where no one respondent who built FRLC house bricks walled & iron sheet roof. During group discussion, respondents revealed that during project the built bans were very temporally and after project farmers did not repair them due to expenses. Also respondents mentioned that theft and cost of a standard FRLC bans were the main constraints on building a standard FRLC houses. The construction of houses should be in such a way that, they are easy to clean, well ventilated and cheap (Host, 1990).

Table 15: Housing management practices by respondents (n=63)

| Type of house | Frequency | Percentage |
|----------------------|------------------|-------------------|
|----------------------|------------------|-------------------|

| | | |
|------------------------------------|----|------|
| Bricks walled and grass roof | 13 | 20.6 |
| Polled, mud walled with grass roof | 50 | 79.4 |

The respondents who housed their FRLC did so either; because of experience they got from their fore-parents, or because were advised by the project and did not like to sleep with their FRLC, or because they wanted to protect their FRLC from hazards. Housing helped protect FRLC against diseases and predators, adverse temperature, radiation, rain and chilling weather. Njue *et al.* (2001), on a survey on a disease status of village chicken in Kenya, suggested that the designing of housing for the village chicken will go a long way into controlling parasitic disease and losses associated with predation. Mwalusanya *et al.* (2002) in the study of Productivity of local chickens under village management conditions established that simple housing was provided at night to 95.2% of the households studied. The birds were only housed at night and left to scavenge for their feed during the day, thereby getting exposed to various predators. Lack of protection of young birds from predators (birds of prey, rodents and domestic dogs and cats), cold and heavy rains contributing to the losses which could be reduced considerably if proper housing was provided and husbandry practices improved.

4.7.3 Household gender relationship on FRLC

Results summarized in Table 16 indicate the ownership status of FRLC in households. Indeed results, revealed that 137 respondents (65.2%) reported that women were the owners of FRLC, while 17 respondents (8.1%) said men were the owners of FRLC, 13 respondents (6.2%) indicated male child, and 29 respondents (13.8%) indicated female children while 14 respondents (6.7%) indicated all family members.

Table 16: Ownership of FRLC by gender in the household (n=210)

| Care of FRLC | Frequency | Percentage |
|-----------------------|------------------|-------------------|
| Women | 137 | 65.2 |
| Men | 17 | 8.1 |
| Male child | 13 | 6.2 |
| Female child | 29 | 13.8 |
| All household members | 14 | 6.7 |

According to Habtemariam, (2000), who studied livestock production, household food security and sustainability in smallholder mixed farms in Ethiopia revealed the same trend of results; Women in the households contributes more in household income from FRLC activities compare to other family members, all small animals and poultry in the household are owned and cared by women due to reason that they are easy to handle. In the household larger animals and good properties are owned by men, Ellis, (2000) on his study reported that, in the rural households men own large, complicated and valued items in the house because they can handle them thus leading into male domination culture.

4.7.4 FRLC household income and decision

Table 17 shows results on who decides on selling and keeping money from FRLC at household level, the study revealed that 129 respondents (61.4%) mentioned men, 60 respondents (28.6%) mentioned women and 21 respondents (10.0%) said all household members. This study revealed that although women were the owners of FRLC, but men made decisions on whether to sell or not to sell. In the study area, decision on the household properties holds strongly with gender relationship in the house.

**Table 17: Decision of selling and keeping money from FRLC by respondents
(n=210)**

| Decision maker | Frequency | Percentage |
|-----------------------|------------------|-------------------|
| Women | 60 | 28.6 |
| Men | 129 | 61.4 |
| All household members | 21 | 10.0 |

In FGD in all three villages, respondents revealed that culturally decision makers are men not women, and they believe that married woman need to listen and obey men and this applies as a simple definition of marriage (male domination system).

4.7.5 Reasons that prompt selling FRLC

The way FRLC incomes and decisions are handled tend to vary between households. Table 17 summarizes data on who decides on selling and keeping money from FRLC at household level. This study revealed that 129 respondents (61.4%) mentioned men, 60 respondents (28.6%) mentioned women and 21 respondents (10.0%) said that all members of the family as household income's decision makers. Although women are the owner of FRLC but men are the one who decides whether to sell or not to sell. In the study area decision on the household properties holds strongly with gender relationship in the house.

Table 18: Purpose of selling FRLC by respondents (n=210)

| Statements | Frequency | Percentage of responses | Percent of cases |
|--------------------------------------|------------------|--------------------------------|-------------------------|
| Food expenses | 210 | 21.0 | 100.0 |
| Medical expenses | 204 | 20.4 | 97.1 |
| Education expenses | 147 | 14.7 | 70.0 |
| Development contributions | 118 | 11.8 | 56.2 |
| Cultural expenses (Drama and brides) | 107 | 10.7 | 51.0 |
| Purchase of household items | 79 | 7.9 | 37.6 |
| Housing construction | 56 | 5.6 | 26.7 |
| Settling legal fines and cases | 53 | 5.3 | 25.2 |
| Purchase of veterinary drugs | 26 | 2.6 | 12.4 |
| Total | 1000 | 100 | 476.2 |

Results presented in this study show that food expenses were ranked the most important reason for selling of FRLC. In fact, all the respondents (100%) indicated that they normally sell FRLC when they face serious lack of food in their households. In FGD revealed there is serious food deficiency in the study area in the period of August to December of every year, in this period households eat one to two meals per day. In livestock keeper production setting, food security is defined as having enough food for the household throughout the year (Delgado *et al.*, 1999). It was learnt that food security in the study area depends mostly on own crop cultivation. In addition, it is achieved indirectly by selling FRLC to obtain cash for purchasing food or sometimes through barter (exchange FRLC with cereal).

Medical expenses were ranked second most important reason that prompts households to sell FRLC. In FGD different diseases were mentioned to affect the community. The major ones were malaria, acute respiratory infection, diarrhea diseases and HIV/AIDS-related illness.

The discussion revealed that awareness of the importance of education in the study population is growing and there is an increasing interest to send children to school. This was ranked as the third most important reason that motivated individuals to sell FRLC. About 70% indicated education related expenses having influence on their decision to sell FRLC. To understand how the respondents valued education, they were asked to mention their primary reason for sending their children to school. Majority (97.3%) of them stated that education is useful in that it assures employment for children after completion of their studies.

Contribution to support development projects or programs was mentioned to have influence on tendency of community to sell FRLC. About 56.2 percent stated to have sold FRLC in order to contribute development levy. During one of FGDs, it was mentioned that currently development partners such as government or NGOs do not provide full financial support to their development projects. On the contrary, one of their compulsory conditions to support implantation of projects is that they require part of the costs of the project to be met by the community where these projects are implemented. Between Tsh. 10 000 to 30 000 is charged per household per projects. Respondents complained that these contributions have been causing decrease in number of FRLC kept per households and have negative impact on their livelihood.

4.8.0 Farmer's attitude towards ND vaccination program

Attitude measures the degree of liking or disliking of an individual towards an object, idea or practice (Chein, 2002). Likert scale gives a degree of liking or disliking of an individual towards a stimulus (Edwards, 2007). The attitude towards

ND vaccination program was measured using Likert scale. The attitude is positive or negative has significant implication towards ND vaccination program.

The respondents were presented with ten (10) statements on 3-level Likert scale (agree, uncertain or disagree) on a number of issues measuring attitude towards ND vaccination program. An equal number of these statements presented positive and negative connotations on the subject matter. Issue evaluated including general carryout of ND vaccination, benefit of ND vaccination to FRLC keepers, assurance of ND vaccination, household income and FRLC. Table 19 provides distribution of responses on individual statements.

Table 19: Distribution of responses on individual statements by respondents

| Statements | Agree (%) | Disagree (%) | Uncertain (%) |
|--|------------------|---------------------|----------------------|
| ND vaccination is simple to be carried out | 69.4 | 20.7 | 9.9 |
| Vaccination of ND is beneficial to FRLC keepers | 97.1 | 1.7 | 1.2 |
| If FRLC proper vaccinated will not die | 88.0 | 3.8 | 8.2 |
| Some amount of money earned from selling FRLC and eggs should be used to buy ND vaccine | 53.6 | 42.1 | 4.3 |
| Using ND vaccine can increase income at household | 98 | 0.8 | 1.2 |
| ND vaccination practice needs complicated facilities | 10 | 89.6 | 0.4 |
| Vaccination practice is not beneficial to FRLC | 0.5 | 97.3 | 2.2 |
| ND vaccine does not prevent occurrence of ND | 16.1 | 83.7 | 0.2 |
| All money earned from selling FRLC and eggs should be used into other activities than ND vaccine | 51.3 | 44.7 | 4.0 |
| Using ND vaccine does not increase income at household | 2.5 | 92.9 | 4.6 |

The results show that majority of respondents gave higher scores of more than 53% to positive statements, the highest score was using ND vaccine can increase income at household level (98%) and ND vaccination is beneficial to FRLC keepers (97.1%). Analysis of negative statements showed all money earned from selling FRLC and eggs should be used into other activities than ND vaccine (51.3%). Higher score in

vaccination can increase income at household level as reported in FGD, was due to the result observed after project were community managed to pay basic needs and school needs. Also it was reported that eggs were used as food and as immediate alternative source of income. The highest score in negative statement all money earned from selling FRLC and eggs should be used into other activities than ND vaccine (51.3%) was also reported in FGD, that the government should be responsible for vaccine for FRLC keepers.

Individual attitude score determine extent of personal attitude towards liking or disliking ND vaccination. Responses from Table 19 were summarized after which an index developed in order to determine the attitude of sample responded depending on point scored on Likert scale (Table 20). The potential highest points score for 10 statements at 3-level Likert scale are 30 points and a cut-off point for neutral response being 20. Individuals who scored points higher than 20 points were regarded to have negative attitude (disliking).

Table 20: Distribution of individual score on attitude to ND vaccination (n=210)

| Responses | Frequency | Percentage |
|-------------------|------------------|-------------------|
| Positive attitude | 201 | 95.7 |
| Neutral attitude | 6 | 2.9 |
| Negative attitude | 3 | 1.4 |

The result revealed that majority (95.7%) of respondents had positive altitude towards ND vaccination program and few showed a negative attitude. Individual scores on Likert scale showed the highest and the lowest score were 22 and 21 points for respondents with positive attitudes and 19 and 12 points for those with negative

attitude, respectively. Furthermore, the mean was 16 points out of potential 30 scores. This implies that, in general, the attitude of sample respondents is positive. These suggest that farmers understand theoretically the importance of ND vaccination to FRLC. There are still issues to be addressed in order to make farmers practice ND vaccination. According to Minga *et al* (2001), availability of vaccine and attitude of rural FRLC keepers that FRLC needs less care are main challenges to FRLC industry in the country.

4.9. Sustainability of the ND vaccination program

4.9.1 Farmer's knowledge on FRLC acquired through project intervention

ND vaccination project in Mtwara region carried out in Mtwara rural district in three villages (Mbae, Mkangala and Naliendele). Apart from putting pilot area for Avian flu outbreak control in Tanzania, also aimed at controlling ND and thus improves production of FRLC. The project interventions was feeding, disease control, housing management and gender issues. According to Pedersen and Kristensen (2004), the level of chicken production highly depends on the farmer's management skills and knowledge level on poultry. Table 21 summarizes data of training to respondents from different villages.

Table 21: Knowledge received from project by respondents (n=210)

| Knowledge offered | Mbae (n=81) | % | Mkangala (n=77) | % | Naliendele (n=52) | % |
|--------------------------|------------------------|----------|----------------------------|----------|------------------------------|----------|
| Feeding | 51 | 63.0 | 58 | 75.3 | 49 | 94.2 |
| Housing management | 69 | 85.2 | 62 | 80.5 | 43 | 82.7 |
| Disease control | 73 | 90.1 | 70 | 90.9 | 51 | 98.1 |
| Gender relation issues | 58 | 71.6 | 67 | 87.0 | 44 | 84.6 |

Results from Table 21 shows that majority of the respondents from Mbae 73 (90.1%) indicated that they have received training on disease control, 69 respondents (85.2%) trained on housing management while 58 respondents (71.6%) trained on gender related issues. Also majority of respondents from Mkangala and Naliendele trained on disease control 70 (90.9%) and 51 (98.1%) respectively.

The project however, claimed to have educated all its participants. But, the above results show a different picture. This was probably due to poor participation in the project activities by the project beneficiaries, or poor technology dissemination. In this regard, for example, Lugeye (1994) discovered that illiterate groups need special attention when information is being disseminated.

4.9.2 Group formation

The use of small informal group approaches to deliver development services to small farmers (provided by government, NGOs and/or the private sector) has proven to be an effective institutional device for sustainability, lowering the delivery costs of these services, for reducing the expenses small farmers incur in gaining access to those same services, and to markets, and for promoting small farmer self-development. Small farmer groups are also seen a useful organizational mechanism for mobilizing small farmer collective self-help actions aimed at improving their own economic and social situations and that of their communities. This is the conclusion of FAO after more than two decades of direct project implementation experience in 17 countries (Kusina *et al.*, 2001).

Table 22: FRLC keeper group formation (n=210)

| Responses | Frequency | Percentage |
|------------------|------------------|-------------------|
| Yes | 3 | 1.4 |
| No | 193 | 91.9 |
| Not aware | 14 | 6.7 |

Table 22 shows data obtained after farmers were asked if they have formed any group among of FRLC keepers. One hundred and ninety three respondents (91.9%) said there were no any groups formed after the project and 3 respondents (1.4%) said there are groups formed. All three respondents who said there are FRLC available groups was from Naliendele village, on FGD it was revealed that, there was another project from District Agriculture Development Program (DADP) which involved these three FRLC keepers from ND vaccination project. On interview of village livestock field officer revealed that this intervention of group forming was left to farmers themselves to formulate groups though they have trained on how to formulate groups. These results indicating that sustainability of ND vaccination regime will be difficult unless there is formation of groups.

4.9.3 Policies formation

Availability and understanding of FRLC policies and guideline governing the sector is of paramount importance. Data obtained in this study suggested that majority of households were not aware of FRLC policies and guidelines. Table 23 shows that, 152 respondents (72.4%) reported that no policy formed to guide FRLC, 57 respondents (27.1%) reported that they are not aware if there is any policy formed to guide FRLC and only one respondent (0.5%) reported there is policy formed to guide FRLC. According to Morton, J. (1990), management of any rural development

should be decentralized to local community (owned) by using community methods to insure sustainability by formation of by laws from main policies.

In FGD, all three villages suggested the use of by laws will enforce farmers to manage their FRLC effectively, farmers mentioned some village by laws would help sustainability of ND vaccination like keeping of FRLC, building house for FRLC and ND vaccination should be compulsory to all FRLC keepers.

Table 23: FRLC policies formation (n=210)

| Responses | Frequency | Percentage |
|------------------|------------------|-------------------|
| Yes | 1 | 0.5 |
| No | 152 | 72.4 |
| Not aware | 57 | 27.1 |

4.9.4 Access to ND vaccines and poultry inputs

Sonaiya, F.B (2000) and Taddelle *et al*, (2000) have researched and classified poultry inputs into feeds, medicine for FRLC, viral drugs and veterinary services. Feed resources available for scavenging poultry in Southeast Asia, feeds was defined as the total amount of food products available to all scavenging animals in a given area. It depends on the number of households, the types of food crops grown and their crop cultivating and crop processing methods, as well as on the climatic conditions that determine the rate of decomposition of the food products. Where by seasonal fluctuations occur due to periods of fallow or flooding, cultivation, harvesting and processing. These feeds include termites, snails, worms, insects, grain from sowing, harvesting by-products, seeds, grass, fodder tree leaves, water-plants and non-traditional feed materials.

In the study area FRLC keepers where supplements local available feeds, unavailability of manufactured feeds and high cost for small available manufactured feeds are the reason for FRLC keeper to use local available feeds. When respondents were asked whether, accessible to veterinary and extension services, poultry vaccine and medicine, 120 respondents (63.8%) indicated lack of access at all and 68 respondents (36.2%) hand assess as shown in Table 24.

During FGD it was revealed that there were no veterinary centre at Mbae and Mkangala villages where in Naliendele village farmers are using veterinary centre which is at Naliendele Livestock Training Institute (These are those contributed on 36.2% of farmers who indicated assess to poultry inputs).

Table 24: Access to poultry inputs (n=188)

| Responses | Frequency | Percentage |
|------------------|------------------|-------------------|
| Yes | 68 | 36.2 |
| No | 120 | 63.8 |

These results can be attributed to the fact that in Naliendele village all 68 respondents had received interventions on FRLC management and there are available veterinary services around the village, and hence they did not need a lot of assistance from the extension and veterinary officers. Also it was observed that most of the respondents visited the extension and veterinary officers by themselves and did so by visiting veterinary center. This was opposite to Mbae and Mkangala villages where respondents were comfortable with the visit of project representatives and regarded them as their extension and veterinary officers.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Overview

The general objective of this study was to assess socio-economic impact at village level of ND vaccination project to communities that keep local chicken within project area. This study was done in Mbae, Mkangala and Naliendele villages in Mtwara Rural District Mtwara Region which situated in Southern of Tanzania. This chapter therefore summarizes the main conclusion and recommendation.

5.2 Conclusions

Based on the findings of the study, the following conclusions can be drawn

- a) The availability of poultry vaccines and drugs were not established in order to sustain ND vaccination regime. Therefore, apart from ND vaccination program interventions Newcastle Disease is still the major disease affecting FRLC production in the study area, probably this is the reason for the decline in number of FRLC encountered after project interventions.
- b) The finding showed that FRLC keepers had positive attitude towards ND vaccination program on FRLC; the study also showed that the ND vaccination program had significant impact on acquiring level of knowledge on keeping FRLC. Though the interventions did not improve sustainability of vaccination of FRLC against ND. The attitude of FRLC keepers towards FRLC production was to keep their chicken as a supplementary enterprise and the interventions did not change their attitude. However the interventions did influence their change in practices towards FRLC production.

- c) Apart from the training gained by FRLC keepers in gender relationship it have been realized that, Women suffer most from lack of resources. When husband goes to sells FRLC women never know how much he has received. However women and girls are main responsible with FRLC keeping at household level.
- d) This study showed that there were no group formations and policies formation (Village livestock by laws) which enhances poultry production. According to the study findings, during FGD 98 interviewed FRLC keepers in all three villages show that 98 respondents (100%) not all come across to know Agriculture and Livestock policy of 1997 and National Livestock policy of 2006. This reveals that National Livestock policy that has been in place as of July 2007 not well known to these important Livestock stakeholders which reduces numbers of nuisance in production like contribution of government in livestock sector by subsidizes in veterinary drugs. The policy developed has enhanced the capacity of the local government to formulate by laws which will enhance increase livestock production.

This shows that even though Tanzania has initiated several agricultural and livestock reforms and strategies including the agricultural and livestock development framework in the early 1970s and Agricultural Sector Development Strategy (ASDS), most of the policies had no significant impact on the majority of smallholder farmers.

- e) Apart of respondents to receive knowledge on FRLC house management (Mbae 85.2%, Mkangala 80.5% and Naliendele 82.7%) still many of respondents 62.7% sleeping with FRLC in the same house reasoning as security. Therefore, there is need of community to control security in their area through village governments.

5.3 Recommendations

Based on the above conclusions and major findings, a number of recommendations has been proposed;

- a) In program sustainability, the research revealed that there are signs of sustainability due to profitability gained by FRLC keepers after program. However, respondents reported poor access to vaccine and other veterinary services. Therefore insuring program sustainability FRLC stakeholders should formulate a better mechanism which will insure availability of vaccine and other services throughout the year.
- b) Further more; in sustainability of ND vaccination program this research revealed that there were no formulation of policies (by laws) and groups for FRLC keepers. District council by using cooperative officers and community development officers should make sure that there formation of groups and policies for FRLC.
- c) Both research and extension services are profoundly important for the adoption of FRLC production (especially ND vaccination) which has limited influences on adoption. Further research needs to identify means and production practices that will make FRLC to adopt ND vaccination regime.

- d) Research and extension efforts needs to be linked and strengthened to increase the flow of information to livestock keepers.
- e) In collaboration with the government and other stakeholders, there is need of establishment of formal credit system to accommodate problems of FRLC keepers.
- f) Government has a task of transforming subsistence poultry keeping to commercial poultry keeping, through re-orientating the poor subsistence poultry production towards the market and the success of this strategy will depend on the uptake of improved FRLC keeping technologies by a significant proportion of farmers so as to increase total factor productivity and total income. In this regard, the government has among other things resolved to support the generation, dissemination and adoption of productivity-enhancing technology.
- g) Formulation of National Poultry Policy
It is important to develop a national poultry policy to strengthen poultry production; poultry is only briefly referred to in the livestock policy of 2006.

Further areas of research

The study recommends the following further areas of research:

- a) Determination of factors that causes death of chick below two months of age after I-2 ND thermostable vaccine
- b) An anthropological investigation of socio-cultural factors that influence adoption of ND vaccine regime

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Cattle
 Sheep
 Goats

2.1. General information about FRLC in the village.

| | | |
|---|--|--|
| (13) What is the total number of chickens and chicks that you're household own? | (write response here) | |
| (14) Who normally cares for the chickens? | 1. Wife 2. Husband 3. Female children 4. Male children 5. Children regardless of gender 6. Other | |
| (15) Were your chickens vaccinated against Newcastle disease? | 1. No 2. Yes 3. I don't know | |
| (16) If yes, when and how many times were they vaccinated? | 1 () 2 () 3 () 4 () 5 () | |
| (17) If the number of your household chicken has increased from last year, what are the reasons for the increase? | Give response here... | |

2.2. Health status of the FRLC on ND in the study area.

(18) Do you know any diseases that affect FRLC in this village? Yes; No

If answered Yes in question above, mention three serious diseases that mostly kill FRLC in this village. _____, _____, _____

(19) Have you ever heard of Newcastle Disease (ND)? Yes; No

(20) Did ND kill your FRLC in last year? Yes; No

(21) If answered Yes in question 20 above how many FRLC did you lose because of ND? in 2006; in 2007; 2008; and2009.

(22) What were the three symptoms that FRLC show when they die from ND?

(23) When does ND usually occur in this village? Month(s) of

- (24) Have you ever received any information for controlling ND? Yes; No.
- (25) If answered Yes in question 24 above who gave you the information?
- (26) Did you vaccinate your FRLC in last year against ND? Yes, No
- (27) If answered Yes in question 26 above who did the vaccination?
- (28) If answered No in question 26 above give three reasons for not vaccinating.....
- (29) Do you think that the epidemic of ND could be controlled in this village? Yes, No.
- (30) If answered Yes in question 29 above how could it be controlled? Give three reasons.,
- (31) If answered No in question 29 above give three reasons for not being able to control ND.
- (32) Do you usually use local herbs to control ND? YES, NO.
- (33) If answered Yes in question 32 above mention three herbs that you usually use to control ND. ,
- (34) Do you usually use local herbs to treat FRLC affected by ND? YES, NO.
- (35) If answered Yes in question above mention three herbs that you usually use
- (36) What do you think is the best methods to use in ND prevention? Local methods
() ND vaccination () (Tick where appropriate)

3. Chicken and household income

3.1 Income (from chicken)

| | | |
|--|--|--|
| (37) Of the chickens your household owns, how many are eaten by the household in a month? | 1. None 2. One 3. Five 4. Ten 5. Others (specify please)..... | |
| (38) Of the chickens your household raises, how many are sold in a month? | 1. None 2. One 3. Five 4. Ten 5. Others (specify please)..... | |
| (39) On average how much does it cost to buy a chicken? | Give your response here | |
| (40) Is the number of chicken sold by the household more, less or about the same compared to last year? | 1. More 2. Less 3. Same amount | |
| (41) Is the price higher, lower or about the same that you normally get during by selling your chickens? | 1. Higher 2. Lower 3. Same price | |

3.2 Income from eggs

| | | |
|---|---|--|
| (42) How many eggs do you collect in a day or week? | Per day..... Per week..... | |
| (43) Of the eggs collected in a day or week, how many are eaten by the household? | | |
| (44) Of the eggs that you collect in a day, how many are sold? | 1. All 2. Most 3. Half 4. Less than half 5. None | |
| (45) How much does it cost to buy an egg or a tray? | Price per egg..... Price per tray..... | |
| (46) Is the price higher, lower or about the same compared to the one you sold last year? | 1. Higher 2. Lower 3. Same price | |

4. Socio-relations within and among the household

(47) Where do FRLC sleep at night? Tick the appropriate answer.

(i). In the same house that humans stay, (ii). In a house built for FRLC, (iii).

On top of the trees, (iv). On the roof of house.

(48) If you have built a house for FRLC, what are the walls made of? Tick the appropriate answer

(i)Poles, (ii) burnt bricks, (iii) cement blocks, (iv) mud bricks, (v) dry grass

(49) If you have built a house for FRLC, what are the floors made of? Tick the appropriate answer.

(i)Mud, (ii) cement,

(50) Do you think that you could improve the production of FRLC by building a good house? YES/ No.

| | | |
|---|--|--|
| (51) Who usually sells the chicken? | 1. Wife 2. Husband 3. Both 4. Other (specify please) | |
| (52) Who usually sells the eggs? | 1. Wife 2. Husband 3. Both 4. Other (specify please) | |
| (53) Who usually keeps the money from selling chickens? | 1. Wife 2. Husband 3. Both 4. Other (specify please) | |
| (54) Who usually keeps the money from selling eggs? | 1. Wife 2. Husband 3. Both 4. Other (specify please) | |
| (55) Who usually decides on the use of the money obtained from selling chicken and eggs? | 1. Wife 2. Husband 3. Both 4. Other (specify please) | |
| (56) What do you use the money obtained from chicken and eggs for? | 1. School Fees 2. Clothes 3. Food 4. Medicine 5. Others (specify please) | |
| (57) Is there any misunderstanding that has arisen within and outside the household as a result of the ND vaccination project activities? | 1. Yes 2. No | |
| (58) If yes, what kind of misunderstanding? | Within the household..... With neighbors..... With local authority..... | |
| (59) How do you solve the identified | Within the household..... | |

| | | |
|--|---|--|
| misunderstandings? | With neighbors..... With local authority..... | |
| (60) What do you think can be done to reduce the misunderstanding to happen? | Within the household..... With neighbors..... With local authority..... | |

5. People’s perception towards ND vaccination exercise

| | | |
|---|---|--|
| (61) How did you know about the ND vaccination exercise? | Give your response here | |
| (62) How important do you think it is to vaccinate your chickens for Newcastle disease? | 0. Not important 1. somewhat important 2. Important 3. very important 4. extremely important | |
| (63) How much do you benefit from vaccinating your chickens for Newcastle disease? | 0. No benefit 1. little benefit 2. average amount of benefit 3. large benefit 4. very large benefit | |

6. Actions adopted for sustainability of the ND and vaccination exercise

| | | |
|--|---|--|
| (64) Do you think that selling FRLC could help for controlling ND? | Yes No | |
| (65) Do you think that most villagers use money from selling FRLC to buy vaccines for ND? | Yes No | |
| (66) If No what are the reasons | Mention | |
| (67) Do you usually give free FRLC for ceremonial activities? . | YES NO | |
| (68) Do you think that selling FRLC is more profitable than selling crops? | YES NO. | |
| (69) Is there any network developed as a result of the ND vaccination exercise? | Yes No | |
| (70) If yes, who facilitated the formation of the network? | 1. Households 2. Village leaders 3. ND project facilitators 4. Others (specify please)..... | |
| (71) Is there any rules and policy that ensure the sustainability of the ND vaccination exercise | Yes No | |
| (72) Where are you getting ND vaccines | | |
| (73) Are you accessible to ND vaccine all the time of the year?. | Yes No. | |

7. Farmer's attitude towards ND vaccination program

| Statements | Agree (%) | Disagree (%) | Uncertain (%) |
|--|------------------|---------------------|----------------------|
| ND vaccination is simple to be carried out | | | |
| Vaccination of ND is beneficial to FRLC keepers | | | |
| If FRLC proper vaccinated will not die | | | |
| Some amount of money earned from selling FRLC and eggs should be used to buy ND vaccine | | | |
| Using ND vaccine can increase income at household | | | |
| ND vaccination practice needs complicated facilities | | | |
| Vaccination practice is not beneficial FRLC | | | |
| ND vaccine does not prevent occurrence of ND | | | |
| All money earned from selling FRLC and eggs should be used into other activities than ND vaccine | | | |
| Using ND vaccine does not increase income at household | | | |

THANK YOU FOR YOUR ATTENTION

Checklist**Source of information**

- (1) Do you get any reference materials concern the chicken (including production, diseases and disease control especially Avian influenza and Newcastle Diseases) Yes/No
- (2) What type of reference materials do you normally use? (i) Leaflets (ii)Books (iii) Chicken magazine (iv) Personal readings
- (3) Where do you get those reference materials (i) From Friends, (ii) Agriculture and livestock extension officer, (iii) Veterinary extension officer (iv) Village leaders (v) People from the project
- (4) Do you get information about feeding FRLC? YES/NO
- (5) If answered YES in question 4 above who are the sources of that information?
(i) Family members, (ii) Friends, (iii) Relatives (iv) Village elders (v) Agriculture and livestock extension officer, (iv) Veterinary officer.
- (6) Do you get information about housing FRLC? YES, NO
- (7) If answered YES in question 6 above who are the sources of that information? (i) Family members, (ii) Friends, (iii) Relatives, (iv) Village elders, (v) Agriculture and livestock extension officer, (vi) Veterinary extension officer
- .
- (8) Do you get information about general disease control in FRLC? YES, NO
- (9) If answered YES in question 8 above who are the sources of that information? (i) Family members, (ii) Friends, (iii) Relatives, (iv) Village

elders, (v) Agriculture and livestock extension officer, (vi) Veterinary extension officer.

(10) Do you get information about controlling Newcastle disease in FRLC? YES, NO

(11) If answered YES in question 9 above who are the sources of that information? (i) Family members, (ii) Friends, (iii) Relatives, (iv) Village elders, (v) Agriculture and livestock extension officer, (vi) Veterinary extension officer.

(12) What problems do you face during ND vaccination?.....

(13) Do you have any suggestions on the ND vaccination project?

(14) Do you have any suggestions on improvement of FRLC/Mention
.....
.....
.....