A COMPARATIVE STUDY ON THE CONTRIBUTION OF LIVESTOCK PROJECTS ON POVERTY REDUCTION IN TANDAHIMBA DISTRICT, MTWARA REGION

BY

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ABSTRACT

A comparative study on the contribution of dairy cattle and indigenous chicken projects on poverty reduction in Tandahimba district was done in four villages of Tandahimba district. A sample size of 120 respondents 60 from dairy cattle and indigenous chicken projects and other 60 out of the projects were selected and interviewed using a structured questionnaire. Data obtained from the study area were analysed using Statistical Package for Social Science (SPSS) and Statistical Analysis System (SAS) computer programmes to compute descriptive statistics. Income was compared for households in and out of projects as well as before and after joining the projects. It was found that mean annual incomes for households in dairy cattle project (1 427 800.00 TAS) were higher than those (414 800.00 TAS) out of the project. Further, incomes were higher after (1 427 800.00 TAS) than before (527 200.00 TAS) involvement in dairy cattle project. Farmers' mean annual income in indigenous chicken project was higher (705 850.00 TAS) than for those out of the project (407 290.00 TAS). In addition, farmers had higher income after (705 850.00 TAS) than before joining in the poultry project (337 680.00 TAS). Forward multiple regressions was carried to determine the contribution of livestock projects to total annual household income. Annual income from dairy cattle and indigenous chicken ranked second each in their respective villages after cash crops. The coefficient of determination (R^2) increased from 0.86 to 0.99 and 0.67 to 0.96 for villages under dairy cattle and indigenous chicken projects as more economic activities were included in the multiple regression model. It was concluded and recommended that livestock projects had significant contribution to total household annual income. The local governments, Non-Governmental Organizations, Faith

Based Organizations and Community Based Organizations should continue to support and encourage development of livestock projects.

DECLARATION

I, ROBERT EDWARD MWANAWIMA, do hereby declare to the Senate of the Sokoine University of Agriculture that this work is my own original work and that it has neither been submitted nor being concurrently submitted for a degree award in any other Institution.

_____ _____

Robert Edward Mwanawima **Date**

(MA. Rural Development student)

The above declaration is confirmed

_____ _____

Prof. Kifaro, G.C. **Date**

(Supervisor)

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AMCOS	-	Agricultural Marketing Co-operative Society
ASDP	-	Agricultural Sector Development Programme
CBOs	-	Community Based Organizations
CBPP	-	Contagious Bovine Pleural Pneumonia
DADPs	-	District Agricultural Development Programmes
ECF	-	East Coast Fever
FAO	-	Food and Agriculture Organization

Fig	-	Figure
FBOs	-	Faith Based Organizations
GDP	-	Gross Domestic Product
HIT	-	Heifer International Tanzania
HIV	-	Human Immunodeficiency Virus
HPI	-	Heifer Project International
IFAD	-	International Fund for Agricultural Development
ILO	-	International Labour Organization
KALIDEP	-	Kagera Livestock Development Programme
Kg	-	Kilogram
MKUKUTA	-	"*Mkakati wa Kukuza Uchumi na Kuondoa Umaskini Tanzania"*
MLD	-	Ministry of Livestock Development
MoAFS	-	Ministry of Agriculture and Food Security
MWLD	-	Ministry of Water and Livestock Development
NCD	-	Newcastle disease
NGOs	-	Non Governmental Organizations
NPESP	-	National Poverty Eradication Strategy Paper
NSGRP	-	National Strategy for Growth and Reduction of Poverty
SHDDP	-	Southern Highlands Dairy Development Programme
SAS	-	Statistical Analysis System
SPSS	-	Statistical Package for Social Science
TAPHGO	-	Tanzania Pastoralists, Hunters and Gatherers Organization
TAS	-	Tanzanian Shillings

TASAF	-	Tanzania Social Action Fund
TDC	-	Tandahimba District Council
UNDP	-	United Nation for Development Programme
UNEPs	-	United Nations Environmental Programmes
URT	-	United Republic of Tanzania
USD	-	United States Dollar
WFP	-	World Food Programme
WHO	-	World Health Organization

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Livestock keeping is critical for many of the poor in the developing world, often contributing to multiple livelihood objectives and offering pathways out of poverty (Demment *et al.,* 2007). Recognition of the complexity of the role livestock play in household decision-making and of the opportunities foregone due to misconceptions can enhance the ability of livestock to contribute to human well-being in the developing world. Livestock development efforts in lower-income countries are intended to generate income and meet growing demand for animal-source foods as well as an alternative form of insurance and providing the family assets (Kitalyi *et al.*, 2005).

The overall objective of Tanzania Ministry of Livestock Development is to facilitate provision of improved animal health and production services so as to produce quality livestock products, increase income, improve nutrition of rural and urban population and alleviate poverty (Kingu, 2006; URT, 2006a). To meet such objectives, modernization of the livestock industry into commercial agro-business sector so as to increase its contribution to both the Gross Domestic Product (GDP) and poverty reduction in the country is required (Kingu, 2006). The National Strategy for Growth and Reduction of Poverty (NSGRP) places high priority on livestock sector development. This is in recognition of the role played by the livestock sector in the nation's socio-economic development. Therefore, emphasis is to facilitate the sector to contribute significantly to poverty reduction through

provision of sufficient food of animal origin and increased incomes to livestock farmers and other stakeholders.

Tanzania is endowed with abundant natural resources, which include, land, forage and a large livestock resource base. Out of the total 94 million hectares of land resource, 60 million hectares are utilized for grazing (URT, 2006b). The country has the third largest cattle population and is among the top three African countries having largest livestock population; other countries include Ethiopia and Sudan (MWLD, 2004; URT, 2006b). Tanzania has about 18.8 million cattle, 13.5 million goats, 3.6 million sheep, 33 million indigenous chicken, 1.37 million pigs and 20 million exotic poultry (URT, 2006a; MLD, 2007). Over 90% of the livestock population is of indigenous types, which are known for their low genetic potential. There is a widespread agreement that livestock is an essential tool to poverty reduction at the household level. Due to the recognition of livestock being potential for poverty reduction through sales of products such as milk, live animals and other by-products, a number of bilateral and multilateral donor agencies and Non Governmental Organizations (NGOs) have supported dairy, chicken and goat development programmes/projects in Tanzania such as the Small Scale Dairy Development Programme (SHDDP) in Iringa and Mbeya, the Kilimanjaro Dairy Extension Project under FAO/WHO assistance, Heifer- in-trust Schemes (HIT) in Tanga region supported by World Food Progrmme (WFP) (Massawe, 1993; Mtumwa and Mwasha, 1995), Kagera Livestock Development Programme (KALIDEP) and Kilombero dairy cattle project under HIT in Kilombero district. Local chicken projects in different districts such as Tandahimba, Morogoro, Kibaha,

Newala, Masasi and Lindi have been supported by the government through Agricultural Sector Development Programmes under District Agricultural Development Plans (DADPs) and Non Governmental Organizations (NGOs) such as Tanzania Social Action Fund (TASAF), International Fund for Agriculture Development (IFAD) and Action Aid International. Other projects include: improvement of local goats, promotion of dairy goats in Mgeta, Kongwa, and Mpwapwa as well as production and utilization of biogas and so forth.

In Tandahimba district there are several projects which are being implemented with the objective of increasing income of rural people, reducing poverty and improving quality of life and social wellbeing. Such projects include improvement of cashew production, community based seed multiplication for the purpose of ensuring availability of improved seed varieties, local chicken production, improvement of local goats and promotion of dairy cattle (TDC, 2008). Agricultural projects, mainly crop production, depend on rainfall which is unreliable also markets for crops are unreliable; hence make these projects not sustainable. Dairy cattle production under Heifer International Tanzania and Agricultural Sector Development Programme (ASDP) as well as chicken production under ASDP through District Agricultural Development Programmes (DADPs) meet the objectives.

Dairy cattle and indigenous chicken projects were started in 2004. These projects were demand driven where by their identification were through a participatory approach. Village meetings were conducted to identify the needs and priorities of the community by pair wise ranking method. Due to congestion of production,

reproduction and household works performed by females, their attendance to the meetings were low. It was obvious that many opportunities concerning participation in livestock projects were offered to males. Patriarchy model of life also contributed to exclusion of females in the projects. Rich people also attended village meetings, but they saw that joining the projects was wastage of time which could be used for performing their other important duties.

There are nine villages in Tandahimba district which are implementing dairy cattle production projects. Among these, seven are under ASDP and two under Heifer International Tanzania. Also, there are forty villages which are implementing local chicken production projects. Objectives of these projects are to increase income of rural people, improve nutrition, and provide manure for crop production and source of employment (TDC, 2008).

Heifer Project International combats hunger, alleviates rural poverty and restores the environment by providing appropriate livestock, training and related services to small-scale farmers worldwide (HIT, 2004). Currently, Heifer International Tanzania supports over 300 projects that create sustainable small-scale farm enterprises to improve nutrition and supplement income through giving loans of livestock. A farmer is given a loan and has to pass to two or more of the off-springs to another family in need (Charity Wire, 2005). Despite the importance of livestock to households and the nation, the challenge is how to make the livestock sub-sector individually and collectively contribute more to poverty reduction. This study was intended to assess how livestock (dairy cattle supported by HIT and indigenous

chicken under ASDPs) projects contribute to the socio-economic poverty reduction at household level.

1.2 Problem Statement

Together with policies and policy frameworks which have been formulated to tackle the problem of poverty and measures undertaken (URT, 2005), poverty has continued to remain a stubborn scourge and is still persistent and wide spread in rural areas (URT, 1998; 2003a). Poverty has remained high in rural areas, where about 47% of total population cannot afford to have basic necessities (Kazi, 1994, cited by URT, 2001). Therefore, there was a need to establish sustainable and affordable projects among disadvantaged populations including Tandahimba District. Different stakeholders have implemented various initiatives including the government and non- governmental organizations such as Heifer International Tanzania (HIT), Community Based Organizations (CBOs) and Faith Based Organizations (FBOs) have been implementing various programmes for the purpose of reducing poverty in urban and rural areas (URT, 1999). Heifer International Tanzania is one of the non-governmental organizations which has been working with livestock development with the main aim of poverty reduction (HIT, 2000). It strives to assist low income families to improve their nutrition and income through raising dairy cattle, dairy goats and fish farming.

Tandahimba District is among the districts in the country which has few numbers of livestock compared to demands of district dwellers (URT, 2003b; TDC, 2008). Majority of people in the district are poor, and there are no sustainable income

generating activities. Livestock keeping could have assisted but the farmers have no culture and financial ability to start up livestock projects. In addressing this, a dairy cattle project under HIT and an indigenous chicken project under DADPs were initiated in selected villages since 2004 as a means to poverty reduction. However little is known about the contribution of the introduced dairy cattle and indigenous chicken projects to the reduction of poverty in the villages where the initiative has been implemented. This study was designed to generate such information.

1.3 Justification of the Study

For several decades most smallholders in Tandahimba District used to keep small stocks such as shoats, local chicken and a few of them kept indigenous cattle. During the period of the late Mwalimu Nyerere, some of the villages were provided with cattle for the purpose of introducing cattle keeping in the southern regions. All these animals were kept traditionally without using new technologies for their improvement. Due to lack of technologies on livestock husbandry, productivity had been too low leading to insufficient number of livestock and their products. After observing this problem, several programmes have been established such as goat production in the form of loans where by villagers in selected areas were provided with goats with the understanding that the first kid would be offered to another person within that village. Since implementation of livestock projects in 2004, performance of animals has not been evaluated. Several studies have been done on the contribution of livestock under HIT schemes to poverty reduction at Mbeya, Arumeru and Temeke Municipality (Masako, 2002; Karavo, 2002; Urassa, 2005; Mpapila, 2006) and non to southern regions. Impact of projects on anticipated

poverty reduction has not been assessed. How the livestock projects (dairy and indigenous chicken) have assisted in other socio-economic wellbeing of households have not been evaluated. No one can state the relative impacts of dairy cattle and indigenous chicken projects toward poverty reduction. A comparative study of livestock projects on socio-economic impact was done to enable project initiators to judge which project was worth for them to be implemented for the purpose of reducing poverty which is the strategy of the nation as spelled out in Millennium Development Goals (URT, 2006a), Rural Development Strategy (URT, 2003c), Agriculture Development Strategy (MoAFS, 2001) and National Strategy for Growth and Reduction of Poverty (URT, 2005).

1.4 Objectives and Hypotheses

1.4.1 General objective

To determine the contribution of livestock projects (dairy cattle and indigenous chicken) on poverty reduction in Tandahimba District.

1.4.2 Specific objectives

i. To identify the major sources of income among households in the district
ii. To compare levels of income between households with or without livestock projects
iii. To determine the contribution of the two livestock projects on total household income in relation to other sources of income.

1.5 Hypotheses

H_0: Livestock projects do not differ significantly in their contribution toward poverty reduction at household level

H_1: Livestock projects differ significantly in their contribution toward poverty reduction at household level

H_0: Household incomes do not differ significantly between those with and those without livestock projects

H_1: Household incomes differ significantly between those with and those without livestock projects

H_0: Income from livestock does not have a significant contribution on total income of the household

H_1: Income from livestock has a significant contribution on total income of the household

1.6 Conceptual Framework

For the purpose of meeting the stated objectives (general and specific), the conceptual framework is presented in Fig. 1. The conceptual framework consists of independent and dependent variables with their operational definitions as indicated in Appendix 1. The independent variables influence both dairy cattle and indigenous chicken projects in poverty reduction. The framework shows the interrelationship between various sources of household income, the expenditure patterns and some of economic indicators in realization of the level of household poverty reduction taking into consideration the introduction of dairy cattle and indigenous chicken projects. Production process variables include milk, sales of chicken, eggs, culls, manure and

other economic activities which are being conducted. These have relationships towards the determination of poverty reduction. There are household expenditure variables such as assets, household status, and ability to facilitate members of the household on the issue of education, food expenses, clothing, as well as health services. The expenditure from dairy cattle and indigenous chicken production determine the level of household income which again reflects the household living standard.

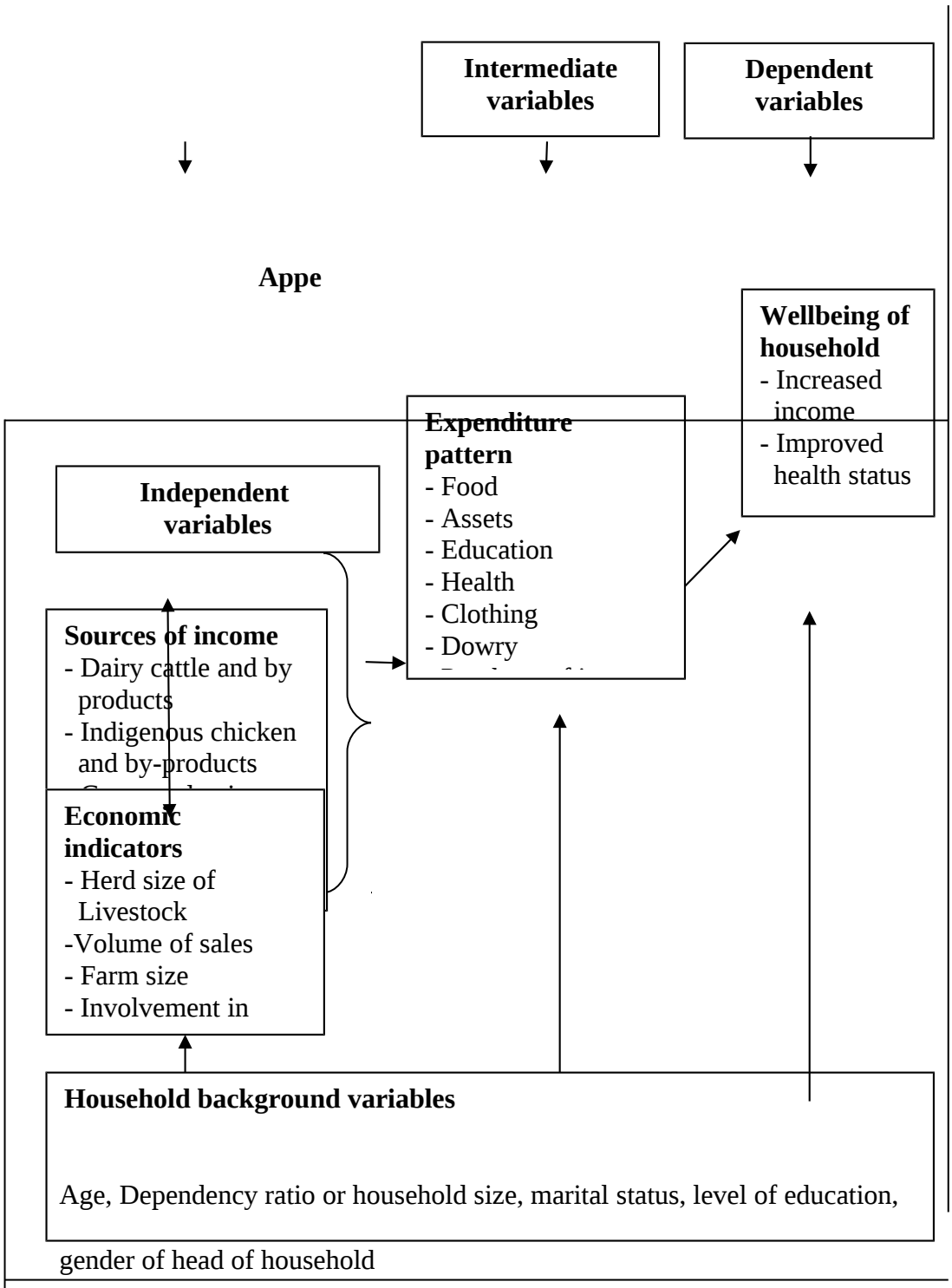

Figure 1: Conceptual framework

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 The Concept of Poverty

Poverty is a worldwide problem, particularly in the third world countries where it needs to be reduced as soon and as much as possible. Poverty is defined as a state of deprivation and prohibitive of decent life that results from many mutually reinforcing factors such as lack of productive resources to generate material wealth, illiteracy, prevalence of diseases, discriminative socio-economic and political systems and natural calamities such as droughts, floods, HIV and wars (URT, 1999). Poverty is deprivation and vulnerability to scourges such as ignorance, diseases, food insecurity and lack of decent shelter and clothing. Poverty may also be defined as an economic condition of lacking both money and basic necessities needed to successfully live, such as food, water, education, healthcare and shelter, or the economic condition of lacking predictable and stable means of meeting basic life needs. According to Cooksey and Likwelile (2002), poverty in Tanzania is a complex and multidimensional concept.

The key dimensions identified are: deficiencies in human capability, illiteracy, diseases, malnutrition, and inadequate income to purchase basic necessities, isolation and vulnerability (social exclusion and dependency). Poverty is difficult to define and even more difficult to measure because of being multidimensional, multi-sectoral and inter-disciplinary. The dimensions of poverty are therefore political, economic, social and cultural or anthropological (Kapinga, 2007). Poverty is not only the outcome of inadequate resources but also an inability of society to

recognize its extent and put greater determination in identifying potentials that could be applied to overcome it.

Household is defined as a social group residing in the same place, shares the same meals, and makes joint or coordinated decisions over resource allocation and income pooling (Ellis, 2000).

Livestock is defined as all domesticated live animals and birds that have been reared by man for socio-economic well being of human beings (UNEP as cited by Kurwijila and Kifaro, 2001).

2.2 Overview of Poverty Status

Poverty is a call to action for the poor and the wealthy alike, a call to change the world so that many more may have enough to eat, adequate shelter, access to education and health, protection from violence, and a voice in what happens in their communities. As poverty has many dimensions, it has to be looked at through a variety of indicators, levels of income and consumption, social indicators, and indicators of vulnerability to risks and of socio/political access. The state of poverty differs from one continent to another, one country to another and rural to urban areas.

2.2.1 Poverty status in the world

In spite of efforts made by developing nations in collaboration with foreign governments and donor agencies, poverty has remained the most intriguing problem

facing developing countries. The world total population below poverty line is estimated to be more than one billion, of which about 939 million are in rural areas (FAO, 2005). According to FAO (2005) cited by Kapinga (2007), about 1.5 billion people lack access to clean and safe water and about 125 – 130 million children do not attend primary school. Of the world's population 20% which is about 1.2 billion live on less than 1USD per day (below poverty line); 70% of these are rural dwellers and 90% are in Asia and Sub- Saharan Africa (World Bank, 2001). UNDP (2005) reported that 34.9% of the world's population lives on 1USD per day and 55.8% live on 2 USD per day. By the new measurements 1.4 billion people are living in extreme poverty, this is more than one-quarter of the population of developing countries (World Bank, 2008).

2.2.2 Poverty status in sub-Saharan Africa

Poverty is higher in most African countries than elsewhere in the developing world. In Sub- Saharan Africa, 50 per cent of the total population or 300 million people live on less than 1 USD per day (Otte and Knips, 2005). Poverty in Sub Saharan Africa is especially prevalent in rural areas where an estimated 70% or 210 million of the poor people live. The concentration of poor people in rural areas and their predominant involvement in agriculture (crop and livestock) means that for Sub-Saharan Africa rural well-being is closely linked to agricultural performance. In most areas of Sub-Saharan Africa increasing productivity of farm activities will have the greatest potential for poverty-reduction either through direct income benefits or indirect expenditure linkages through consumer benefits (Wiebe *et al.*, 2001).

2.2.3 Poverty status in Tanzania

In Tanzania, the government has sought to achieve sustainable growth and poverty reduction/alleviation through various efforts guided by both short and long-term policy frameworks and strategies. These include The Tanzania Development Vision 2025 for Mainland and Vision 2020 for Zanzibar (URT, 1999), National Poverty Eradication Strategy (URT, 1998), Poverty Reduction Strategy Paper for Mainland (URT, 2000), Rural Development Policy (URT, 2003a), Agricultural Sector Development Strategy (MoAFS, 2001) as well as other various sectoral policies, strategies and the Millennium Development Goals.

The National Poverty Eradication Strategy Paper (NPESP) provides the long term framework for guiding poverty eradication efforts in order to reduce absolute poverty by 50% by 2010 and eradicate absolute poverty by 2025 (URT, 2006). In April 2005, a new strategy "The National Strategy for Growth and Reduction of Poverty" was approved by the Tanzania government and is being implementing as a five years (2005/06 – 2009/10) strategy focusing on three major clusters of poverty reduction outcomes, which are growth and reduction of income poverty, improvement of quality of life and social wellbeing, and good governance (URT, 2005).

There is evidence of modest decrease in the rate of poverty in the 1990's where by rural population in extreme poverty was 59 per cent and urban population was 39 per cent. In 2001 about 18.7 per cent of rural and urban population lived below the national food poverty line and 35.7 per cent lived below the national basic needs

poverty line (URT, 2001, cited by Kapinga, 2007). Also regarding non-income poverty, the illiteracy rate was 28.6 per cent whereby women comprised 36.2 per cent and men 20.4 per cent and malnutrition was 44 per cent within the range of moderate to severe and rural areas were worse-off (URT, 2005). Based on official population projections, there are now 12.9 million Tanzanians below the basic needs poverty line, compared with approximately 11.4 million in 2000/01 (URT , 2007).

2.3 The Nature of Rural Poverty in Tanzania

Poverty is concentrated in rural areas where approximately 80% of Tanzanians live (URT, 2001; World Bank, 2001). The profile of poverty shows that the rural poor are diverse and face many challenges. They lack sufficient income to meet the minimum level of human needs. They lack basic services and capacities such as health, education and nutrition (World Bank, 2001).

Together with all progress initiatives which the Tanzania Government has been doing to accelerate poverty eradication and meet the targets of the National Strategies for Growth and Reduction of Poverty by 2005 – 2010 (URT, 2005), and Millennium Development Goals by a half by 2015, poverty remains overwhelmingly high in rural areas (URT, 2007). Poverty is highest among households which depend on agriculture and livestock whereby about 83% of individuals below the basic needs poverty line are residents in rural areas (URT, 2007). Poverty differences cut across gender, ethnicity, age, residence (rural and urban) and income source. In households, children and women suffer more than men while in the community, the rural poor suffer more than urban ones. According to Jere (1993), understanding

poverty relations in rural areas and its effects on different groups, assets owned by poor and those which they have access to, should be examined for their links to economy. It is important to device strategies that will enable these sectors to raise living standards of the poor. To that effect, initiatives to support rural people for the purpose of increasing their productive capacities is of due consideration.

2.4 Overview of Livestock Production

2.4.1Sub-Saharan Africa dairy cattle and chicken production

Livestock and livestock products are the most important cash 'crop' in many smallholder mixed farming systems in Sub-Saharan Africa. Trends in poultry production and demand are highest in Asian countries and lowest in Sub-Saharan Africa, due to the low overall economic development in the region (Delgado *et al.*, 1999). Poultry occupy a unique position in terms of their contribution to the provision of high quality protein food to rural smallholder farming families in Africa (Sonaiya *et al.,* 1999). Both poultry meat and eggs enrich and contribute to a well balanced diet to satisfy human needs. Village poultry is particularly important in improving the diet of young children in Sub-Saharan Africa which inhabits about 33 million malnourished children, who are below five years old (Rosegrant *et al.*, 2001).

According to FAO (2003), Africa is estimated to produce 206 643 000 metric tonnes of milk annually. Considering ideal lactation length of 305 days it gives an average of 1.5 litres per cow per day in Africa compared to 17.4 litres per cow per day in Europe. On the overall, economic growth in sub Saharan Africa is likely to stay

modest because this growth still offers opportunities for improving the incomes and livelihoods of the livestock dependent poor. According to Otte and Knips (2005), annual per capita consumption of meat, milk and eggs in Sub-Saharan Africa in 2000 was only around 10 kg, 30 kg and 1-2 kg respectively, only about 40%, 60% and 20% of the respective developed country averages.

2.4.2 Tanzania dairy cattle and indigenous chicken production

In Tanzania the annual production of main livestock products in 2006/2007 was 370,566 tonnes of meat, 1.43 billion litres of milk, 2.23 billion eggs, 1 933 776 pieces of cattle hides, 1 191 736 pieces of goat skins and 504 655 pieces of sheep skin (MLD, 2007). Under good management one hen can produce 11 to 14 eggs per clutch, and can lay at five distinct periods per year and reach production of 55 to 78 eggs (FAO, 2007). According to MLD (2007), the estimated consumption of some of livestock products per person per annum was 10.5 kg of meat, 39 litres of milk and 64 eggs. This consumption is low compared to that proposed by FAO which is 50 kgs of meat, 200 litres of milk and 300 eggs per person per annum (URT, 2006b; MLD, 2007). The per capita consumption of milk is much higher in urban centres (40 litres per annum) than in rural areas (15-20 litres per annum) (Kurwijila, 2002a).

2.5 Economic Contribution of Livestock Sector to Poverty Reduction

Agriculture and livestock are the key components of the livelihood of rural people. The majority (80%) of the world's poorest people are located in rural areas where they are engaged primarily in subsistence farming (World Bank, 2001). The link between livestock and poverty is brought about by the broad roles that livestock play

to the society. Livestock especially cattle, poultry, sheep, goats and pigs make a substantial contribution to household food security by providing income, quality food, energy, fertilizer and assets in over 80% of rural households in developing countries (FAO, 2005). Livestock could be seen on one hand as a means of alleviating poverty, and on the other hand as the economic activity to be supported because of the contribution it makes in meeting rapidly growing demand of animal source foods. Small scale livestock production has adequately been cited by FAO (2005) and HPI (2006) as one of the strategy for poverty reduction.

About one billion herds of livestock are kept by more than 600 millions of small farmers in rural areas around the world (FAO, 2001). And about 95 per cent of livestock keepers from rural areas live in extreme poverty (Richard and Adams, 1996). Livestock production contributes about 25 – 35% of agricultural Gross Domestic Product in Sub Saharan Africa (Winroch International, 2000; Ehui *et al.*, 2002). Sales of livestock products such as milk, eggs and fibre generate a constant stream of income and the sale of live animals, meat and hides produce substantial sporadic income (Otte and Knips, 2005).

Livestock contribute to the stability of the incomes of farm households as they act as a cash buffer (small stock), a capital reserve (large animals) and as a hedge against inflation. Raising livestock is often found to be more profitable than saving money in a bank as net annual returns from livestock are higher than interest rates (Slingerland, 2000). In many Asian and African countries, livestock rearing and dairying contribute more as source of income and employment for rural people. It

has been estimated that, livestock farming accounts for 15% in India and 20% in Asia of the agricultural GDPs (Shah, 2006). In Tanzania and Africa, agriculture and livestock contribute about 26.5% and 30% of GDP which is relatively small compared to other sectors (Kapinga, 2007). Livestock currently sustain the livelihoods of an estimated 700 million rural poor in developing countries, and are source of income generation, improved household food security and nutritional status (Maltsoglou and Taniguchi, 2004).

There are several studies which have been done concerning the contribution of livestock to the household poverty reduction. For instance, studies conducted in India revealed that, about 40 million landless poor families got a major part of their income from milk (de Haan *et al*., 2003). Cyril *et al.* (2002) in Morogoro revealed that dairy farming is important revenue for poverty reduction due to its contribution in income generation through sales of milk, milk products, live animals and manure. Mwalusanya *et al*. (2002) pointed out that regardless of mode of sales, this function ranks among the top most three important roles (food, income and social cultural) that played by indigenous chickens for the well being of the household and community. Other studies conducted in Temeke, Ilala Municipal council and Masasi (Mbapila, 2006; Macha, 2008; Mfaume, 2008).

In Tanzania, livestock products account for about 30% of agriculture and about 90% of value of food production and provide about 34% of protein and 16% of energy combined in human diets (Sibuga *et al.*, 2003). The livestock sector contributes 18% of Tanzania's GDP and 30% of the Agricultural GDP out of these 40% comes from

beef production, 30% from milk, 30% from poultry and small stock production (Kurwijila, 2002b; TAPHGO. Admin, 2008).

Other uses of livestock are sources of power (for cultivation and pulling carts); source of foreign exchange (export of products); source of raw materials for industries (hooves, hides and skins); source of manure which are applied on the soils to improve soil fertility; source of energy (Bio-gas); provide source of employment for rural and urban people through herding livestock; in processing livestock products and marketing of livestock and livestock products which is about 50% of the total employment; provision of food which is utilized in form of eggs, meat and milk; store of value and investment channel; sales of livestock and livestock by products provide farmers with cash to purchase household necessities and farm inputs as well as assets of over 80 per cent of households in developing countries (Sibuga *et al.,* 1993; ILO, 2001; FAO, 2005; URT, 2006b). It is through provision of these necessities that livestock contribute to increasing income of rural and urban people, reduction of income poverty, improvement of quality of life and social wellbeing.

According to some schools of thought, they claim that it is difficult to distinguish economically between livestock and agriculture incomes especially within rural subsistence economy (Richard and Adams, 1996). This is due to that fact that outputs from one, such as crop residues from agriculture and draft power and manure from livestock are used as inputs in the other. Also according to FAO (2005), agricultural income is highly correlated with land owned while the

correlation between livestock and income and land owned is negative and statistically significant. Marginal lands which are not suitable for crop production can be utilized by livestock.

2.6 Constraints of Livestock Production

Livestock production is very important in many parts of developing countries due to provision of valuable food products and income to smallholder farmers. However, there are constraints to increased livestock production (Mukiibi Muka *et al.,* 2000; Owen *et al*., 2005; Aboe *et al.*, 2006; URT, 2006b; Kivaria, 2006). Such constraints include: poor nutrition both in quality and quantity; diseases and parasites (due to poor animal health services); weak extension services; inadequate supply of dairy stocks; inadequate research; non-availability of credit services; disorganized milk and eggs marketing; poor management and poor livestock houses.

Several studies have been done to illustrate these constraints in dairy cattle and indigenous chicken. Msechu (2001) pointed several factors attributing to low contribution of livestock sector to national economy. These include policy and institutional organizations. In past decades major and minor changes in the ministries hosting the livestock sector, departmental organization and policies relating to management of livestock have been observed to be the constraint in livestock development. These changes affected performance of livestock sector since each time a change took place there was a time lag for adjustment. Also Kurwijila and Kifaro (2001) argued that low genetic potential for milk production characterized by poor milk yields; short lactation length, long calving intervals and

old age at first calving contribute to low contribution of livestock to the country's GDP. Others include animal health, that is, diseases and parasites and nutrition associated with extreme climatic change and low quality tropical feeds. Mlay (2001) reported fall in milk yield by more than 40% during the dry season due to nutritional related constraints in which nitrogen, metabolizable energy contents and organic matter digestibility declined as the dry season advanced. In wet seasons there is enough natural pasture and of high quality with high protein and low fibre content hence increased nutritional status of livestock and performance (Kimambo *et al.*, 1999). Feeding systems of livestock also have been reported as a constraint in performance of livestock. Commonly practiced systems include zero (intensive) grazing system, partial (semi intensive) and free range (extensive) system (Urassa, 1999).

According to Aboe *et al*. (2006), Newcastle disease constitutes the most serious epizootic poultry disease throughout the world, particularly in developing countries. Newcastle disease occurs every year and kills on an average 70-80% of the unvaccinated village chickens. It is the most important health issue for chicken. Other constraints are poor feeding, poor nutrition, poor housing and marketing (Mukiibi Muka *et al.*, 2000). Farmers are handicapped in disease control particularly with the infectious diseases such as Newcastle disease, which is the most devastating (Yongolo, 1996). The study which was done by Minga *et al.* (1989) revealed that there are other infectious diseases which affects chicken in Tanzania, these include: Fowl pox, Collibacillosis, Infectious coryza, Gumboro disease, and

Fowl typhoid. Also there is high chick mortality during the first four weeks due to predation, parasites, fleas and mites.

Newcastle disease being the main constraint to productivity of chicken on smallholder poultry production is controlled by the use of Lasota and I-2 vaccines. Observations from studies by Kampeni (2000) found that performance of Lasota in rural areas was not effective because it is packed in large quantities of vials of 1000 doses and it needs to be stored in refrigerators. Also farmers are unable to access the vaccines due to financial constraints as vials are packed and sold in large quantities (Nyange, 2000).

Despite the fact that livestock contribute to poverty reduction in many developing countries, most livestock policies and services favour large scale production and neglect small scale production which plays more role in poverty reduction. Due to population growth which results into increased demands of livestock products, small herders have to be facilitated to access basic needs such as services and technologies to increase production and productivity. Small scale livestock production has adequately contributed to social well-being of rural and urban farmers and hence one of the strategies for poverty reduction (FAO, 2005; HPI, 2006). Other income generating activities in the rural areas besides of crop and livestock production include: hand crafts, sell labour, tailoring, carpentry, small business, masonry and employment.

The complementarities of activities that reduce income and non-income poverty should be born in mind since high incomes imply ability of households to afford better social services (URT, 2005). This will be in line with livestock policy (URT, 2006b), which aims at stimulating development in the livestock industry in order to increase rural and national income, improve food security and environmental conservation and hence addressing the National Strategy for Growth and Reduction of Poverty (MKUKUTA).

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Description of the Study Area

3.1.1 Location and size of the district

Tandahimba District is among the five districts of Mtwara region. It is 95 kilometres West of Mtwara town. It is located in the Makonde plateau 900 m above sea level between longitude 38^{o} and 48^{o} East of Greenwich and latitude 10^{o} and 12^{o} south of Equator. It borders with Mtwara Rural District to the East, Newala District to the West, to the South is Ruvuma River which forms the border with the Republic of Mozambique and Lindi Rural District to the North (Fig. 2). The district has three divisions of Namikupa, Mahuta and Litehu; 22 wards, 140 villages, and 472 sub-villages (hamlets). The district has an area of about 1673 square kilometres which is equivalent to 167 331 ha. The area favourable for agriculture is 157 304 ha, which is 94% of the total area of the district. The area used for cultivation and livestock keeping is 111 128.5 ha, which is 71% of the total area and about 25 218 ha which is equal to 15% is occupied by forest reserves including the Makonde escarpments (TDC, 2008).

3.1.2 Population

In 2003 the district had a population of 204 648 residents categorized as follows: 94 021 were males and 110 627 were females and there were 53 790 households with an average of 3.8 people per household (URT, 2003b).

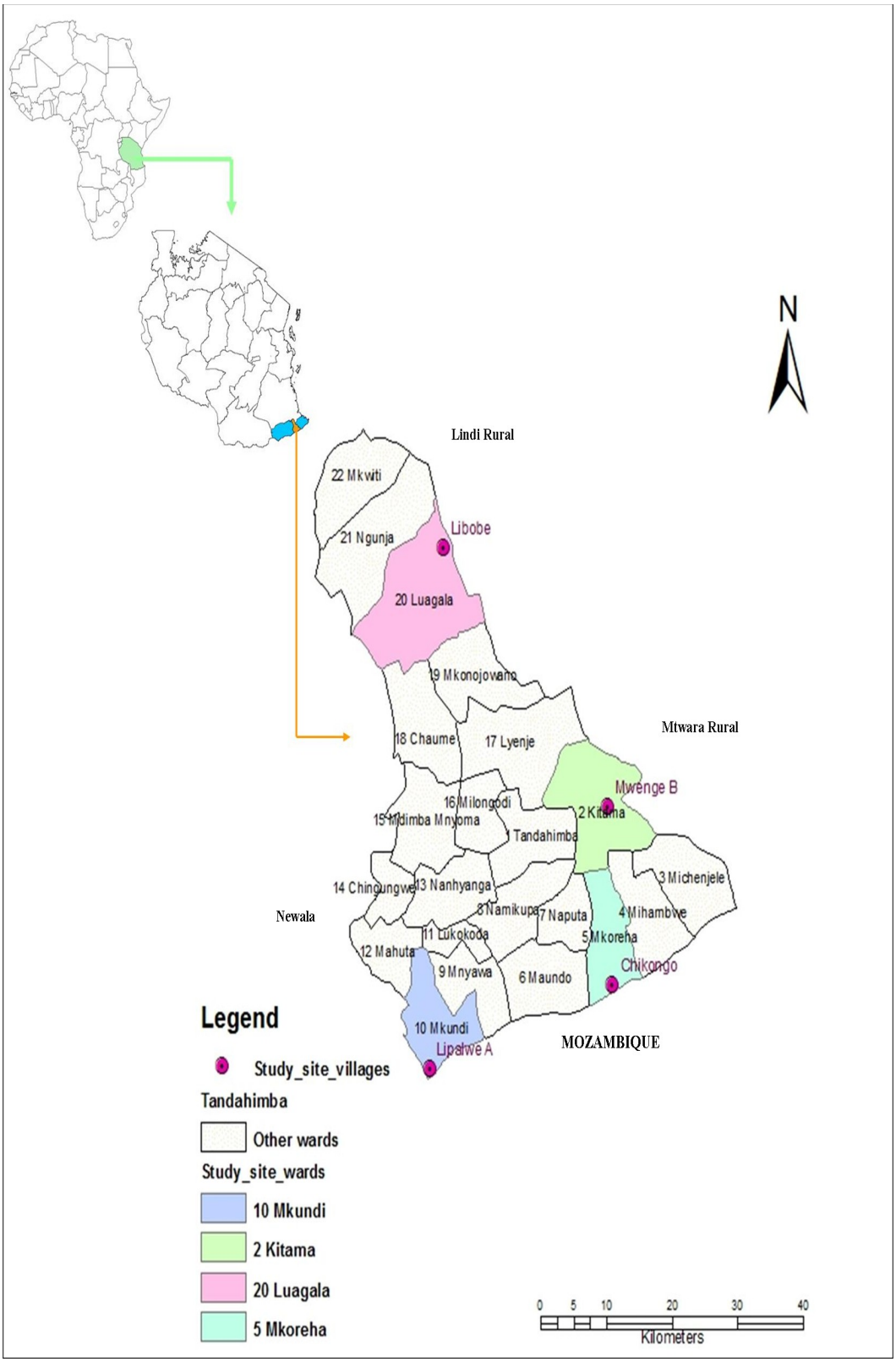

Figure 2: Map of Tandahimba district showing study sites

3.1.3 Agro-ecological zones

The district has three ecological zones which are: Ruvuma river basin, plain basin and upper land basin. Each zone has conditions which favour certain types of crops to grow.

3.1.3.1 Ruvuma basin

The zone is composed of Mahuta and Namikupa divisions all of which are bordered to Mozambique country with Ruvuma River. Soil types in this zone are mostly sandy soils, sandy loam and clay soils along Ruvuma river valley. Major food crops grown include; paddy, cassava, cashewnuts, groundnuts, sesame, maize and sorghum.

3.1.3.2 Plain basin

The zone is composed of half part of Mahuta and Namikupa divisions. The zone is dominated by sandy loam soils and sandy soils. Major crops grown include: cassava, cashewnuts and bambaranuts.

3.1.3.3 Upper land basin

The zone covers Litehu division. Soil types vary from sandy loam soils, greyish soils and clay soils. Major crops grown in this zone include: maize, sorghum, cassava, paddy, bambaranuts, sesame, cowpeas and groundnuts.

3.1.4 Climate

The district receives a mono-modal type of rainfall, which usually starts at the end of November and ends in May. Annual rainfall ranges from 900 to 1000 mm, and the temperatures range from 21^{o} to 28^{o}C.

3.1.5 Main activities

The main activities performed by residents are cultivation of crops both cash and food crops such as cassava, sorghum, maize, paddy and cashewnut and livestock keeping, that is cattle, goats, poultry, sheep and pigs. The district has 1081 cattle (875 indigenous cattle and 138 dairy), 275 200 goats (275 125 indigenous and 75 dairy), 10 138 sheep, 338 211 local chicken and 42 pigs (TDC, 2008). The district dwellers mainly use poor, primitive farming methods and implements such as traditional small hoes known as "*chingondola"* to the till land. Due to poor implements used, their production remains low though they spend most of their time in cultivation.

3.2 Research Design

A cross sectional design was used in the study in order to allow various data to be collected at one time for the purpose of establishing relationships between variables for testing the hypotheses. This method was used due to limitations of resources and time (Kothari, 2004).

3.3 Sampling Procedure

Taking into consideration of the dairy project under Heifer International Tanzania (HIT) and indigenous chicken project under Agricultural Sector Development Programme (ASDP) through District Agricultural Development Programmes (DADPs), the sampling procedure used was purposive at the division, ward and villages. The study involved three divisions of Litehu, Namikupa and Mahuta, four wards: Mkoreha, Mkundi, Kitama and Luagala and four villages which were; Chikongo, Lipalwe 'A, Mwenge 'B' and Libobe. Due to the limited number of dairy cattle keepers, 60 respondents were selected, 30 dairy cattle keepers under the HIT by using purposive sampling and 30 non-dairy cattle keepers by simple random sampling method. In the indigenous chicken project: 60 respondents were selected in the following manner; 30 farmers in poultry project were selected by employing purposive sampling and 30 farmers not in poultry project were selected by employing simple random sampling. In total, 120 respondents were selected from the four villages. Pre-testing of the questionnaire to remove ambiguous and leading questions was done by using ten respondents. Then 120 respondents from dairy cattle and indigenous chicken projects and those out of the projects were interviewed using the structured questionnaires (Appendix 2).

3.4 Data Collection

Primary data were collected from households using structured questionnaire containing tabular, closed and open-ended questions together with that which were obtained from the project supervisors. Interview with key informants was also carried out guided by a checklist that was developed for this exercise. Also

performance records of animals (cattle and chicken) were obtained from individual livestock keeper's records as well as project supervisors.

3.5 Data Analysis

The data collected were coded and analysed by using the Statistical Package for Social Science (SPSS) and Statistical Analysis System (SAS) computer programmes to compute descriptive statistics. Comparison of income was done using t-test to compare households with and without livestock projects as well as comparing periods before the project and after getting involved in the projects. The relative importance of the two projects of dairy cattle and indigenous chicken on total income was determined using forward multiple regressions whereby annual income for each project was computed separately; comparison of these projects was done to see which one had higher annual income. Results indicated effects of each independent variable on the dependent variable after computing the coefficient of multiple determinations ($\mathbf{R^2}$), which showed the proportion of variation in the dependent variable that was explained by the independent variables entered in the model. The formula for the forward multiple linear regression model that was used is shown below:

$$Y= \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \ldots.. + \beta_n x_n + E_{ij}$$

Where Y= dependent variable (Annual income), β_0= Y intercept, β_1, β_2... β_n= partial slopes of the linear relationship between independent variables and dependent variable Y, x_1 = annual income from dairy or indigenous chicken, x_2 = annual income from 2nd income generating activity, x_n = annual income from nth income generating

activity, E_{ij} = random error term. The impact of the independent variables was determined by observing the standardized beta-weights (β) which bear positive signs implying positive impacts. Levels of significance of the impacts were realized by observing p- values computed concomitantly with the beta weights. Impact was said to be significant when p- value was at least 0.05 (Hedey, 2005).

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Overview

The results presented in this chapter are divided into five main sections basing on the objectives of the study. The main sections include; sample profile, households socio-economic characteristics, comparative analysis of different sources of income performed by households in the study area, uses of income earned from livestock and crops and contribution of livestock projects (dairy cattle and indigenous chicken) to total household nutrition and income.

4.2 Sample Profile

Out of the total sampled 120 respondents, 75.5% were males and 24.5% females (Table 1). The low percentage of female headed household is due to the fact that, most places in Tanzania have norms which still have patriarchy mode of life where by males are the decision makers and control of most resources in the family.

Table 1: Distribution of household heads by sex, division, ward and villages

			Sex of respondent		Total
Division	**Ward**	**Villages**	**Male**	**Female**	
Namikupa	Mkoreha	Chikongo	24(20.0)	6(5.0)	30(25.0)
	Kitama	Mwenge 'B'	21(17.5)	9(7.6)	30(25.0)
Mahuta	Mkundi	Lipalwe 'A'	22(18.3)	8(6.9)	30(25.0)
Litehu	Luagala	Libobe	24(20.0)	6(5.0)	30(25.0)
Total			**91(75.5)**	**29(24.5)**	**120(100)**

* The numbers in brackets are percentages and out of brackets are frequencies of households

Also due to many works performed by women they fail to attend village meetings where decisions concerning project implementation are approved.

4.3 Household Socio-economic Characteristics

During the study, respondents were the head of household**s.** The demographic characteristics described were; sex, age, education level, marital status, household head, household size and main economic activities.

4.3.1 Sex of respondents

The study revealed that out of 120 respondents, 85.8% of the households interviewed were males while 14.2% were females regardless of whether one was in or out of dairy cattle or indigenous chicken project (Table 2). The small percent of females can be explained by the fact that in Tanzania in general, including Tandahimba district, men control most of the resources in the family. Women spend most of their time on farming and house activities and making them not participating in village meetings which deal with decisions on project initiation and implementation.

This finding concurs with surveys in a number of African countries that have reported that ownership of resources and decision making is mostly dominated by men while women and children play the role of stock management in terms of feeding, watering, cleaning, disease control, treatment and protecting them against predators (Ngongi, 1996; Alders, 1997). A similar explanation was given by Pereka (1998) that in Tanzania, women are involved in the manual activities such as

herding, feeding the animals, husbandry, milking and milk marketing but have no decision making on the finances obtained.

Table 2: Distribution of household heads by sex of respondents

Head of Household	Household head characteristics (N=120)				Total
	Household in dairy cattle project	Household out of dairy cattle project	Household in indigenous chicken project	Household out of indigenous chicken project	
Male	25(83.3)	24(80.0)	28(93.3)	26(86.7)	103(85.8)
Female	5(16.7)	6(20.0)	2(6.7)	4(13.3)	17(14.2)
Total	**30(100.0)**	**30(100.0)**	**30(100.0)**	**30(100.0)**	**120(100.0)**

* The numbers in brackets are percentages and out of brackets are frequencies of households

4.3.2 Age of respondents

Age of the majority (46.7%) of respondents in dairy cattle project lied between 44 and 52 years and 30.8% of all respondents in and out of both livestock projects (Table 3). About one third (36.7%) of the respondents' ages were between 36 and 43 years for indigenous chicken project and 30.8% of all respondents. Therefore, it is true that 61.6% of respondents' ages lie within 36 and 52 years. The age distribution and involvement in project was observed not to be in great range due to the fact that these projects are demand driven and originated through community participation approaches. Young people below 18 years were not included in projects in this study because they are considered to be dependants.

According to Basnayake and Gunaratne (2002) the age of a person usually is a factor that explains the level of production and efficiency. It has an influence on decision making and wealth which reflect to the capacity of working of a person and hence individual's productivity can be attained. The same finding was pointed by Mandara

(1998) and Mtenga (1999) that household members are considered economically productive from the age of 16 to 64 years. The age groups below 16 years are children who attend school and are too young to participate in farming activities. The age group above 64 years is considered less economically active.

Table 3: Age of respondents who are in and out of livestock projects

Age category (Years)	Respondent's age category characteristics (N=120)				Total
	Household in dairy cattle project	Household out of dairy cattle project	Household in indigenous chicken project	Household out of indigenous chicken project	
27 – 35	4(13.3)	7(23.3)	6(20.0)	4(13)	21(17.5)
36 – 43	8(26.7)	9(30.0)	11(36.7)	9(30.0)	37(30.8)
44 – 52	14(46.7)	6(20.0)	7(23.3)	10(33.3)	37(30.8)
53 – 61	1(3)	5(16.7)	6(20.0)	3(10.0)	15(12.5)
Over 61	3(10.0)	3(10.0)	0(0)	4(13.4)	10(8.4)
Total	**30(100.0)**	**30(100.0)**	**30(100.0)**	**30(100.0)**	**120(100)**

*Numbers in brackets are percentages and out of brackets are frequencies of respondents

4.3.3 Education level of respondents

For the purpose of efficient utilization of skills and knowledge provided to the respondents by extension officers, education level is of great importance. In this study the majority (86.7%) of farmers' education was primary level in dairy cattle project. In the indigenous chicken project, 76.7% of respondents had secondary education level. The overall findings show that 48.3% of interviewees in and out of livestock projects had secondary education (Table 4). Farmers in villages under dairy cattle projects had primary education due to the fact that these villages are located along the borders of Ruvuma River where farmers in these areas are dealing with agriculture. For the past years education in these areas was not given priority.

Respondents in villages dealing with indigenous chicken project had secondary education due to location of the villages; they are in the plain basin and upper land basin. For the past years these areas had missionary schools hence education was given priority. Almost half of all farmers in the study area to have secondary education was due to the fact that nowadays there are secondary schools in the areas which offer secondary education. Criteria for joining the projects didn't take education into consideration though education is very important for efficient implementation of the project. This complies with observations by Regnar *et al*. (2002) that, level of education of farmers is very important for their ability to utilize efficiently the advice and information offered by the extension service and development agents.

Table 4: Education level of respondents in and out of livestock projects

Education level of respondent	**Respondent's education level characteristics (N=120)**				**Total**
	Household in dairy cattle project	**Household out of dairy cattle project**	**Household in indigenous chicken project**	**Household out of indigenous chicken project**	
No formal education	4(13.3)	9(30.0)	2(6.7)	3(10.0)	18(15.0)
Primary education	26(86.7)	7(23.3)	1(3.3)	5(16.7)	39(32.5)
Secondary education	0(0)	14(46.7)	23(76.7)	21(70.0)	58(48.3)
Completed "A' level	0(0)	0(0)	4(13.3)	1(3.3)	5(4.2)
Total	**30(100.0)**	**30(100.0)**	**30(100.0)**	**30(100.0)**	**120(100.0)**

*Numbers in brackets are percentages and out of brackets are frequencies of respondents

It also conforms to the finding by Huvisa (2003) who pointed out that higher level of education increases farmers ability to learn innovations easily and increases

profitability by adopting management improvement technologies resulting into more income. By knowing that education is very important for one to set strategies for reducing poverty, respondents in indigenous chicken and dairy cattle projects can use that knowledge to be creative in tackling the issue of poverty.

3.3.4 Marital status of household head

All (100%) household heads in indigenous chicken project and 83.3% in dairy cattle project were married implying that there are few marriage problems in the study area. In total, 90.8 % of household heads were married for all households which are in livestock projects. Divorced cases were observed to be low, 2.5% of all households (Table 5). The study also found that there were neither widows nor divorced heads of households in the indigenous chicken project. The finding that most of respondents (90.8%) in livestock projects are married implies that married couples are likely to be more productive than single persons due to labour supply in farm activities. It was also found that all the households headed by males were married.

Table 5: Marital status of household heads

Marital status Of respondent	Respondent's Marital status characteristics (N=120)				Total
	Household in dairy cattle project	Household out of dairy cattle project	Household in indigenous chicken project	Household out of indigenous chicken project	
Single	0(0)	1(3.3)	2(6.7)	0(0)	3(2.5)
Married	26(86.7)	25(83.3)	28(93.3)	30(100)	109(90.8)
Widowed	3(10.0)	2(6.7)	0(0)	0(0)	5(4.2)
Divorced	1(3.3)	2(6.7)	0(0)	0(0)	3(2.5)
Total	**30(100.0)**	**30(100.0)**	**30(100.0)**	**30(100.0)**	**120(100.0)**

*Numbers in brackets are percentages and out of brackets are frequencies of respondents

This complies with the views of Mtama (1997) who pointed out the effect of marriage on the production process that it increases labour availability in the household through sharing income generating activities between husbands and wives and other family members.

4.3.5 Head of household

The majority (85.8%) of interviewees for households in and out of livestock projects were male headed. About 93.3% of respondents in indigenous chicken project were males followed by 83.3% in the dairy cattle project (Table 2). The disparity of being in the project is due to the criteria used for one to be in the project. These projects were demand driven and decision of one to be in the project was from village meetings concerning with project identification and model of implementation. In these meetings, the majorities of females do not participate due to the workload they have in production and house works. Due to their absence chances of them being involved in projects is minimal.

4.3.6 Household size and composition

The average number of persons in a household was 5.5 (± 2.71 standard deviation) and ranged from 2 to 18. Household size of 3 to 6 persons was mentioned by 50.8% of all the household heads interviewed. Household size of 3 to 6 people was stated by 63.3% of interviewees in both households within and out of dairy cattle project (Table 6). Family size determines the income expenditure of the household. In the study the household having 18 persons use more income to satisfy the family needs. Further, the head of household cannot afford to provide family needs such as

education, health services, food and other basic needs. Due to provision of inadequate family needs it is obvious that the households' living standard will be poor.

Table 6: Distribution of households by household size

Respondent's household size characteristics (N=120)					
Household Size	**Household in dairy cattle project**	**Household out of dairy cattle project**	**Household in indigenous chicken project**	**Household out of indigenous chicken project**	**Total**
Below 3	0(0)	0(0)	17(56.7)	0(0)	17(14.2)
3 – 6	19(63.3)	19(63.3)	12(40.0)	11(36.7)	61(50.8)
7 – 10	8(26.7)	8(26.7)	1(3.3)	16(53.3)	33(27.5)
11 – 14	2(6.7)	3(10.0)	0(0)	3(10.0)	8(6.7)
15 – 18	1(3.3)	0(0)	0(0)	0(0)	1(0.8)
Total	**30(100.0)**	**30(100.0)**	**30(100.0)**	**30(100.0)**	**120(100.0)**

*Numbers in brackets are percentages and out of brackets are frequencies of respondents

4.4 Household Income Generating Activities

In rural areas people are engaged in diverse economic activities with the purpose of income generation and sustaining their daily livelihood. In the study, it was observed that most (76.7%) of household heads both within and out of livestock projects deal with agriculture and livestock keeping. Further, 90.0% and 86.7% of household heads within dairy cattle and indigenous chicken projects respectively (Table 7) are engaged in agriculture and livestock activities. Other activities observed were; crop production only which was mentioned by 46.7% of respondents out of dairy cattle production and 15.0% of all interviewees within and out of livestock projects. A combination of agriculture, livestock keeping and kiosk were income generating activities for only 5.1% of respondents.

Table 7: Households income generating activities

Household Activities	Respondent's activity characteristics (N=120)				Total
	Household in dairy cattle project	Household out of dairy cattle project	Household in indigenous chicken project	Household out of indigenous chicken project	
Agriculture only (crop production)	0(0)	14(46.7)	0(0)	4(13.3)	18(15.0)
Livestock keeping only	1(3.3)	0(0)	1(3.3)	0(0)	2(2.4)
Sell labour	0(0)	0(0)	1(3.3)	0(0)	1(0.8)
Agriculture and livestock keeping	27(90.0)	16(53.3)	26(86.7)	24(80.0)	93(76.7)
Agriculture, livestock keeping and kiosk	2(6.7)	0(0)	2(6.7)	2(6.7)	6(5.1)
Total	**30(100.0)**	**30(100.0)**	**30(100.0)**	**30(100.0)**	**120(100.0)**

*Numbers in brackets are percentages and out of brackets are frequencies of respondents

Most (76.7%) households deal with agriculture and livestock keeping. This confirms what was reported by World Bank (2001) that agriculture and livestock are the key components of the livelihood of rural people. The majority (80%) of the world's poorest people are located in rural areas where they are engaged primarily in subsistence farming. Therefore, increasing productivity of farm activities will have the greatest potential for poverty reduction either through direct income benefits or indirect expenditure linkages through consumer benefits (Wiebe *et al.*, 2001).

4.4.1 Types of livestock

In the study area it was revealed that different types of livestock were raised by households. All 30 farmers (100.0%) in dairy cattle project have dairy cattle and none for respondents out of dairy cattle project. Out of 30 farmers, 14 (or 46.6%) keep dairy cattle only. In addition to dairy cattle of the 30 farmers, 11 keep

indigenous chickens, 2 raise indigenous chicken and goats and 3 keep indigenous chickens, goats and sheep. It was also found that 33.4% of interviewees out of dairy cattle project keep indigenous chickens. Others keep chickens and other types of livestock and 7 farmers out of 30 do not keep any kind of livestock (Table 8).

During the study it was also observed that villages which deal with a certain livestock project type had different priority on what type of other livestock to be kept. For example, in villages dealing with indigenous chicken project, it was observed that indigenous chicken were kept by many households taking the first place by being mentioned by 53.3% of respondents followed by indigenous chicken and goats 30% (Fig. 3). A few kept sheep. Livestock are critical physical assets that can improve the stock or quality of all household assets, reducing vulnerability, broadening livelihood alternatives and improving outcomes. Its ownership can enhance social capital.

Table 8: Types of livestock kept by respondents in villages under dairy cattle project

	Category of being		**Total**
Type of animals	**Out of the project**	**In the project**	
Dairy cattle	0(0)	14(46.6)	14(23.4)
Dairy cattle and indigenous chicken	0(0)	11(36.7)	11(18.3)
Dairy cattle, chicken and goats	0(0)	2(6.7)	2(3.3)
Dairy cattle, indigenous cattle, chicken, goats and sheep	0(0)	3(10.0)	3(5.0)
Indigenous chicken	10(33.4)	0(0)	10(16.7)
Indigenous chicken and goats	9(30.0)	0(0)	9(15.0)
Goats	3(10.0)	0(0)	3(5.0)
Indigenous cattle and chicken	1(3.3)	0(0)	1(1.7)
No livestock	7(23.3)	0(0))	7(11.6)
Total	**30(100.0)**	**30(100.0)**	**60(100.0)**

* The numbers in brackets are percentages and out of brackets are frequencies of households

From the results it implies that farmers in the study area keep small stocks. For many decades traditionally farmers in Tandahimba district keep these small stocks such as goats, sheep and indigenous chickens. The act of keeping large animals such as dairy and indigenous cattle is new to them and has started recently. This is also supported by TDC (2008) report that the district has 1081 cattle (875 indigenous cattle and 138 dairy), 275 200 goats (275 125 indigenous and 75 dairy), 10 138 sheep, 338 211 local chicken and 42 pigs. There are large numbers of small stocks in the district compared to dairy and indigenous cattle. The reason behind is mostly low purchasing power and customs of the district dwellers.

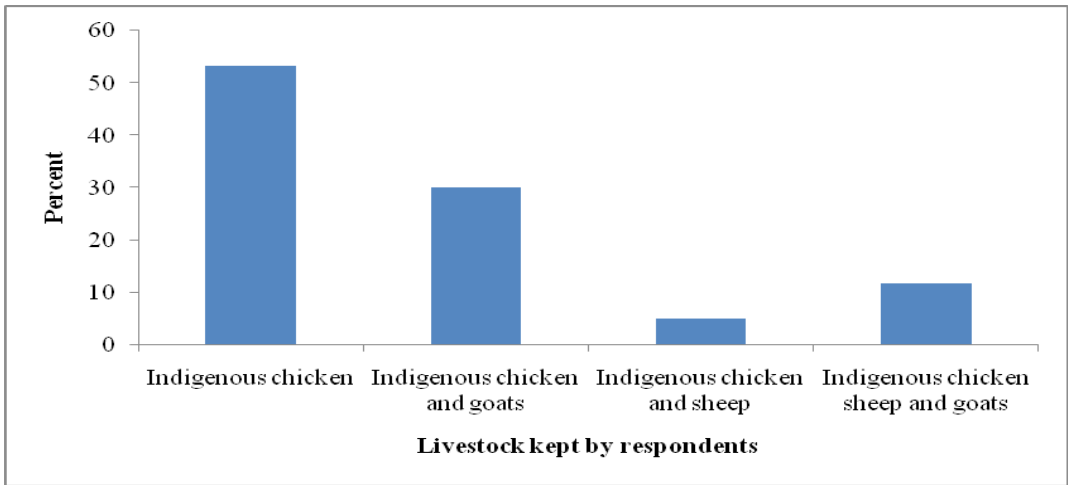

Figure 3: Types of livestock kept by respondents under indigenous chicken project villages

4.4.2 Number of livestock kept

All respondents outside the dairy cattle project did not have dairy cattle. About 38.3% of respondents who are in dairy cattle project had 1 – 3 dairy cattle, and one of them had 8 dairy cattle (Table 9).

Table 9: Number of dairy cattle and indigenous chicken kept

Number of animals	Frequency	Percent
Dairy cattle		
0	30	50.0
1 – 3	23	38.3
4 – 6	6	10.0
7 – 9	1	1.7
Total	**60**	**100.0**
Indigenous chicken		
4 – 8	7	12.1
9 - 13	13	20.7
14 – 18	4	6.9
19 – 23	11	19.0
24 – 28	3	5.2
29 – 33	9	15.5
34 – 38	4	6.9
39 – 43	5	8.6
44 – 48	2	3.4
over 63	1	1.7
Total	**60**	**100.0**

In villages dealing with indigenous chicken project, it was observed that 13 interviewees (20.7%) kept 9 to 13 indigenous chickens followed by 11 respondents (19.0%) who kept indigenous chicken ranging from 19 to 23 and one of them had over 63 indigenous chickens (Table 9). A larger herd constitutes an increase in physical capital, better nutrition and health. From the study it was revealed that there were variations in number of chickens possessed by farmers. The reason could be due to keenness in the adoption of innovations on chicken management such as disease prevention specifically Newcastle disease which kills on an average 70-80% of the unvaccinated village chickens. Those who had a large number of stock uses improved chicken management practices. Some of respondents used lasota to vaccinate their chickens which may not perform well in villages due to its cold chain storage condition.

4.5 Dairy Cattle Production

Dairy cattle production is a means to generate ready income, build assets, socio-economic benefits and hence impact on poverty reduction and household stability as well as potential for increasing the current level of production.

4.5.1 Purposes of keeping dairy cattle

About 63.3% of respondents of Chikongo and Lipalwe villages stated that the purpose of keeping dairy cattle was to get manure, food (milk, meat) and income from sales of products. To increase income for paying for education and treatment expenses was another purpose mentioned by 30.0% of farmers and lastly was poverty reduction (Fig. 4). Manure as a product obtained from dairy cattle was used by farmers of Chikongo and Lipalwe villagers in their farms for the purpose of improving soil fertility basing on the fact that the soils are sandy loam. Milk and meat were used as food for family consumption in the study areas as well as in other areas of Tandahimba district where they are sold. Money obtained from sales of live animals such as bulls, culls and milk was used to get family basic necessities, such as paying school fees, treatment expenses and others. In other words, it can be said that dairy cattle keeping is a means to generate ready income, build assets and socio-economic benefits, significant benefits to child nutrition, impact on poverty reduction and household stability. These findings concur with previous reports by Sibuga *et al.* (1993), ILO (2001) and FAO (2005)**.** Also there are several studies which have been done to illustrate the contribution of dairy cattle on household income. For instance, studies conducted in India revealed that, about 40 million

landless poor families got a major part of their income from milk (de Haan *et al.*, 2003).

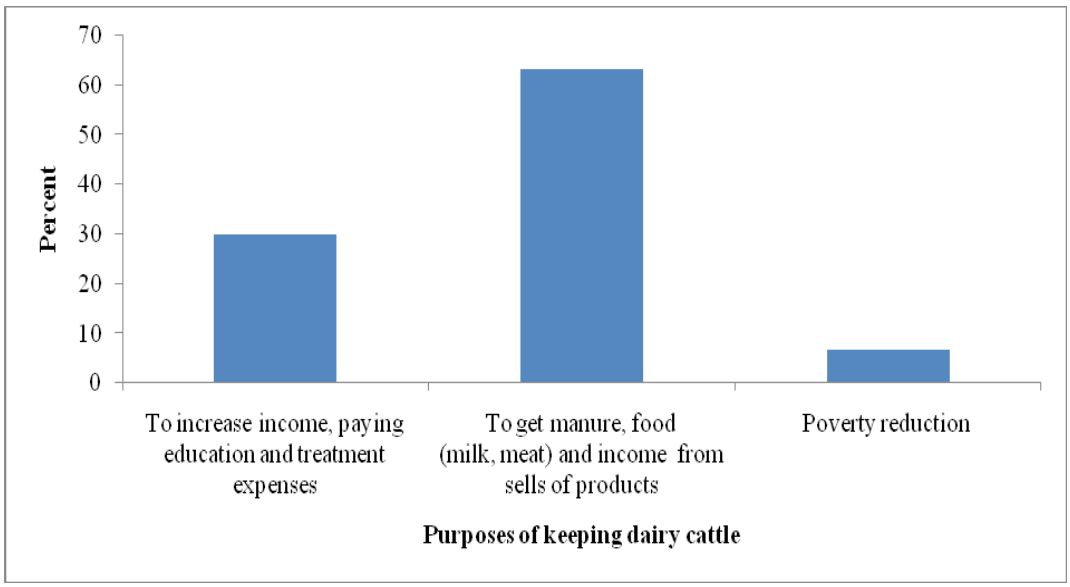

Figure 4: Purposes of keeping dairy cattle

Also, findings by Banda *et al.* (2000) and Bebe *et al.* (2003) that dairying in smallholder farms is practiced to produce milk for feeding the family and for sale, to produce manure to support crop production and to provide dairy animals for insurance and financing emergency cash needs. The same finding was also revealed by Otte and Knips (2005) that sales of livestock products such as milk, eggs and fibre generate a constant stream of income and the sale of live animals, meat and hides produce substantial sporadic income. According to Cooksey and Likwelile (2002), the key dimensions of poverty identified were: deficiencies in human capability, illiteracy, diseases, malnutrition, and inadequate income to purchase basic necessities, isolation and vulnerability (social exclusion and dependency). Therefore, by keeping dairy cattle, the households are in a better position to fight against those dimensions and hence climbing out of poverty.

4.5.2 Feeding system of dairy cattle

The study revealed that all farmers (100%) in Chikongo and 73.3% in Lipalwe villages used indoor system of feeding their dairy cattle (Table 10). On the overall, 86.7% of interviewees from the two villages cut forages/grass and carry by bicycles or on foot for the purpose of feeding their animals. The dairy cattle were normally zero-grazed and fed mainly natural forages and crop residues. Herding system comprised of 13.4% of the total households who use that system and was only practiced at Lipalwe village. Farmers in this village use this system because it is very close to Ruvuma basin where there are plenty of pastures and water.

Table 10: Distribution of households by system of feeding dairy cattle (N = 30)

System	Name of village		Total
	Chikongo	Lipalwe 'A'	
Indoor system	15(100.0)	11(73.3)	26(86.7)
Herding	0(0)	4(26.7)	4(13.4)
Total	**15(100.0)**	**15(100.0)**	**30(100.0)**

*Numbers in brackets are percentages and out of brackets are frequencies of respondents

Indoor system of dairy cattle feeding practiced by farmers of Lipalwe and Chikongo villages create employment to the people in the study area where they cut forages and carry by whatever means to feed the animals. People who are engaged in this activity get money and hence employment creation. This finding was similar to that observed by Msangi and Kavana (2002) who reported that natural pastures species in the communally owned land were the major source of feed for ruminant animals in Tanzania. It also complies with that observed by Mlay *et al.* (2000) in Morogoro whereby feeds were carried from the fields on head, bicycle or using man driven carts and rarely by motor vehicles to homesteads where cattle were kept. Many

smallholder dairy projects advocate this system in order to allow accumulation of manure, to avoid animals to contact diseases especially tick-borne diseases while grazing and minimize walking.

4.5.3 Animal deaths

Animal diseases are among the constraints which hinder development of smallholder dairy farming in Tanzania. In the study areas, it was found that Contagious Bovine Pleural Pneumonia (CBPP) and East Coast Fever (ECF) were the leading diseases which caused six out of the eight deaths of mature animals in Chikongo village (Table 11). But in general ECF was found to be the leading disease by causing deaths to four out of nine animals or 44.4% of all the deaths among the mature animals in Chikongo and Lipalwe villages. The reason for high incidence rate of tick-borne diseases is that many farmers do not have the habit of dipping their animals to kill ticks which are vectors of the diseases. Other diseases which were observed to attack young animals were diarrhoea which caused death to 44.4% of calves, worm infestation caused death to 33.3% of calves and lastly was ECF (22.2% of deaths of calves).

Table 11: Number of dairy cattle which have died by various causes

Causes	Name of village		Total
	Chikongo	Lipalwe 'A'	
Mature animals			
CBPP	3(37.5)	0(0)	3(33.3)
ECF	3(37.5)	1(100.0)	4(44.4)
Pneumonia	1(12.5)	0(0)	1(11.1)
Accident	1(12.5)	0(0)	1(11.1)
Total	**8(100.0)**	**1(100.0)**	**9(100.0)**
Young animals			
Worms	2(40.0)	1(25.0)	3(33.3)
Diarrhoea	2(40.0)	2(50)	4(44.4)
ECF	1(20.0)	1(25.0)	2(22.2)
Total	**5(100.0)**	**4(100.0)**	**9(100.0)**

*Numbers in brackets are percentages and out of brackets are frequencies of respondents

Diarrhoea was found to be the leading disease for deaths of young animals (calves), that means farmers do not give their calves antihelminthetics regularly as a result worms infect calves and result into deaths. But diarrhoea is not only caused by worms but also by other enteric infections, scours, and colibacillosis. A variety of diseases affect the calves and milking cows. Losses due to disease are variable across the country and are dictated largely by the level of management, knowledge base, access to drugs and services, and the efficiency of extension services. Losses are high in areas where efficient preventive health care and treatment cannot overcome the disease problems.

4.5.4 Products obtained from dairy cattle and their uses

One of the purposes of keeping dairy cattle is to get products from them. The findings from the study revealed that products obtained by households from dairy cattle were meat, milk and manure as mentioned by 96.7% of respondents (Table 12).

Table 12: Products obtained from dairy cattle and their uses

Product	Frequency	Percent
Products obtained		
Meat, milk and manure	29	96.7
Meat, milk, manure and hides	1	3.3
Total	**30**	**100.0**
Uses of products		
To get money from sales of products, food, soil fertility	17	56.7
To get money and food	8	26.7
To get food	5	16.6
Total	**30**	**100.0**

The uses of livestock products obtained by the households were outlined as; to get money from sales of products, food and soil fertility was mentioned by 56.7% of farmers followed by getting money and food as stated by 26.7% of interviewees (Table 12).

From the findings it can be explained that meat, milk and manure were the products which farmers from project sites of Chikongo and Lipalwe commonly obtained compared to one respondent who said that together with meat, milk and manure also he gets hides from dairy cattle. These products were used differently as stated by respondents in Table 12. Dairy development interventions in lower-income areas typically have as their primary objective, generating income for livestock-keeping households. But livestock can also be used to deliver critical micronutrients needed to enhance the nutritional status of household members and secure their most fundamental livelihood asset, their human capital, as a precondition for alleviating poverty.

4.5.5 Application of animal manure in crop farming

Concerning the utilization of animal manure it has been shown that 73.3% of farmers who are in dairy cattle projects use animal manure. On the overall, 63.3% of respondents in and out of the projects do not use animal manure where as 36.7% use animal manure in their farms (Table 13). Households which are not in dairy cattle project do not use animal manure at all. The large percent of farmers who do not use animal manure comes from farmers who were not in the project. Further, as long as low soil fertility remains the primary constraint to agriculture in most areas of Tandahimba district and developing countries, manure from animals provide a critical source of organic matter and nutrients, boosting smallholder's crop yields on farms where chemical fertilizers are often unavailable and unaffordable. From the use of animal manure, farmers in dairy cattle projects get more crop harvests compared to those who do not have dairy cattle.

Table 13: Distribution of households by animal manure application

Use of manure	Category of being		Total
	Out of the project	In the project	
Yes	0(0)	22(73.3)	22(36.7)
No	30(100.0)	8(26.7)	38(63.3)
Total	**30(100.0)**	**30(100.0)**	**60(100.0)**

* The numbers in brackets are percentages and out of brackets are frequencies of households

Farmers out of dairy cattle projects do not use animal manure in their farms because they do not have the manure. Those who have dairy cattle and do not use animal manure have difficulties to change and adopt new innovations though they see the benefits from their colleagues who apply manure. The study revealed that the majority of the households did not get enough manure to fertilize their crop fields. It

has shown that the major limitations of manure utilization were inadequate amount of manure. Manure is an excellent fertilizer containing nitrogen, phosphorus, potassium and other nutrients. It also adds organic matter to the soil which may improve soil structure, aeration, soil moisture-holding capacity and water infiltration. It is a source of many nutrients. However, nitrogen is often the main nutrient of concern for most crops.

4.5.6 Benefits obtained by animals from crops

This study has revealed that 96.7% of farmers indicating that animal manure application results in increased crop yields. About benefits obtained by animals from crops, all respondents said that animals get forages (crop residues) used to feed their animals. The integration of livestock and crops also allows for efficient recycling of crop residues and by-products as animal feed and the use of animal manure as crop fertilizer. Animals produce manure which is used to increase fertility in the soil. When crops are grown in that soil the outcome is high yield of crops. Animals obtain feeds which are crop residues such as dried maize stalks and maize bran. It is also true to say that there is a favourable symbiotic relationship between animals and crops. A similar finding was pointed out by Luoga (2002) that, in some part of southern highlands of Tanzania, mixed farming is commonly practiced. Under this system manure is used as the fertilizer for crops and fodder production and the crop residues and crop by-products are part of animal feeds.

4.5.7 Constraints faced by households in dairy cattle production

Diseases were mentioned by 70.0% of respondents that they were the leading constraint faced by the farmers in project areas followed by high prices of veterinary drugs was stated by 23.4% of farmers (Fig. 5). Other constraints included; conflicts between livestock keepers and farmers and lack of processed feeds which were each mentioned by 3.3% of respondents. Diseases which ranked high were East Coast Fever (ECF), Trypanosomosis, Contageous Bovine Pleural Pneummonia (CBPP) and worm infestations. These lead to poor health of animals and hence low milk production and also death of animals. Prices of drugs such as Eco ticks, Eco fleas, dip wash and Ox tetracycline (OTC) were very high ranging from 6000.00 to 8000.00 TAS per 100cc as well as equipments such as hand sprayer which if available was sold up to 150 000TAS.

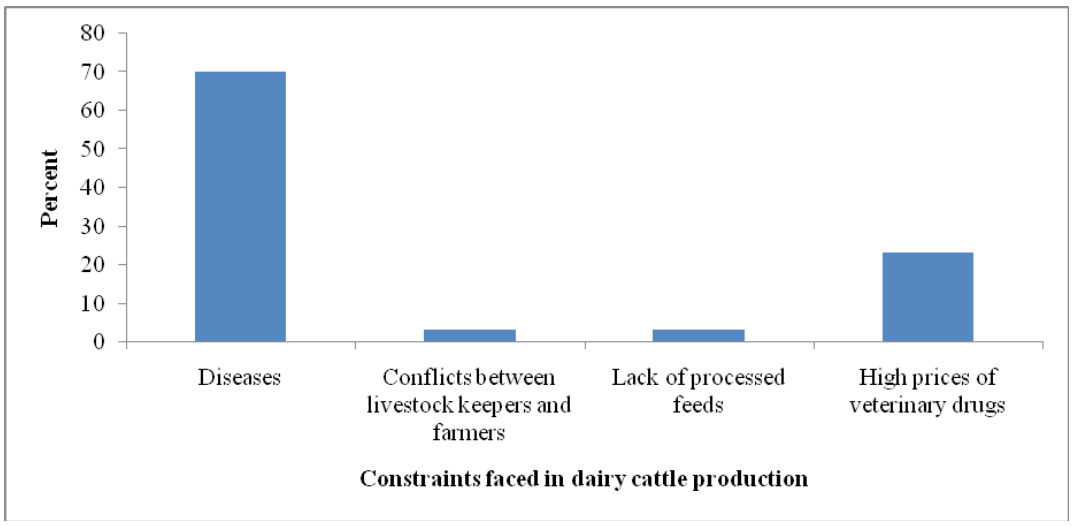

Figure 5: Constraints faced by farmers in dairy cattle production

During the dry season there is a decrease in pasture both in availability and quality. Due to that, supplemental feeds were necessary as outlined by 3.3% of respondents.

This was also pointed by Kimambo *et al*. (1993) that poor quality pastures in the dry season was apparent in the feed analyses of forage samples collected from smallholder farmers over a period of one year, where it was found to be fibrous with very high lignocelluloses, low content (4 to 5%) in protein and other essential minerals and low in digestibility. Such feeds are therefore unable to meet maintenance requirements and to support a modest level of production. Availability of feed supplements such as maize bran, cotton or sun flower seed cake is greatly influenced by crop performance as dictated by weather.

4.6 Indigenous Chicken Production

4.6.1 Feeding system of indigenous chicken

The feeding systems practiced by farmers in the study area were as follows; 48.3% of respondents mentioned semi intensive system mainly used by those who are in indigenous chicken project, 48.3% free range system commonly used by respondents who are not in the project and 3.4% used intensive system (Fig. 6). The intensive and semi intensive systems of chicken rearing used by farmers were good methods of rearing the birds. The flock was contained in the shelter overnight and during the day time. Sometimes chickens were provided with green forage in a run as well as feeds and water. This enabled the farmers to take appropriate care of their birds, which enhances their productivity. However, this had implications on the cost of rearing. Intensive and semi intensive forms of rearing are effective in controlling diseases and infections but are more expensive than the extensive (free range) system.

In the free range system the housing structures were either on the ground or raised structures from the ground and some of them were provided with perches. There were cases where the birds did not have separate houses and instead the birds roost in the family house or kitchen. Such houses would definitely not provide a healthy environment. In this system indigenous chickens left scavenging around the house during day time to obtain whatever feed they may be able to get from the environment often in the form of kitchen leftovers /waste, insects and seeds. By their mode of life on free range, and scavenging habits chicken were in permanent contact with other flocks, soil and insects. Soil and insects can act as reservoirs or vectors for a range of bacterial and helminth diseases.

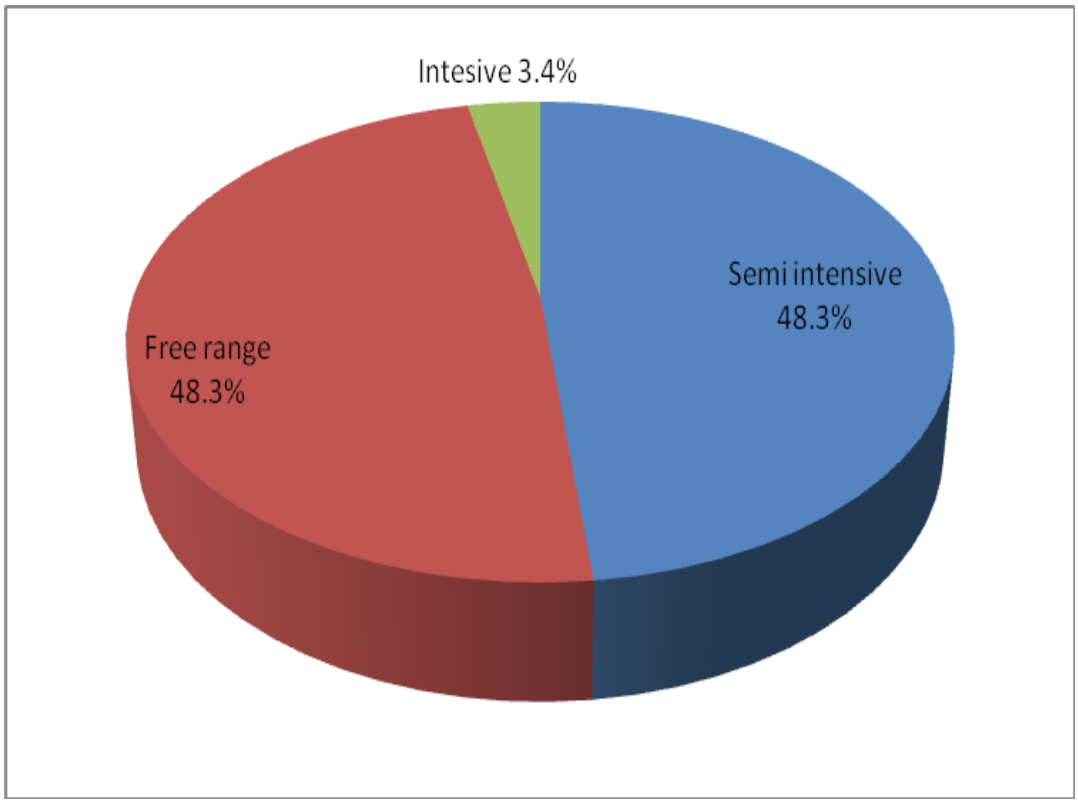

Figure 6: Feeding systems used to feed indigenous chicken

These findings comply with those described by Sonaiya (1990) that, free-range system, semi intensive system and the intensive husbandry system are commonly practiced. According to Guèye (1998), the two first types are the most commonly practiced systems in rural Africa.

4.6.2 Causes of death of indigenous chicken

Death of indigenous chicken can be caused by various factors. Respondents were asked for causes of deaths for the two categories of chickens namely mature ones and young chicks. Newcastle disease was mentioned by 77.4% of respondents as the major cause of loss of chickens followed by Salmonellosis which was mentioned by 12.2% of respondents (Fig. 7). Results from the study shows that Newcastle disease is the main killer and most destructive disease which cause highest economic losses in indigenous chicken. The findings are supported by Aboe *et al.* (2006) who pointed out that, Newcastle disease constitutes the most serious epizootic poultry disease throughout the world, particularly in developing countries. Newcastle disease occurs every year and kills on an average 70-80% of the unvaccinated village chicken. A similar finding by Mtei and Msami (1996) revealed a 70% mortality rate to be due to Newcastle disease.

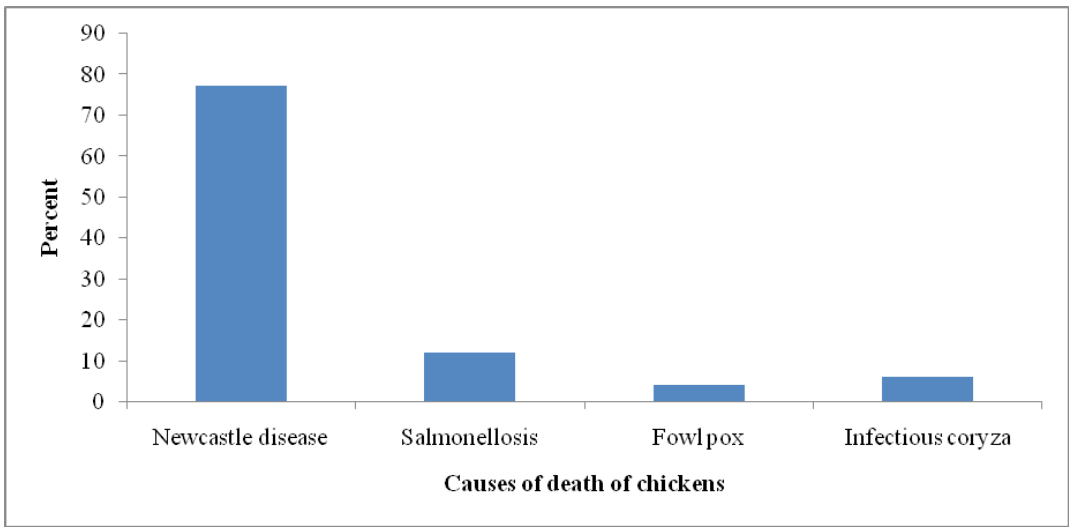

Figure 7: Causes of deaths of chickens

High mortality rates among chicks was mentioned by 55.6 % of respondents to be caused by predators and ectoparasites (fleas and mites) specifically during the first four weeks followed by Newcastle disease which was mentioned by 25.9% of respondents (Fig. 8).

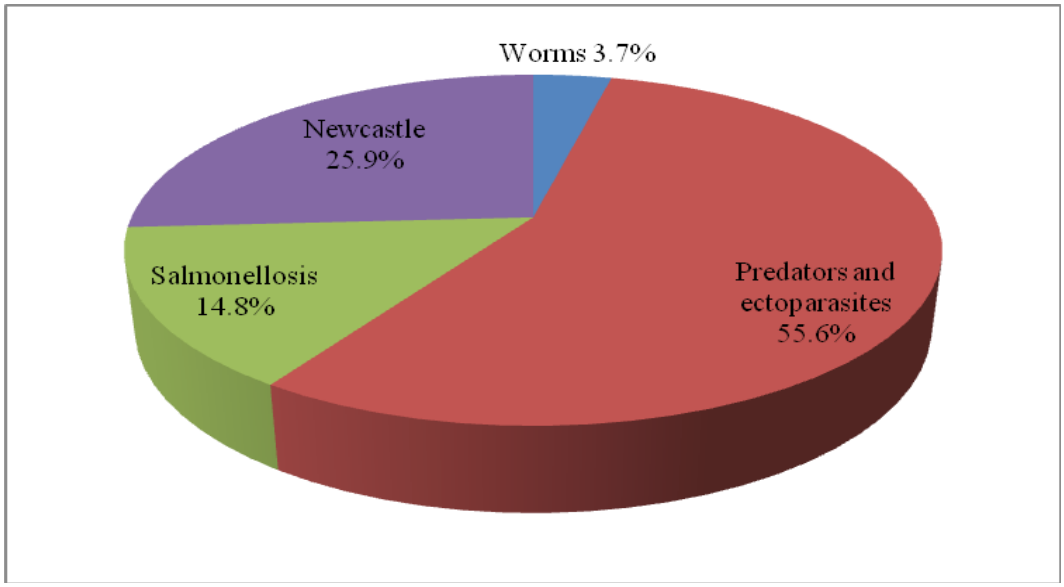

Figure 8: Causes of deaths of chicks

Under extensive system a greater proportion of chicks' losses were due to predators, mainly hawks, crows, dogs and squirrels. A similar observation was reported by Gunaratne *et al*. (1993). Also a study by Yongolo (1996) in Tanzania indicated a chick mortality of 60% by the age of 10 weeks to be caused by predators.

4.6.3 Vaccination of indigenous chicken

In the study areas it was observed that vaccination of chicken against Newcastle disease is done but at different scales. About 93.3% of respondents in the project and 56.7% out of the indigenous chicken project vaccinate their chicken. The overall total vaccination of indigenous chicken mentioned by respondents in and out of the project was found to be 75.0% (Table 14).

Table 14: Vaccination of indigenous chicken against diseases

Vaccination	Category of being		Total
	Out of the project	In the project	
Yes	17(56.7)	28(93.3)	45(75.0)
No	13(43.3)	2(6.7)	15(25.0)
Total	**30(100.0)**	**30(100.0)**	**60(100.0)**

*Numbers in brackets are percentages and out of brackets are frequencies of respondents

It was also revealed that farmers used different types of vaccines. The majority (58.3%) of respondents used I 2, 18.3% used Lasota and 23.4% did not use any vaccine (Fig. 9). The outputs for these farmers and consequently the income of the indigenous chicken husbandry could be improved by controlling diseases, ectoparasites, predators and provision of capital.

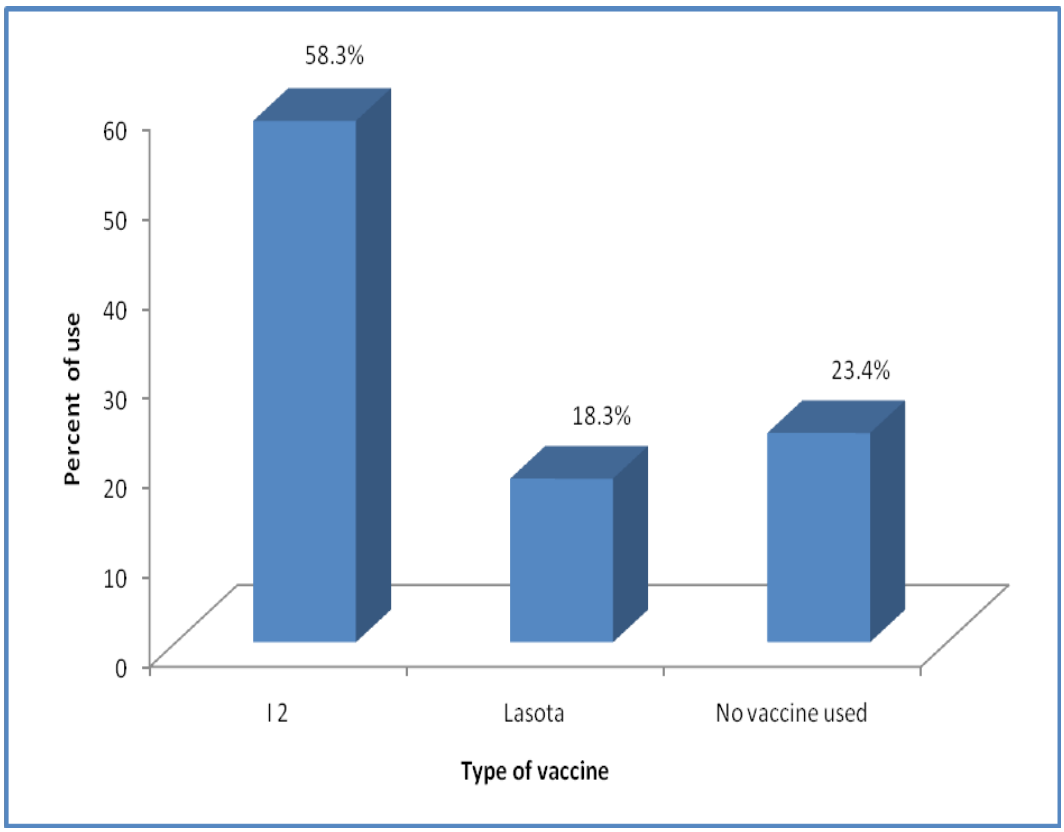

Figure 9: Types of vaccines used to vaccinate chickens

Many respondents said that they vaccinated their chicken but deaths occurred in large numbers. There are conditions which may result into death of chicken even if vaccination was done. These include: improper vaccine handling, vaccination procedures, time of vaccination in relation to the outbreak of NCD and storage of vaccines. Conditions for storage of vaccines (I 2 and Lasota) differ. Lasota is a cold chain vaccine and should be kept in refrigerators which are not available in rural areas. It is obvious that for those who used that vaccine it is doubtful if it worked properly. This finding is in line with observations from studies by Kampeni (2000) which revealed that performance of Lasota in rural areas was not effective because it is packed in large quantities of vials of 1000 doses and it needs to be stored in refrigerators.

4.6.4 Constraints faced in indigenous chicken production

Several constraints affect indigenous chicken production in the villages under the study. These constraints were categorized basing on whether the respondent was in or out of the project. It was found that 73.3% of farmers within the indigenous chicken project said that their main constraints were high prices of feeds. About 56.7% of respondents out of project mentioned diseases, predators and ectoparasites as their main problems in chicken production (Table 15). In general, high prices of feeds, drugs and diseases were the leading constraints stated by 40.0% of interviewees followed by diseases, predators and ectoparasites (30.0%).

Table 15: Constraints faced by farmers in indigenous chicken production

	Category of being in or out of the project		Total
Constraints	**Out of the project**	**In the project**	
High price of drugs	3(10.0)	0(0)	3(5.0)
Diseases, predators and ectoparasites	17(56.7)	1(3.3)	18(30.0)
Marketing	8(26.7)	7(23.3)	15(25.0)
High prices of feeds, drugs and diseases	2(6.7)	22(73.3)	24(40.0)
Total	**30(100.0)**	**30(100.0)**	**60(100.0)**

*Numbers in brackets are percentages and out of brackets are frequencies of respondents

Marketing of live chicken and eggs was stated by 25.0% of household heads to be the third constraint. The major disease affecting indigenous chicken rearing was the Newcastle disease. Controlling Newcastle disease through the development of appropriate vaccine that will be stable under tropical environments will be a major breakthrough in stimulating increased production and output of indigenous chicken husbandry and consequently resulting in higher income.

Predators such as snakes, rats, dogs, cats, foxes, raccoons, birds of prey represent the main causes of losses, especially for chicks. Provision of safe shelter could significantly reduce losses due to predation. Market problems in the study area comprise of low prices, distance from production area to the market and ability of people to reach the market place. If markets are working well, and trade and exchange are flourishing, then this could increase the cash in circulation in rural areas and give individuals broader opportunities to construct pathways out of poverty. Prices of indigenous chicken were low raging from 6000.00 to 7000.00 TAS (Table 23), eggs price from 150.00 to 250.00 TAS (Table 22). The distance from production areas was not a problem. Farmers have low purchasing power which makes them buy live chickens and the eggs at low prices. In general, findings on constraints from the study are similar to those pointed out by Mukiibi Muka *et al.* (2000), Saleque (2000), Owen *et al*. (2005), Aboe *et al. (*2006), Kivaria (2006) and URT (2006b).

4.7 Crop Production

4.7.1 Crop production in villages under livestock projects

Crop production is among of the activity which is conducted by households in the study area. They cultivate food and cash crops in farms of different sizes.

4.7.1.1 Farm size

Table 16 shows farm sizes possessed by households in the villages which are in or out of dairy cattle projects. Findings from the study show that 86.7% of households out of the project had farms of 1 – 3 hectares, where as 66.7% of respondents in

dairy cattle project own farms of that size. Large farms were possessed by farmers who were in the project, for instance farms of 4 – 6 hectares were possessed by 30.0% of households which were in the project compared to 13.3% of households which were out of the project. About 73.3% of land owned by households in dairy cattle project was purchased whereas 30.0% of households out of the project inherited, were offered or hired land (Table 16). This implies that household heads in dairy cattle project had a higher purchasing power than those out of the project.

Table 16: Farm size and land ownership/acquisition for crop production

Item	Category of being		Total
	Out of the project	**In the project**	
Farm size (ha)			
1 – 3	26(86.7)	20(66.7)	46(76.7)
4 – 6	4(13.3)	9(30.0)	13(21.7)
7 – 9	0(0)	1(3.3)	1(1.7)
Total	**30(100.0)**	**30(100.0)**	**60(100)**
Land ownership/acquisition			
Inherited	9(30)	6(20)	15(25)
Offered by somebody	9(30)	0(0)	9(15)
Purchased	3(10)	22(73.3)	25(41.7)
Hired	9(30)	0(0)	9(15)
Personal establishment	0(0)	2(6.7)	2(3.3)
Total	**30(100)**	**30(100.0)**	**60(100.0)**

*Numbers in brackets are percentages and out of the brackets are number of household heads

Farmers get income from sales of dairy cattle (culls and steers) and their products such as milk and meat. Also use of animal manure increases the farm outputs, hence improving household food security and income. Income obtained is used for various activities including purchase of farms and agricultural or livestock inputs.

4.7.1.2 Average harvest of food crops

Food crop production was found to be very important in the study area for ensuring availability of sufficient or extra food. Table 17 shows the different crops cultivated by respondents and average harvest for each crop. It was found that cassava was the leading food crop having a mean harvest of 548 kg with maximum harvest of 1860 kg for the year 2008/2009. The second food crop was paddy having a mean harvest of 298 kg. Other crops were maize and sorghum.

Table 17: Maximum and mean harvests of food crops in the 2008/2009 season

Crop harvested (kg)	N	Minimum	Maximum	Mean	Std. Deviation
Cassava	120	0	1860	548	507
Paddy	30	0	1275	298	376
Maize	60	0	980	268	288
Sorghum	60	0	1000	55	154

The findings in this study imply that farmers in the study area depend more on cassava as their main staple food. Cassava crop is grown in the whole district due to its favourability to the climatic condition and soil types of Tandahimba district. Paddy crop ranked second in its production. It is grown in Ruvuma river basin and other parts of the district which have valleys favourable for the crop. The crop is also mixed in cassava crops in upper basins depending on rainfall availability. Other crops such as maize and sorghum are grown in small amount in the upper land basin of Litehu division.

4.7.1.3 Constraints to crop production

According to the results obtained from the study (Fig. 10) the major constraints faced by farmers in crop (cash and food) production were diseases as mentioned by

47.5% of respondents, followed by high prices of inputs (34.4% of farmers) while 11.6% of farmers said unreliable markets. Lastly were floods as stated by 6.5% of respondents.

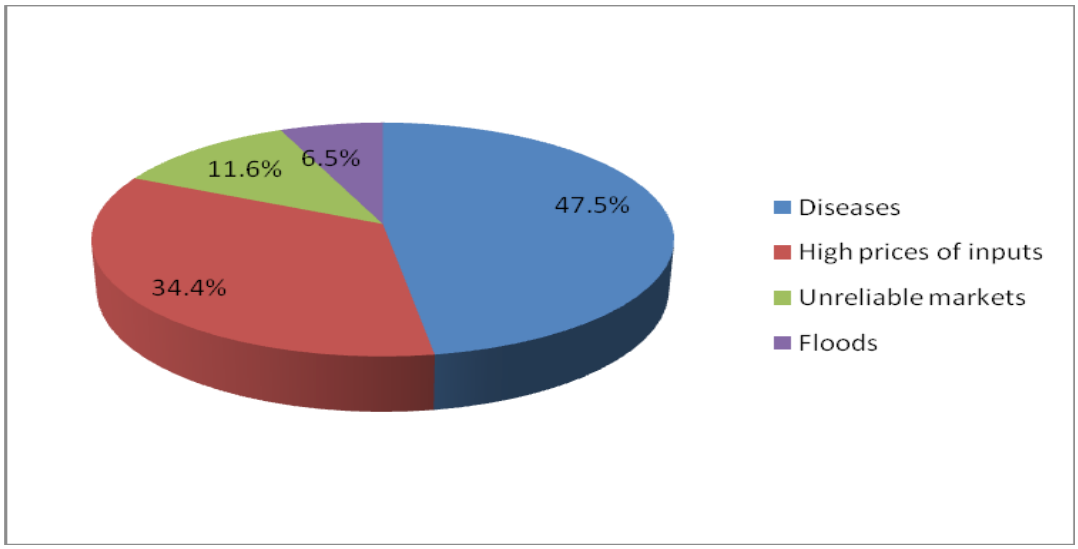

Figure 10: Constraints faced in crop production

Diseases being the leading constraint in crop production lowers the production of crops especially cashewnuts**.** The common disease affecting cashew is powdery mildew**.** The disease is prevented by applying sulphur dust or Bayfidan. Sulphur, Bayfidan and Karate are sold at very high price ranging from 15 000.00 to 25 000.00 TAS per litre. When applied it increases production costs in such a way that the cashewnuts produced and sold does not recover the costs of production and produce profit. Markets for the crops produced are unreliable and prices of crops are very low. Flood is another problem facing farmers especially those who are dealing with paddy production along the Ruvuma river basin. Due to occurrence of floods, paddy crop together with other crops cultivated are carried away by water.

4.8 Economic Situation of Households

During the study, different sources of income were mentioned and the contribution of each to the total household income was evaluated. For the purpose of this study, consideration was on dairy cattle, indigenous chicken and crop production. This is due to their importance in the contribution to household income.

4.8.1 Dairy cattle production

Different activities are involved in dairy cattle production, among them was milk production which was used for home consumption, but most of it was sold directly to consumers or through middlemen who transport the milk to urban areas (Table 18).

4.8.1.1 Market of dairy cattle and their products

Livestock keepers in Tandahimba are the ones who set prices for selling their animals and their products. Results in Fig. 11 show that majority of respondents (40%) either sold their milk at home or took it to other consumers it Tandahimba town and Mahuta min town. Markets for milk and live animals from production areas were sold at Lipalwe village and Mahuta min town as mentioned by 40.0% of households. About 33.3% of interviewees said that they sold their milk at Chikongo village and Tandahimba town. Milk, bulls, heifers and steers were sold to the neighbours within the villages and excess milk was sent to Tandahimba town and Mahuta min town.

Figure 11: Markets for dairy cattle and their products

It was also found that 56.7% of households used bicycles, 26.7% of respondents mentioned that transportation was on foot and 16.6% of farmers transported milk on foot and bicycle (Table 18). Geographically farmers of Lipalwe face problem in transporting their milk both on foot and by bicycle up to Mahuta min town. The reason is that to reach the market place one has to cross the mountain along the road which is not easily passable. Chikongo village is in the border between Tanzania and Mozambique. This village is located 47 km from Tandahimba town. Milk transportation to the market place is difficult. It takes a long time to reach the market place. Due to these constraints farmers are forced to sell their milk at low prices in their respective villages. Availabilities of a market drive, organised marketing and access to market outlets are therefore important prerequisites for the distribution and sale of milk produced. In the absence of these, prospects for promotion of efficient milk production will always be vulnerable and a risk.

Table 18: Means of milk transportation to the markets

Transport	**Frequency**	**Valid Percent**
Bicycle	17	56.7
On foot	8	26.7
On foot and bicycle	5	16.6
Total	**30**	**100.0**

These findings resemble with those found by Mutabazi (2002) who reported that market actors in Mbeya Municipality, in areas with poor roads transported their milk either on foot or used bicycles. Improving road infrastructure should be crucial and

taken into considerations since it benefits a variety of agricultural and other rural sub-sectors; infrastructure is particularly important to dairy development due to the perishable nature of milk and the need for daily collections. Improved feeder roads are likely to have a significant positive impact on dairy cattle and indigenous chicken development.

4.8.1.2 Income earned from dairy cattle and their products

Benefits from dairy cattle normally are accrued over several years of their useful economic life. Therefore, the appropriate analytical approach for analyzing economic returns from dairy cattle production is to use the approach that takes into account of future benefits and costs associated with dairy cattle production. In this study household income was estimated as average monthly income from sales of milk and live animals that is bulls and heifers. Table 19 shows the mean and maximum incomes obtained from sales of dairy cattle that is; bulls, heifers and their products specifically milk. Mean income from sales of bulls was 500 000.00 TAS where by maximum income was 1 300 000.00 TAS. The mean income from sales of milk was 374 830.30 TAS with the maximum income being 945 000.00 TAS. The current study has shown that households did not sell cows, this is due to the fact that cows and heifers are breeding stock. They are mainly kept for production purposes. Sales of live animals in this study was very low, probably due to the low fertility rate which is existing in the area because they have few bulls and not enough knowledge on signs of heat. Manure as a product of dairy cattle was not sold but instead it was used by households in their farms though it was in small amount. They use animal manure for improving soil fertility which in turn promotes growth

of crops leading to higher yields. This is in line with the study by Mbapila (2006) which showed that manure was useful in nutrient cycling.

Table 19: Mean annual income earned from dairy cattle and their products for the year 2008/2009

Item	N	Minimum	Maximum	Mean	Std. Deviation
Number of bulls sold	30	0	2		
Income from bulls (Tshs)	30	300000.00	700000.00	500 000.00	334844.10
Litres of milk sold (Tshs)	30	0	1890	715.72	440.46
Income from milk (Tshs)	30	0.00	945000.00	347830.30	229330.60
Number of heifers sold	30	0	1		
Income from heifers (Tshs)	30	0.00	450000.00		
Number of cows sold	30	0	0	0	0
Income from cows (Tshs)	30	0.00	0.00	0.00	0.00
Annual income from dairy cattle	30	329000.00	1896000.00	773270.00	375650.00

4.8.1.3 Litres of milk produced, sold and consumed per month

One of the products obtained from dairy cattle is milk which can be sold or consumed for nourishment purposes. Milk consumed at home is an indicator of status of contribution of the dairy cattle project to improvement of nutrition of households keeping these animals. Income earned from milk sold also has an indication of how dairy cattle contribute to well–being of households.

The average amount of milk produced per month was observed to be 129 litres (4.3 litres per day) with maximum of 300 litres (10 litres per day) and zero as a minimum. The mean income from milk produced per month was 66 190.00 TAS. The average amount of milk consumed per month at home was 39 litres valued at 19 500.00 TAS while milk sold per month was 89.5 litres which earned a mean income of 44 750.00 TAS. Considering the mean household size of 5 persons, it means that one person in the household consumes 0.26 litre per day (Table 20).

Table 20: Litres of milk produced, consumed and sold per month

Item	N	Minimum	Maximum	Mean	Std. Deviation
Litres of milk produced per month	30	0	300	129.1	79.59
Income from milk produce per month	30	0.00	150000.00	66190.0	40930.50
Litres of milk consumed per month at home	30	0	71	39.0	24.99
Value of milk consumed at home	30	0.00	40000.00	20030.3	12980.30
Milk sold per month	30	0	270	89.5	61.14
Income from milk sold per month	30	0.00	135000.00	44 750.0	31250.00

From the findings it shows that the quantity of milk sold (89.5 litres) was more than that consumed at home (39 litres). This confirms the importance of dairy production both as a source of income and nutrition for rural households. Consumption of even small amounts of milk can have dramatic effects on improving the nutritional status of poor people and is especially important for children and nursing and expectant mothers. The ability of dairy enterprises to earn regular income and to contribute to the household diet on a daily basis throughout the year is an advantage over other farm enterprises. This is a pointer as to why dairy is favoured as a cash crop for most farm households. The findings comply with that of Jacobi *et al.* (1999) that milk production in Dar es Salaam is used for the market, with only a small portion consumed at home. Consumption of 0.26 litres per day (94.9 litres per year) in the study area is higher compared to per capita consumption of milk in Tanzania of about 39 litres per annum which is also considered to be higher compared to Uganda (40 litres). It is low compared to Kenya (145 litres) and the amount recommended by FAO of 200 litres (URT, 2006b). It is also higher compared to the findings of Kurwijila (2002a) who reported the per capita consumption of milk to be much higher in urban centres (40 litres per annum) than in rural areas (15-20 litres

per annum). Milk yield and reproductive efficiency play major roles in determining the profitability of a dairy herd (Arbel *et al*., 2001). It was observed that mean daily production of milk per cow was low (4.3 litres) and the cows were lactating for a range of 7 to 9 months. The average lactation length was 8 months (Table 21).

Table 21: Daily milk yield per cow and lactation length

Item	N	Minimum	Maximum	Mean	Std. Deviation
Number of cows in lactation	23	1	2	1.43	.507
Litres of milk produced per day	22	2	7	4.33	1.241
Lactation length (months)	23	7	9	8.00	2.511

In most modern dairy farms, a lactation length of 305 days (10 months) is commonly accepted as a standard. This lactation length is different from that observed in the study. However, such a standard lactation length might not work for smallholder dairy cows in which the lactation length is extended considerably in most cases due to poor management (Masama *et al*., 2003; Msangi *et al*., 2005). The low lactation length and milk yield is due to inappropriate management practices conducted in the study area particularly feeding. Thus, it is of interest to properly evaluate the economic benefits and subsequently optimize both the lactation length and calving interval under the given production level and prevailing management conditions.

4.8.2 Indigenous chicken production

4.8.2.1 Markets of indigenous chicken and their products

In the project areas the main players or actors in marketing of chicken were middlemen as mentioned by 50.0% of respondents followed by retailers who were stated by 40.0% of farmers (Fig. 12).

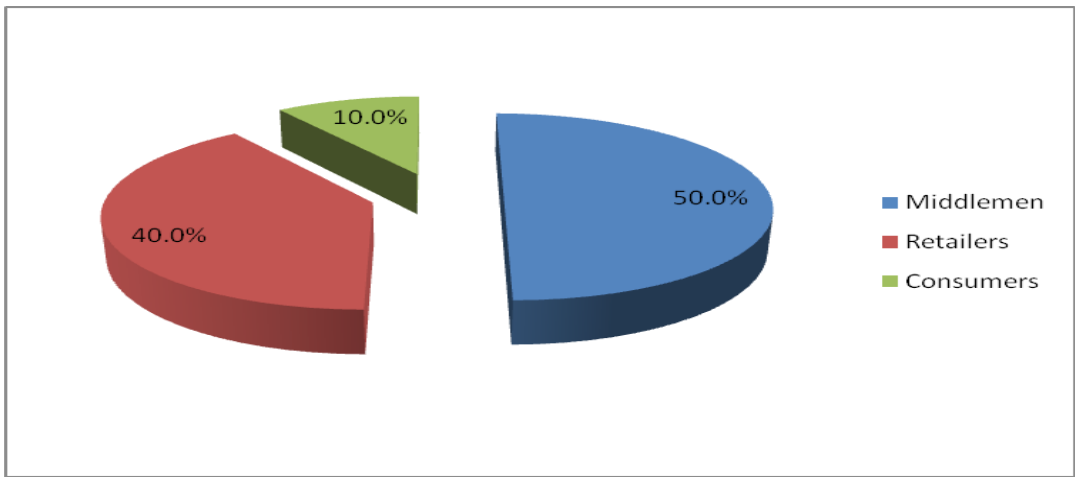

Figure 12: Markets for indigenous chicken and their products

Live chicken and eggs produced were sold to middlemen and from middlemen to retailers and then to consumers. Producers in the project area also sold chicken and eggs direct to consumers. The commodity chain is illustrated as follows: Producer to middlemen to retailer to consumers. From this chain, the prices of chicken and eggs increases from one stage to another implying that the consumer buys the chickens or eggs at a higher price because each actor will be seeking for good profit.

4.8.2.2 Income earned from chicken and their products

Increased productivity of indigenous chicken as well as improved marketing system will be reflected in the household income.

4.8.2.3 Eggs produced, sold and consumed per month

There is a clear correlation between level of income and consumption of livestock products in urban as well as in rural areas. Consumption and selling of chicken products (eggs) is determined by production. High production of eggs will influence the amount of eggs to be sold and consumed. Findings from this study (Table 22) show that the mean number of eggs produced per month was 56, with minimum of 36 eggs and maximum of 79 eggs. Mean income obtained from eggs per month was 8950.00 TAS with 5400.00 TAS as minimum and 19 750.00 TAS as maximum income earned per month per household. Eggs sold were mentioned by respondents to be 17 on average where by 50 eggs were the maximum number eggs sold. Mean income from eggs sold was 2960.00 TAS with 12 500.00 TAS as maximum income per month. The mean number of eggs consumed per month per household was 24 eggs. The mean value of eggs consumed was 3890.00 TAS. Total average income obtained from egg production was 15 820.00 TAS per month. The rest of eggs (15) were left for hatching purposes.

Table 22: Distribution of household by monthly income earned from eggs

Item	N	Minimum	Maximum	Mean	Std. Deviation
Eggs produced per month	30	36	79	56	11
Price per egg produced	30	150.00	250.00	160.00	20.00
Income from eggs produced	30	5400.00	19750.00	8950.00	2900.60
Eggs sold per month	30	0	50	17	18
Price per egg sold	30	150.00	250.00	80.00	80.70
Income from eggs sold	30	0.00	12500.00	2960.00	3440.00

Eggs consumed per month	30	0	35	24	8
Price per egg consumed	30	150.00	250.00	150.00	50
Value of eggs consumed	30	0.00	7250.00	3890.00	1440.00
Total income	**30**	**6000.00**	**39500.00**	**15820.00**	**6860.00**

The mean consumption of eggs per month of 24 eggs and the mean household size of 5 people implies that each person eats about 5 eggs per month (or 60 eggs per year). This compares favourably to the estimated consumption of 64 eggs per person per annum in Tanzania (MLD, 2007). This consumption is still lower compared to that recommended by FAO which is 300 eggs per person per annum (URT, 2006b; MLD, 2007). Also eggs produced per month averaged 56. Taking into consideration the mean number of chicken kept by each respondent of 32 and laying hens which are on average 9, monthly production of eggs will be 6 – 9 eggs per clutch. This production is low compared to that reported by FAO (2007) that under good management one hen can produce 11 to 14 eggs per clutch, and can lay at five distinct periods per year and reach production of 55 to 78 eggs. Productivity of the indigenous hens is low and losses due to diseases and predators are high. The findings conform with that reported by Saleque (2000) that the constraints to productivity were not only related to diseases but also to management systems, lack of supplementary feeding, predators, and inappropriate strains / breeds.

4.8.2.4 Monthly income earned from chicken

Table 23 shows monthly income obtained by respondents from chicken in the study areas. The mean value of chicken offered as gifts was 7250.00 TAS with maximum of 15 000.00 TAS. Chicken sold per month were valued at 22 330.00 TAS. The mean value of chicken consumed per month was 10 430.00 TAS. This study

revealed that the mean monthly income from sales of chickens and eggs to be 60 050.00 TAS with maximum of 622 250.00 TAS. These figures show that chickens are mainly kept as source of income to the households rather than consumption purposes. Nutrition and gift offering are subsidiary tasks as indicated by low incomes compared to that obtained from sales of chickens.

Table 23: Monthly income earned from sales, gifts and consumption of chicken

Item	N	Minimum	Maximum	Mean	Std. Deviation
Chicken offered as gifts	30	0	3	1	.82
Price per chicken	30	4000.00	6000.00	4900.00	2400.00
Value of chicken offered as gifts	30	0.00	15000.00	7250.00	3980.00
Chicken sold per month	30	0	7	4	1.7
Price per chicken	30	5000.00	7000.00	5600.00	3320.00
Income from sale of chicken	30	0.00	49000.00	22330.00	10890.00
Chicken used for home consumption	30	0	4	2	1.09
Price per chicken	30	4000.00	6500.00	4520.00	2630.00
Value of chicken consumed	30	0.00	24000.00	10430.00	6000.00
Total monthly income earned from sales of chicken	30	8000.00	622250.00	60050.70	107048.70

4.8.2.5 Market problems for indigenous chicken and eggs

In marketing of chicken and eggs there are various problems which are faced by poultry keepers. The majority of interviewees (42.9%) said low prices of eggs and chicken to be the first problem followed by low prices and unreliable market which was stated by 23.8% of respondents (Fig. 13). Others were unreliable market (19%) and high transport costs as mentioned by 14.3% of the farmers.

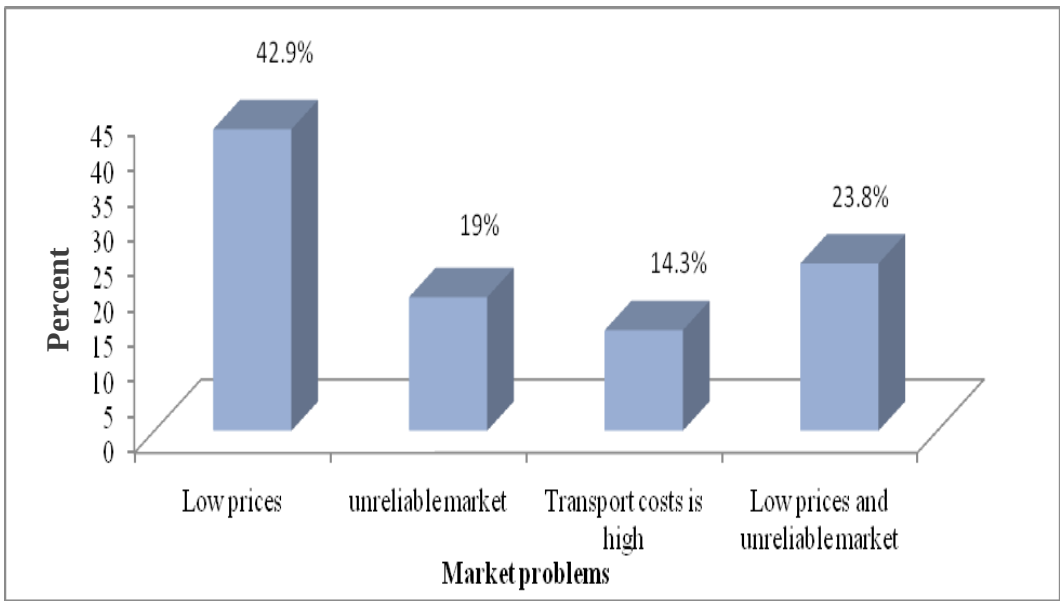

Figure 13: Market problems of indigenous chickens and eggs

Due to presence of many actors in marketing system of chickens and eggs which involve middlemen, retailers and consumers, producers sell their chickens and eggs at low prices to middlemen who again sell to retailers or consumers at prices which give profit to them. Unreliable markets for chicken and eggs make producers in Mwenge 'B' and Libobe villages to involve middlemen in selling their products. If there could be reliable market, farmers could sell direct to the market at reasonable prices. There was a very high risk during transportation of eggs and live chickens searching for market because some of chickens die before reaching the market or eggs broken during transportation.

4.8.3 Cash crop production in villages under livestock projects

4.8.3.1 Markets for cash crops produced

Fig. 14 shows areas where cash crops are sold in villages which are under dairy cattle project. About 36.7% of the farmers sell their cash crops at Lipalwe cooperative union and small private traders. Further, 33.3% of respondents mentioned Chikongo cooperative union as their market where they sell their cash crops.

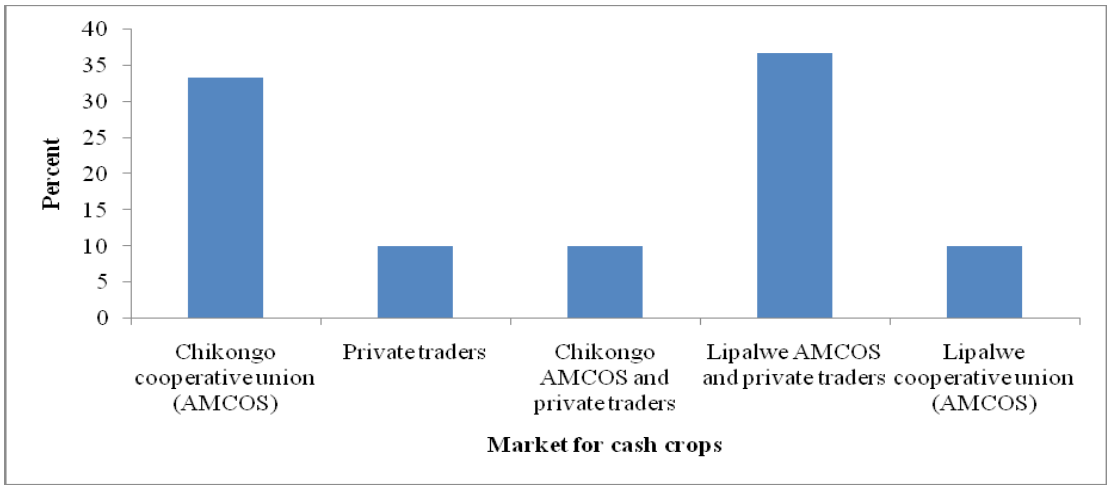

Figure 14: Markets for cash crops produced in villages under the project

It was also found that cooperative unions were specific for buying cashewnuts only and private traders or middlemen buy other cash crops such as sesame, paddy and ground nuts. This study also revealed that villages under indigenous chicken project (Mwenge 'B' and Libobe) sell their cashewnuts to their respective cooperative unions (Litehu and Kitama) and other crops to private traders. In Tandahimba district all farmers do sell their cashewnuts in cooperative unions. No other trader has been allowed to buy cashewnuts from farmers besides the

Agricultural Marketing Co-operative Society (AMCOS). Other cash crops can be bought by any company if all regulations concerning marketing are fulfilled.

4.8.3.2 Income earned from cash crop production

Table 24 shows the mean production of cashewnuts per farmer was 568 kg, the maximum production was 1600 kg and mean income earned was 377 035.00 TAS with maximum income earned from sales of cashewnuts was 1 080 000.00 TAS. The mean production of paddy was 332.5 kg with maximum production of 1 275 kg. Mean income obtained from paddy was 111 700.00 TAS and the maximum income earned was 486 000.00 TAS. Mean production of sesame was only 22 kg, with maximum production of 500 kg. Mean income earned from sesame was 19 800.00 TAS and maximum income earned was 400 000.00 TAS. Respondents also mentioned maximum prices of cash crops produced, these were 675.00, 540.00 and 1000.00 TAS with means of 674.70, 490.00 and 900.00 TAS for cashewnut, paddy and sesame respectively.

Table 24: Income earned from cash crops produced for the season 2008/2009

Cash crop	N	Minimum	Maximum	Mean	Std. Deviation
Cashewnus produced (kg)	30	0	1600	568.00	401.06
Cashewnut sold (kg)	30	50	1600	562.67	398.37
Price of cashewnut per kg	30	670.00	675.00	674.70	205.79
Income earned from sales of cashewnut	30	33500.00	1080000.00	377035.00	271230.70
Paddy produced (kg)	30	300	1275	332.50	376.64
Paddy sold (kg)	30	150	900	227.50	271.12
Price of paddy per kg	30	500.00	540.00	490.70	268.01
Income earned from sales of paddy	30	75000.00	486000.00	117700.00	2660.00
Sesame produced (kg)	30	160	500	22.00	94.88
Sesame sold (kg)	30	160	500	22.00	94.88
Price of sesame per kg	30	800.00	1000.00	900.00	229.84
Income earned from sales of sesame	30	120000.00	400000.00	19800.00	7714.50
Total annual income earned from cash crops	30	238500.00	1667500.00	515820.00	359390.40

Mean total annual income earned from cash crops was 515 820.00 TAS with the highest income of 1 667 500.00 TAS. Increase in production of cash crops in the areas depends on improvement of farming system. This can be done by using new technologies, application of appropriate inputs, increase cultivated acreage, improved implements (power tillers) and irrigation agriculture. High yield of cash and food crops will result into increased household income and living standards.

4.8.3.3 Problems faced in selling cash crops

Marketing system of cash crops had some problems. The intensity of problems was similar for all villages and the whole district. Table 25 shows some of the marketing problems faced by farmers during selling their crops. These problems were; unreliable market as mentioned by 50.0% of respondents who sell their cash crop at Chikongo Agricultural Marketing Co-operative Society (AMCOS). It was also revealed that 50.0% of farmers from Lipalwe Agricultural Marketing Co-operative

Society (AMCOS) stated unreliable market. On the overall, 41.7% of interviewees said unreliable market is their serious problem, followed by poor infrastructure (roads) as mentioned by 30.0% of respondents.

Table 25: Problems faced by respondents in selling cash crops

Problems	Market for cash crops				Total
	Chikongo AMCOS	Lipalwe AMCOS	Chikongo AMCOS, Private traders	Lipalwe AMCOS, Private traders	
Unreliable market for cashewnuts	8(50.0)	9(50.0)	5(36.7)	3(25.0)	25(41.7)
Poor infrastructure (roads)	6(37.5)	4(22.2)	4(28.6)	4(33.4)	18(30.0)
Low prices of cash crops	2(12.5)	2(11.1)	5(35.7)	4(33.3)	13(21.7)
Unreliable markets and low prices of cash crops	0(0)	3(16.7)	0(0)	1(8.3)	4(6.6)
Total	**16(100.0)**	**18(100.0)**	**14(100.0)**	**12(100.0)**	**60(100.0)**

Prices of their crops were low especially for cashewnuts. This is due to the marketing system which is operating in the area. Farmers are paid in instalments until the announced price is attained. Together with the payment system, the market is unreliable. Poor infrastructures such as roads are a problem as the roads are not passable for the whole year. Agricultural Marketing Co-operative Societies are specifically for buying cashewnuts. Private traders buy other types of cash crops such as paddy, sesame and groundnuts. Most farmers encounter cash flow problems. Due to unreliable markets when harvests come, farmers sell their crops in pursuit of cash. Harvest season usually arrives together with the beginning of schools and traditional ceremonies making up the pressing needs of money. In the absence of the government's price intervention, late buying of crops and high demands of cash, farmers sell their crops to small traders at low prices. Cash crop traders face trade

barriers in transportation of crops which requires various permits that cost the traders' time and money. Traders internalize these costs and lower the buying price from farmers. Infrastructure (roads) is a key to farmers' bargaining power. Limited infrastructure leads to a situation where intermediaries dictate the price in the village, simply because they know farmers cannot afford to sell their crops elsewhere.

4.8.4 Uses of income earned from livestock projects

4.8.4.1 Uses of income from dairy cattle project

Table 26 shows expenditures of income obtained from dairy cattle. Income being used to purchase agricultural/livestock inputs was mentioned by 43.3% of respondents. Others were paying school fees and treatment expenses were said by 26.7%, purchase of farm and clothes was stated by 13.3% of farmers. Lastly was to buy bicycles and farms. Income obtained was used to purchase various household assets and inputs which are used in farming such as sulphur and others.

Table 26: Various uses of income from dairy cattle

Item	Frequency	Percent
Paying education and treatment expenses	8	26.7
Purchase of agriculture/livestock inputs	13	43.3
To buy a farm	2	6.7
To buy a bicycle	3	10.0
To buy a farm and clothes	4	13.3
Total	**30**	**100.0**

These findings resemble those by Mdoe *et al.* (1998) and Mbapila (2006) who showed that incomes from livestock can be used to improve the standard of living of the farmers (better housing, family education, paying health services, clothing and others).

4.8.4.2 Uses of income earned from indigenous chicken project

Respondents used their income from indigenous chickens for education and treatment expenses as mentioned by 36.7% of interviewees; buying agricultural inputs, veterinary drugs as stated by 33.3% of farmers and to purchase chicken and feeds was said by 30.0% of respondents (Fig. 15).

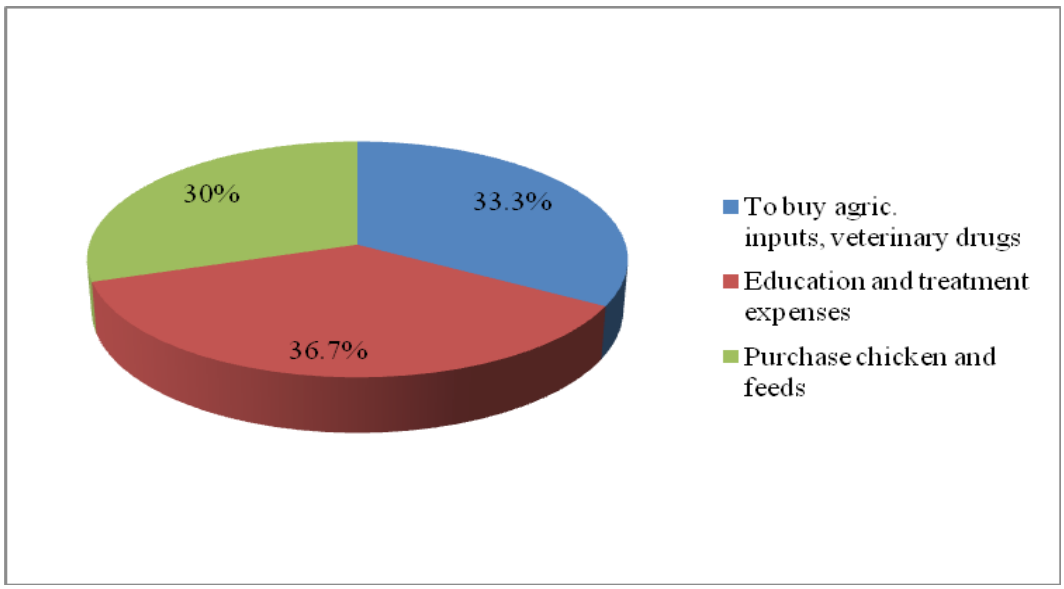

Figure 15: Uses of income from indigenous chicken

Gerd *et al.* (1984) also pointed out that indigenous chicken are the reserve banks that generate gross household cash incomes which is normally used when confronted with problems like food shortage, school fees and others.

4.8.5 Costs of livestock projects

4.8.5.1 Costs of dairy cattle project per year

Table 27 shows costs in dairy cattle production. Findings in this study show that, annual mean costs in feeding dairy cattle was 134 570.00 TAS, disease control and

treatment was 46 480.00 TAS, buying supplementary feeds 54 720.00 TAS and labour costs 48 190.70 TAS. The mean total cost in dairy cattle production was 283 960.70 TAS with the maximum total cost of 700 000.00 TAS.

Table 27: Costs of production of dairy cattle and indigenous chicken per year

Costs	N	Minimum	Maximum	Mean	Std. Deviation
Dairy cattle					
Feeding	30	50000.00	300000.00	134570.00	66940.79
Disease control and treatment	30	12000.00	200000.00	46480.00	37820.6210
Buying supplementary feeds	30	0.00	196000.00	54720.00	42490.614
Labour	30	20000.00	200000.00	48190.70	43710.46
Total costs	**30**	**128060.00**	**700000.00**	**283960.70**	**151830.00**
Indigenous chicken					
Buying supplement feeds	30	35500.00	100000.00	57190.00	14400.80
Labour	30	7000.00	50000.00	38990.00	7870.70
Vaccination	30	0.00	15400.00	10510.00	2810.80
Total costs	**30**	**20060.00**	**143700.00**	**106690.00**	**21930.70**

Mean annual income earned from dairy cattle project was: mean income from milk produced per month 66 190.00 TAS which was equal to 529 520.00 TAS per year (Table 20), mean annual income from bulls 378 670.70 TAS and from heifers 450 000.TAS (Table 19). Total mean annual income from dairy cattle project was 1 358 190.70 TAS. Mean annual costs of dairy cattle production was 283,960.70 TAS. Therefore, the gross margin from dairy cattle project was 1 074 230.00 TAS. The results show that households in dairy cattle project get an income of 2940.00 TAS (2.2 USD) per day which is above 1 USD in contrast to the literature that in Tanzania poverty is still high whereby about 35.7% of the people are below the national basic needs poverty line and 18.7% live below the national food poverty line (URT, 2004), 20% of the world population lives on less than 1 USD (1350.00 TAS) per day which is equal to 492 750.00 TAS per year (World Bank, 2003).

Findings comply with UNDP (2005) reported that 34.9% of the world's population lives on 1USD per day and 55.8% live on 2 USD per day. Farmers in dairy cattle projects have more income (1 074 230.00 TAS) than those engaged in indigenous chicken projects (803 758.40 TAS) and those out of livestock projects.

4.8.5.2 Costs of indigenous chicken project per year

There are several costs concerning indigenous chicken production. Findings from this study (Table 27) revealed the following mean annual costs that were incurred by respondents during chicken production; buying of supplementary feeds having a mean costs of 57 190.00 TAS, labour costs 38,990.00 TAS, vaccination costs 10 510.00 TAS. Total annual mean costs in indigenous chicken production was 106 690.00 TAS with maximum cost of 143 700.00 TAS. These costs are low compared to the costs of dairy cattle production. Mean monthly income from chicken through sales, gifts, and consumption of chickens were 60 050.70 TAS (720 608.40 TAS mean annual income, Table 23). Mean monthly income from sales of eggs 15 820.00 TAS which was equal to annual income of 189 840.00 TAS (Table 22). Total annual mean income is 910 448.40 TAS. Mean annual production costs for indigenous chicken project was 106 690.00 TAS (Table 27). Gross margin for indigenous chicken project was 803 758.40 TAS. This shows that the average income of the chicken project households was 2200.00 TAS (or 1.6 USD) which is above the poverty line (1 USD) per day but low compared to average income of dairy cattle project households (2.2 USD).

4.9 Comparison of Mean annual Incomes Out of and in, Before and After Livestock Projects

4.9.1 Mean annual income out of and in the dairy cattle and indigenous chicken projects

Table 28 shows mean annual income of households that are out and in dairy cattle and indigenous chicken projects. The mean income of respondents out of the dairy cattle project was 414 800.00 TAS while the mean income of households in dairy cattle project was 1 427 800.00 TAS. From these findings it shows that mean income of households in dairy cattle project were higher by 1 013 000.00 TAS compared to households out of the project.

Table 28: Mean annual income out and in livestock projects

Category of being							
Household income out of dairy cattle project		**Household income in dairy cattle Project**		**Household income out of indigenous chicken project**		**Household income in indigenous chicken project**	
N	Mean	N	Mean	N	Mean	N	Mean
30	414 800	30	1 427 800	30	407 290	30	705 850

It was also found out that the mean income for households out of indigenous chicken project was 407 290.00 TAS while households in indigenous chicken project had a mean income of 705 850.00 TAS. It implies that households in livestock projects have more income compared to those out of the projects. Due to increased income for households in livestock projects, they are in good position to cover household expenses such as paying school fees and health services, buying agricultural inputs (Table 26; Fig.15) and hence indicating improved standard of living.

According to the literature, in Tanzania poverty is still high whereby about 35.7% of the people are below the national basic needs poverty line and 18.7% live below the national food poverty line (URT, 2004), 20% of the world population lives on less than 1 USD (1350.00 TAS) per day which is equal to 492 750.00 TAS per year (World Bank, 2003).

4.9.2 Mean annual incomes before and after involvement in livestock projects

Mean annual incomes of households before and after livestock projects were evaluated. The study revealed that (Table 29) households' mean annual income before dairy cattle project was 527 200.00 TAS and after dairy cattle was 1 427 800.00 TAS (2.7 times higher than before the project). For households in indigenous chicken project 337 680.00 TAS and 705 850.00 TAS were the mean incomes before and after indigenous chicken project respectively. These findings illustrate that there is a significant contribution of livestock projects to the household income.

Table 29: Mean annual incomes before and after involvement in livestock projects

Category of projects							
Household income before dairy cattle project		**Household income after dairy cattle project**		**Household income before indigenous chicken project**		**Household income after indigenous chicken project**	
N	Mean	N	Mean	N	Mean	N	Mean
30	527 200	30	1 427 800	30	337 680	30	705 850

4.9.3 Test for comparison of mean annual income before and after, in and out of livestock projects

Paired t-test was employed in this study to compare the mean annual incomes for households in and out of as well as before and after livestock projects. According the results presented in (Table 30), there was a significant difference in mean annual incomes between households in and out of dairy cattle project ($p < 0.001$).

Table 30: Paired t-test statistics for comparison of mean annual income in and out, after and before projects

	Respondent	Mean	N	Std. Deviation	Std. Error Mean	T	df	Sig. (2-tailed)
Pair 1	In dairy cattle project total annual income	1 427 791.66	30	1 016 362.68	185 806.70	7.69	29	.000
	Out of dairy cattle project total annual income	414 798.33	30	229 411.40	41 939.93			
Pair 2	In chicken project total annual income	705 846.67	30	211 199.01	38 559.49	18.30	29	.000
	Out of chicken project total annual income	407 292.50	30	188 457.20	34 407.42			
Pair 3	Total annual income after keeping dairy cattle	1 427 791.66	30	1 016 362.68	185 561.59	7.69	29	.000
	Total income before keeping dairy cattle	527 215.33	30	498 818.24	9 1 071.33			
Pair 4	Total annual income after the chicken project	705 846.67	30	211 199.01	38 559.49	18.30	29	.000
	Total annual income before the chicken project	337 682.67	30	114 448.91	20 895.42			

This complies to the alternative hypotheses that, incomes differ significantly between households with and those without livestock projects. Also it was found

that significant difference was revealed between mean annual household incomes before and after dairy cattle project ($p < 0.001$). Findings in Table 30 further show that there was a significant difference in mean annual incomes between households in and out of indigenous chicken project ($p < 0.001$) as well as before and after indigenous project.

4.9.4 Contribution of livestock projects to total household annual income

Forward multiple regressions was carried out to determine the contribution of incomes from livestock projects to total annual household income. In villages under dairy cattle projects it was found that crop production was the first income generating activity with the coefficient of determination R^2 of 0.86. It indicates that they accounted for 86 % of variation in the total household annual income. Cash crops were leading in their contribution to total household income followed by dairy cattle, kiosk and lastly was other livestock. The coefficient of determination increased to $R^2 = 0.99$ when all economic activities were included in the model meaning that all economic activities contributed to almost 100% of total annual household income (Table 31). The ultimate multiple regression model was:

Total annual income = 42502 + 0.89 cash crop + 1.02 dairy cattle + 1.05 kiosk

+ 1.07 other livestock ($R^2 = 0.99$).

From the equation above, it was revealed that all sources of income had positive (β) beta values indicating their significant contribution to total annual income. All economic activities showed significant ($p < 0.001$) contribution to total household annual income.

Table 31: Forward multiple regression for contribution of various income generating activities to total annual income among dairy farmers

Y	A	bX	Se	P- value	R^2
TOTAL ANNUAL INCOME	143830	2.55 CC	0.19	0.0001	0.86
	-267369	1.70 CC	0.23	0.0001	0.93
		1.08 DC	0.22	0.0001	
	-27982	0.98 CC	0.12	0.0001	0.98
		1.13 DC	0.09	0.0001	
		1.05 KO	0.09	0.0001	
	42502	0.89 CC	0.07	0.0001	0.99
		1.02 DC	0.06	0.0001	
		1.05 KO	0.05	0.0001	
		1.07 OL	0.15	0.0001	

CC – Cash crop, DC – Dairy cattle, KO – Kiosk, OL – Other livestock

Findings comply with those pointed by Cyril *et al*. (2002), Mbapila (2006) and Macha (2008) that dairy farming is an important enterprise for poverty reduction due to its contribution in income generation through sales of milk, milk products and live animals. Table 32 shows contribution of economic activities in villages under indigenous chicken projects. It was revealed that cash crops had a coefficients of determination $R^2 = 0.67$. The coefficient of determination (R^2) increased from 0.67 for cash crops to 0.96 for all economic activities (cash crop, indigenous chicken, kiosk and other livestock). Cash crops, indigenous chicken, kiosk and other livestock were the first, second, third and fourth in income contribution to total household income respectively. Contribution of income from economic activities to the total annual income was significant ($p < 0.001$).

Table 32: Forward multiple regression for contribution of various income generating activities to total annual income among poultry keepers

Y	a	bX	Se	P- value	R^2
TOTAL ANNUAL INCOME	375462	1.07 CC	0.14	0.0001	0.67
	-20460	0.99 CC	0.07	0.0001	0.90
		1.18 CH	0.15	0.0001	
	-49813	1.09 CC	0.06	0.0001	0.94
		1.15 CH	0.12	0.0001	
		4.89 KO	1.18	0.0001	
	-39673	1.04 CC	0.05	0.0001	0.96
		1.11 CH	0,09	0.0001	
		0.82 OL	0.19	0.0003	
		4.97 KO	0.92	0.0001	

CC – Cash crop, CH – Indigenous chicken, KO – Kiosk, OL – Other livestock

Coefficients of determination for each source of income in villages under indigenous chicken projects were low compared to those under dairy cattle projects. It was also shown that kiosk ranked third in income contribution and lastly was other livestock. In real sense other livestock should have been the third income in household income contribution because kiosk as a source of income was possessed by a few interviewees compared to other livestock. Findings concur with those reported by Gerd *et al.* (1984) that indigenous chickens are the reserve banks for generating household cash incomes. They provide supplementary food, income and employment and contribute to poverty reduction (Sonaiya, 2001).

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

According to the results obtained from the study, it is concluded that:

- The major economic activities which were the sources of income were agriculture, livestock keeping and operating kiosks.
- Farmers in dairy cattle project had higher income than those out of the project. Mean household income before joining the project was lower compared to income after joining the project. Similarly, respondents in indigenous chicken project had higher income than those outside. Household incomes before the project was low compared to after joining the project.
- It was evident that livestock contributed substantially to household income and hence improved their standard of living. Livestock projects not only increased cash income but also household consumption of livestock and their products.
- Livestock manure was often an important input for maintaining soil fertility, and so contributes to higher crop production for food and income.
- Diseases, high price of veterinary drugs, unreliable markets for livestock and their products, poor infrastructures (especially roads) were observed to be the main constraints in dairy cattle and indigenous chicken production.
- Livestock projects (dairy cattle and Indigenous chicken) have a significant impact on poverty reduction at household level and have enhanced farmers to acquire assets and meet day-to-day needs.

- The contribution of livestock to the sustainability of smallholder crop–livestock systems through its roles in nutrient cycling, regular cash generation ability, employment creation and provision of farm household nutrition makes it an easy choice as a vehicle to address rural poverty.

5.2 Recommendations

Findings from the study revealed roles played by dairy cattle and indigenous chicken in contributing to poverty reduction. There were several constraints to development of livestock production in the study area. To improve livestock (dairy cattle and indigenous chicken) performance in the area, it is recommended that:

i. The livestock sector has shown to be very important for the reduction of poverty, creation of employment opportunities and for improving nutrition. The local governments should continue to support and encourage development of livestock projects.

ii. Subsidies on veterinary drugs should be in mind by the local government to reduce costs of drugs for the purpose of enabling smallholder farmers (dairy cattle and indigenous chicken keepers) to purchase them for their livestock.

iii. Coordinated market strategies of livestock and their products should be formulated by stakeholders so as to create better market opportunities and incentive for higher production.

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APPENDICES

Appendix 1: Operational definitions of the conceptual framework

Concept	Operational definition
Household wellbeing	Ability of the household to obtain basic and necessary needs such as food, clothes, assets, education and health services.
Sex	Biological appearance as being male or female.
Age	Number of years a person has lived.
Marital status	State of being married, single, divorced or separated
Level of education	Number of years spent in schooling.
Household size	Number of people residing within a family unit.
Source of income	Means used by a household to acquire money. For example provision of labour, selling of milk or eggs.
Indigenous chicken	Native chicken strains that are kept by a household.
Dairy cattle	Improved cattle that have been supplied by the HIT project to a household and the succeeding heifers distributed in the community.
Crop production	Type and quantity of crops produced by a household and the amount of produce sold.
Small scale business	Activities that a household is engaged in as an alternative income generating source.
Labour	Activities that an individual is engaged in for generating income.
Herd size	Numbers of livestock a household have.
Farm size	Number of hectares of a farm or farms a household has.
Involvement in livestock projects	Participation of the household in livestock (dairy cattle and indigenous chicken) projects/beneficiaries.

Expenditure pattern	The services that a household spends the income earned. For example spending in health, school fees, family uses.

Appendix 2 Three sets of questionnaires used in the study
QUESTIONNAIRE FOR DAIRY CATTLE KEEPERS
Background information
Date of interview…… Interviewee's name……
Village…….....
Ward……...
Division…….....

A. Household characteristics
1. Age of respondent……years
2. Sex of respondent (i) Male (ii) Female
3. What is your education level
(i) None / No formal education (ii) Adult education (iii) Primary education
(iv) Secondary education (v) Completed "A" level (vi) Informal
(vii) Others specify…….....
4. Marital status of respondent
(i) Married (ii) Single (iii) Widowed (iv) Divorced (v) Separated
5. Family size of respondent

S/No	Age (Years)	Male	Female	Total
1	Below 10			
2	10 -17			
3	18 -60			
4	Above 60			
Total				

6. What are the main economic activities or sources of income you are dealing with

S/No	Economic activity/source of income	Annual income
1		
2		
3		
	Total annual income (Tshs)	

B. Data on productivity situation of the farmer
7. What type of livestock do you keep?

S/No	Livestock type	Breed		Total
		Indigenous	Exotic	
1	Cattle			
2	Chicken			
3	Goats			
4	Sheep			
5	Others specify.....			
6				

8. What is the purpose of keeping dairy cattle?
(i)…… (ii) …… (iii)..... (iv).....

9. What is your purpose of keeping other livestock
(i)…… (ii)..... (iii)..... (iv).....
10. Which system do you use to feed your dairy cattle
(i) Tethering (ii) Herding (iii) Indoor system (iv) Free range system
11. How many animals have you lost (death) since the implementation of the project

Category	Number
Mature animals	
Young animals	
Total	

12. What do you think were the main cause(s) of death

Category of animal	Causes of death
Mature animals	1.
	2.
	3.
Calves	1.
	2.
	3.

13. What products do you get from dairy cattle?
(i)…… (ii).....…… (iii)...…..... (iv).....
14. Are there any products you get from livestock other than dairy cattle, mention
(i)…… (ii).....…… (iii)...…..... (iv).....
15. What are the uses of products obtained from livestock
(i)…… (ii).....…… (iii)...…..... (iv).....
16. Do you use manure in crop farming…….....
17. If YES what are the advantages do you get from using manure
(i)…… (ii).....…… (iii)...…..... (iv).....
18. What are the benefits obtained by your animals from crops
(i)…… (ii).....…… (iii)...…..... (iv).....
19. What are the constraints do you face in dairy cattle production
(i)…… (ii).....…… (iii)...…..... (iv).....
20. Are you growing crops (i) Yes (ii) No
21. If YES how did you get the land that you use for crop production?
(i) Inherited (ii) Purchased (iii) Offered by somebody (iv) Hired
22. What is your total farm acreage..... hectare.....
23. Which type of food crops do you cultivate
(i)…… (ii).....…… (iii)...…..... (iv).....

24. What was the average harvest in the 2008/2009 season for a hectare

Crop					
Harvest					

25. Do you consume all of your food crops (i) Yes (ii) No
26. If no what do you do with excess food crops……

27. Which cash crops do you cultivate
(i)…… (ii).....…… (iii)...…..... (iv).....

28. What was the average harvest from each cash crop in a season 2008/2009

Crop					
Harvest					

29. What constraints do you face in crop production
(i)…… (ii).....…… (iii)...…..... (iv)..... (v).....

C. Data on socio-economic situation of the farmer

30. Where do you sell livestock and their products (milk, heifers, steers, bulls)?
(i)…… (ii).....…… (iii)...…..... (iv).....

31. What are the farm gate prices of the following livestock and products for the year 2008/2009

Type of livestock	**Category**	**Number sold**	**Price per each**	**Amount of money earned**
Dairy cattle	Bulls			
	Milk			
	Cows			
	Calves			
	Heifers			
	Total (Tshs)			

32. How many litres of milk do you get, sell, and consume per month

Milk produced (Litres)		**Milk consumed at home (Litres)**		**Milk sold (Litres)**	
Litres	Value Tshs	Litres	Value Tshs	Litres	Value Tshs

33. Is the price of milk fair……...
34. Is milk marketing a problem……If YES outline problems……....
(i)…… (ii).....…… (iii)...…..... (iv).....
35. What is the monthly income do you get from milk……
36. Is there any difference in household annual incomes between now and before keeping dairy cattle (i) Yes (ii) No

Comparison of household annual incomes

Activity	**Before**	**After**
Total income (Tshs)		

37. If No, what could be the reasons?
(i)…… (ii).....…… (iii)...…..... (iv).....

38. What is the costs of production of dairy cattle keeping per year

Item	**Cost (Tshs)**
Feeding	
Disease control and treatment	
Buying supplementary feeds	
Labour	
Total costs (Tshs)	

39. What are the farm gate prices of the following livestock and product for the year 2008/2009

Type of livestock	**Category**	**Number sold**	**Price per each (Tshs)**	**Amount of money earned**
Indigenous chicken	Cocks			
	Hens			
	Growers			
	Eggs			
Livestock and their products	Milk			
	Meat			
	Goats			
	Sheep			
	Heifers			
	Bulls			
	Total (Tshs)			

40. What problems do you face during selling of livestock (dairy cattle, bulls, heifers, steers, meat)
(i)…… (ii).....…… (iii)...…..... (iv).....
41. How have you used the income from the project
(i)…… (ii).....…… (iii)...…..... (iv).....

42. What is your annual income obtained from selling cash crops for 2008/2009

Type of crop	**Quantity produced**	**Quantity sold**	**Price per unit**	**Amount of money earned**
Total (Tshs)				

43. What problems do you face during selling your cash crops
1……. 3.....……
2……..... 4…….....
44. Where do you get technical assistance…….....
45. Is the assistance reliable……explain……...
.....

Thank you for your time and answering our questions.

QUESTIONNAIRE FOR INDIGENOUS CHICKEN KEEPERS

Background information

Date of interview…… Interviewee's name……
Village…….....
Ward……...
Division…….....

A. Household characteristics

1. Age of respondent……years
2. Sex of respondent (i) Male (ii) Female
3. What is your education level
(i) None / No formal education (ii) Adult education (iii) Primary education
(iv) Secondary education (v) Completed "A" level (vi) Informal
(vii) Others specify…….....
4. Marital status of respondent
(i) Married (ii) Single (iii) Widowed (iv) Divorced (v) Separated
5. Family size of respondent

S/No	Age (Years)	Male	Female	Total
1	Below 10			
2	10-17			
3	18-60			
4	Above 60			
Total				

6. What are the main economic activities or sources of income you are dealing with

S/No	Economic activity/source of income	Annual income
1		
2		
3		
	Total (Tshs)	

B. Data on productivity situation of the farmer

7. What is your purpose of keeping indigenous (local) chicken
(i)…… (ii).....…… (iii)...…..... (iv).....
8. Which type of feeding system do you use to feed your chicken
(i) Free range system (ii) Semi intensive system (iii) Intensive systems

9. How many chicken have you lost (death) since the implementation of the project

Category	Number of deaths
Hens	
Chicks	
Growers	
Cocks	

10. What do you think are the main cause(s) of death of chicken

Category	**Causes of death**
Hens	1.
	2.
	3.
Cocks	1.
	2.
	3.
Chicks	1.
	2.
	3.
Growers	1.
	2.
	3.

11. Do you vaccinate your chicken against diseases…….....
12. If YES what type of vaccines do you use to vaccinate your chicken against disease
(i)..... (ii)..... (iii).....
13. What products do you get from local (Indigenous) chicken
(i)…… (ii).....…… (iii)...…..... (iv).....
14. Do you use poultry manure in crop production……..
15. What benefits your chicken get from crop farming…….....
16. What are the constraints do you face in indigenous chicken production
(i)…… (ii).....…… (iii)...…..... (iv).....
17. Do you deal with crop farming (i) Yes (ii) No
18. If YES how did you get the land that you use for crop production?
(i) Inherited (ii) Hired (iii) Purchase (iv) Offered by somebody
19. What is your total farm hectare? .....
20. Which type of food crops do you cultivate
(i)…… (ii).....…… (iii)...…..... (iv).....
21. What was the average harvest in the 2007/2008season

Crop					
Harvest					

22. Do you consume all of your food crops (i) Yes (ii) No
23. If no what do you do with excess food crops……
24. Which cash crops do you cultivate
(i)…… (ii).....…… (iii)...…..... (iv).....
25. What was the average harvest from each cash crop in a season 2008/2009

Crop					
Harvest					

26. What constraints do you face in crop production
(i)…… (ii).....…… (iii)...…..... (iv).....

C. Data on socio-economic situation of the farmer

27. What is the costs (inputs) of indigenous chicken production per year

Item	**Costs (Tshs)**
Buying supplement feeds	
Labour	
Vaccination and treatment	
Total annual costs (Tshs)	

28. Where do you sell eggs and chickens

(i)…… (ii).....…… (iii)....…..... (iv).....

29. What are the farm gate prices of the following livestock and products for the year 2008/2009

Type of livestock	**Category**	**Number sold**	**Price per each**	**Amount of money earned**
Indigenous chicken	Cocks			
	Hens			
	Growers			
	Eggs			
	Total (Tshs)			

30. Are prices reasonable compared to production costs…….....

31. If No what is your suggestions/opinions

(i)…… (ii).....…… (iii)....…..... (iv).....

32. How many eggs did you get, sell, and consume per month

Number of eggs produced		**Number of eggs sold**		**Number of eggs consumed at home**	
Eggs	Value (Tshs)	Eggs	Value (Tshs)	Eggs	Value (Tshs)

33. How many chickens did you sell, and consume per month

Number of chickens sold		**Number of chickens consumed at home**	
Chickens	Value (Tshs)	Chickens	Value (Tshs)

34. Is there any difference in household income between now and before keeping Indigenous chicken (i) Yes (ii) No

Comparison of annual income

Activity	**Before**	**After**
Crop production		
Kiosk		
Other livestock		
Sell labour		
Indigenous chicken		
Total (Tshs)		

35. If No, what could be the reasons?

(i)…… (ii).....…… (iii)...…..... (iv).....

36. What is the monthly income obtained from

S/No	Item	Number	Income earned
1	Eggs		
2	Live sales		
3	Home consumption		
4	Gifts		
	Total monthly income (Tshs)		

37. What are the farm gate prices of the following livestock and product

Type of livestock	Category	Number sold	Price per each (Tshs)	Amount of money earned
Cattle and shoats and their products	Milk			
	Meat			
	Goats			
	Sheep			
	Heifers			
	Bulls			
	Steers			
	Culls			
Other livestock				
	Total (Tshs)			

38. Are there any marketing problems you face during selling of eggs or chickens

(i)…… (ii).....…… (iii)...…..... (iv).....

39. Are there any problems experienced in selling other livestock and their products, if any specify.....

(i)…… (ii).....…… (iii)...…..... (iv).....

40. Where do you sell your cash crops

(i)…… (ii).....…… (iii)...…..... (iv).....

41. What is your annual income obtained from selling cash crops for 2008/2009

Type of crop	Quantity produced	Quantity sold	Price per unit	Amount of money earned
Total (Tshs)				

42. How have you used the income from the project

(i)…… (ii).....…… (iii)...…..... (iv).....

43. What problems do you face during selling your cash crops

(i)…… (ii).....…… (iii)...…..... (iv).....

Thank you for your time and answering our questions.

QUESTIONNAIRE FOR FARMERS WHO ARE NOT IN DAIRY CATTLE AND INDIGENOUS CHICKEN PROJECTS

Background information

Date of interview…… Interviewee's name……
Village…….....
Ward……...
Division…….....

A. Household characteristics

1. Age of respondent……years
2. Sex of respondent (i) Male (ii) Female
3. What is your education level
(i) None / No formal education (ii) Adult education (iii) Primary education
(iv) Secondary education (v) Completed "A" level (vi) Informal
(vii) Others specify…….....
4. Marital status of respondent
(i) Married (ii) Single (iii) Widowed (iv) Divorced (v) Separated
5. Family size of respondent

S/No	Age (Years)	Male	Female	Total
1	Below 10			
2	10-17			
3	18-60			
4	Above 60			
	Total			

6. What are the main economic activities or sources of income you are dealing with

S/No	Economic activity/source of income	Annual income
1		
2		
3		
4		
	Total annual income (Tshs)	

B. Data on productivity situation of the farmer

7. What type of livestock do you keep

S/No	Livestock type	Breed		Total number
		Indigenous	Exotic	
1	Cattle			
2	Chickens			
3	Goats			
4	Sheep			
5	Others specify.....			
6				
7				

8. What is your purpose of keeping livestock

(i)…… (ii).....…… (iii)....…..... (iv).....

9. Which system do you use to feed your animals (Tick the appropriate)

Type of animal	**System of feeding used**					
	Tethering	Herding	Indoor	Free range	Intensive	Semi intensive

10. How many animals have you lost (death)

Category	**Number of deaths**
Mature animals	
Young animals	
Total animals lost (death)	

11. What do you think were the main cause(s) of death

Category of animals	**Causes of death**
Mature animals	1.
	2.
	3.
Young animals	1.
	2.
	3.
	4.

12. Are there any products you get from livestock and what are their uses

S/No	Products	Use
1		
2		
3		
4		

13. How many poultry (chicken) have you lost (deaths)

Category	**Number of deaths**
Hens	
Cocks	
Chicks	
Growers	

14. What do you think are the main cause(s) of death of chicken?

Category	**Causes of death**
Hens	1.
	2.
	3.
Cocks	1.
	2.
	3.
Chicks	1.
	2.
	3.
Growers	1.
	2.
	3.

15. Do you vaccinate your chicken against diseases (i) Yes (ii) No
16. If YES what type of vaccines do you use to vaccinate your chicken against disease
(i)…… (ii)....…… (iii)...…..... (iv).....
17. What products do you get from indigenous chicken
(i)…… (ii)....…… (iii)...…..... (iv).....
18. Do you use manure in crop farming (i) Yes (ii) No
19. If YES what are the advantages do you get from using manure
(i)…… (ii)....…… (iii)...…..... (iv).....
20. What are the benefits obtained by your animals from crops
(i)…… (ii)....…… (iii)...…..... (iv).....
21. What are the constraints do you face in livestock production
(i)…… (ii)....…… (iii)...…..... (iv)..... (v).....
22. Do you deal with crop farming (i) Yes (ii) No
23. If YES how did you get the land that you use for crop production
(i) Inherited (ii) Hired (iii) Purchase (iv) Offered
24. What is your total farm hectare.....
25. Which type of food crops do you cultivate
(i)…… (ii)....…… (iii)...…..... (iv).....
26. What was the average harvest in a season 2008/2009 for an acre

Crop				
Harvest				
Price				

27. Do you consume all of your food crops (i) Yes (ii) No
28. If No what do you do with excess food crops……
29. Which cash crops do you cultivate
(i)…… (ii)....…… (iii)...…..... (iv).....
30. What was the average harvest from each cash crop in a season 2008/2009

Crop				
Harvest				

Price				

31. What constraints do you face in crop production
(i)…… (ii).....…… (iii)...…..... (iv).....

C. Data on socio-economic situation of the farmer

32. Where do you sell livestock and their products
(i)…… (ii).....…… (iii)...…..... (iv).....

33. How many litres of milk do you get, sell, and consume per month

Milk produced (Litres)		**Milk consumed at home (Litres)**		**Milk sold (Litres)**	
Litres	Value (Tshs)	Litres	Value (Tshs)	Litres	Value (Tshs)

34. How many eggs did you get, sell and consume per month

Number of eggs produced		**Number of eggs sold**		**Number of eggs consumed at home**	
Eggs	Value (Tshs)	Eggs	Value (Tshs)	Eggs	Value (Tshs)

35. What are the farm gate prices of the following livestock and product

Type of livestock	**Category**	**Number sold**	**Price per each**	**Amount of money earned**
Indigenous chicken	Cocks			
	Hens			
	Growers			
	Eggs			
Cattle shoats and their products	Milk			
	Meat			
	Goats			
	Sheep			
	Heifers			
	Bulls			
	Total (Tshs)			

36. Is there any problems experienced in selling livestock and theirs products, if any specify.....
(i)…… (ii).....…… (iii)...…..... (iv).....

37. Where do you sell your cash crops
(i)…… (ii).....…… (iii)...…..... (iv).....

38. What is your annual income obtained from selling cash crops for 2008/2009

Type of crop	Quantity produced	Quantity sold	Price per unit	Amount of money earned
Total annual income (Tshs)				

39. What problems do you face during selling your cash crops
(i)…… (ii).....…… (iii)...…..... (iv).....
40. What were the uses of income obtained
(i)…… (ii).....…… (iii)...…..... (iv).....

Thank you for your time and answering our questions.

Appendix 3: Forward multiple regression model summary for contribution of economic activities on total household income

3.1 Contribution of economic activities in villages under dairy cattle projects

The SAS System 17:38 Tuesday, January 20, 1998 5

Descriptive Statistics

Variables	Sum	Mean	Uncorrected SS	Variance	Std Deviation
INTERCEP	30	1	30	0	0
DC	23198000	773266.66667	2.2030569E13	141114788506	375652.48369
CC	15083950	502798.33333	1.1540417E13	136421784911	369353.19805
OL	1561000	52033.333333	420152500000	11687188506	108107.30089
KO	2600000	86666.666667	3.56E12	114988505747	339099.55138
TOIC	42833750	1427791.6667	9.1114472E13	1.0329931E12	1016362.6888

Correlation

CORR	DC	CC	OL	KO	TOIC
DC	1.0000	0.7718	0.5617	0.5321	0.8786
CC	0.7718	1.0000	0.5444	0.7130	0.9280

OL	0.5617	0.5444	1.0000	0.3854	0.6380
KO	0.5321	0.7130	0.3854	1.0000	0.8270
TOIC	0.8786	0.9280	0.6380	0.8270	1.0000

Forward Selection Procedure for Dependent Variable TOIC

Step 1 Variable CC Entered R-square = 0.86119650 C(p) =766.26407184

	DF	Sum of Squares	Mean Square	F	Prob>F
Regression	1	25798691480228	25798691480228	173.72	0.0001
Error	28	4158108860189.0	148503887863.89		
Total	29	29956800340417			

Variable	Parameter Estimate	Standard Error	Type II Sum of Squares	F	Prob>F
INTERCEP	143830.74389499	120165.04869473	212757531803.51	1.43	0.2414
CC	2.55363003	0.19374391	25798691480228	173.72	0.0001

Step 2 Variable DC Entered R-square = 0.92635292 C(p) =396.36358227

	DF	Sum of Squares	Mean Square	F	Prob>F

Regression	2	27750569365082	13875284682541	169.81	0.0001
Error	27	2206230975334.8	81712258345.735		
Total	29	29956800340417			

Variable	Parameter Estimate	Standard Error	Type II Sum of Squares	F	Prob>F
INTERCEP	-267369.0857360	122571.21604771	388805684575.06	4.76	0.0380
DC	1.08619659	0.22224179	1951877884854.2	23.89	0.0001
CC	1.70096256	0.22603210	4627394037156.8	56.63	0.0001

Step 3 Variable KO Entered R-square = 0.98709797 C(p) = 51.64231473

	DF	Sum of Squares	Mean Square	F	Prob>F
Regression	3	29570296935487	9856765645162.4	663.06	0.0001
Error	26	386503404929.56	14865515574.214		
Total	29	29956800340417			

Variable	Parameter Estimate	Standard Error	Type II

Variable	Estimate	Error	Sum of Squares	F	Prob>F
INTERCEP	-27982.97588574	56580.25245438	3636118354.2421	0.24	0.6251
DC	1.12914530	0.09487154	2105754541856.1	141.65	0.0001
CC	0.97705657	0.11651428	1045348480932.2	70.32	0.0001
KO	1.05440538	0.09530033	1819727570405.3	122.41	0.0001

Step 4 Variable OL Entered R-square = 0.99562004 C(p) = 5.00000000

	DF	Sum of Squares	Mean Square	F	Prob>F
Regression	4	29825590652637	7456397663159.4	1420.70	0.0001
Error	25	131209687779.26	5248387511.1704		
Total	29	29956800340417			

Variable	Parameter Estimate	Standard Error	Type II Sum of Squares	F	Prob>F
INTERCEP	42502.60967556	35105.42410766	7693228620.4513	1.47	0.2373

DC	1.02094460	0.05846725	1600312936678.2	304.92	0.0001
CC	0.89265506	0.07028096	846677154406.99	161.32	0.0001
OL	1.07313103	0.15386705	255293717150.30	48.64	0.0001
KO	1.05187581	0.05662736	1810932505862.9	345.05	0.0001

All variables have been entered into the model.

Summary of Forward Selection Procedure for Dependent Variable TOIC

Step	Variable Entered	Number In	Partial R**2	Model R**2	C(p)	F	Prob>F
1	CC	1	0.8612	0.8612	766.2641	173.7240	0.0001
2	DC	2	0.0652	0.9264	396.3636	23.8872	0.0001
3	KO	3	0.0607	0.9871	51.6423	122.4127	0.0001
4	OL	4	0.0085	0.9956	5.0000	48.6423	0.0001

3.2 Contribution of economic activities in villages under indigenous chicken projects

Descriptive Statistics

Variables	Sum	Mean	Uncorrected SS	Variance	Std Deviation
INTERCEP	30	1	30	0	0
CCR	9239450	307981.66667	3.5993675E12	25992630902	161222.30274
CHICK	10654400	355146.66667	4.0018564E12	7516611367.8	86698.39311

LVST	736000	24533.333333	67756000000	1713774712.6	41397.76217
KO	50000	1666.6666667	2500000000	83333333.333	9128.7092918
INCOME	21175400	705846.66667	1.6240131E13	44605025463	211199.01861

Correlation

CORR	CCR	CHICK	LVST	KO	INCOME
CCR	1.0000	0.1222	0.2685	-0.3608	0.8189
CHICK	0.1222	1.0000	0.1329	0.0106	0.5781
LVST	0.2685	0.1329	1.0000	-0.1119	0.4123
KO	-0.3608	0.0106	-0.1119	1.0000	-0.0857
INCOME	0.8189	0.5781	0.4123	-0.0857	1.0000

Forward Selection Procedure for Dependent Variable INCOME

Step 1 Variable CCR Entered R-square = 0.67058818 C(p) =211.01618275

	DF	Sum of Squares	Mean Square	F	Prob>F

Regression	1	867436484434.34	867436484434.34	57.00	0.0001
Error	28	426109253982.33	15218187642.226		
Total	29	1293545738416.7			

Variable	Parameter Estimate	Standard Error	Type II Sum of Squares	F	Prob>F
INTERCEP	375462.22436703	49216.39699787	885677879988.14	58.20	0.0001
CCR	1.07274061	0.14208798	867436484434.34	57.00	0.0001

Step 2 Variable CHICK Entered R-square = 0.90257440 C(p) = 46.09901199

	DF	Sum of Squares	Mean Square	F	Prob>F
Regression	2	1167521273101.7	583760636550.83	125.07	0.0001
Error	27	126024465315.01	4667572789.4449		
Total	29	1293545738416.7			

Variable	Parameter Estimate	Standard Error	Type II Sum of Squares	F	Prob>F
INTERCEP	-20460.84989473	56401.47657988	614267432.36737	0.13	0.7196

CCR	0.99508096	0.07928416	735250135795.85	157.52	0.0001
CHICK	1.18216180	0.14743496	300084788667.32	64.29	0.0001

Step 3 Variable KO Entered R-square = 0.94130335 C(p) = 20.23302342

	DF	Sum of Squares	Mean Square	F	Prob>F
Regression	3	1217618930830.5	405872976943.50	138.99	0.0001
Error	26	75926807586.160	2920261830.2369		
Total	29	1293545738416.7			

Variable	Parameter Estimate	Standard Error	Type II Sum of Squares	F	Prob>F
INTERCEP	-49813.42463095	45171.79083363	3551239603.2292	1.22	0.2802
CCR	1.09686293	0.06735494	774439581057.44	265.20	0.0001
CHICK	1.15359604	0.11682183	284761540987.00	97.51	0.0001
KO	4.89037698	1.18071349	50097657728.854	17.16	0.0003

Step 4 Variable LVST Entered R-square = 0.96525429 C(p) = 5.00000000

	DF	Sum of Squares	Mean Square	F	Prob>F
Regression	4	1248600573804.1	312150143451.03	173.63	0.0001
Error	25	44945164612.540	1797806584.5016		
Total	29	1293545738416.7			

Variable	Parameter Estimate	Standard Error	Type II Sum of Squares	F	Prob>F
INTERCEPT	-39673.37019489	35526.86057889	2241958105.4373	1.25	0.2747
CCR	1.04451247	0.05433195	664445918958.35	369.59	0.0001
CHICK	1.11307709	0.09217922	262136458652.01	145.81	0.0001
LVST	0.82438345	0.19858595	30981642973.620	17.23	0.0003
KO	4.97931235	0.92666169	51908597400.288	28.87	0.0001

All variables have been entered into the model.

Summary of Forward Selection Procedure for Dependent Variable INCOME

Step	Variable Entered	Number In	Partial R**2	Model R**2	C(p)	F	Prob>F
1	CCR	1	0.6706	0.6706	211.0162	57.0000	0.0001
2	CHICK	2	0.2320	0.9026	46.0990	64.2914	0.0001
3	KO	3	0.0387	0.9413	20.2330	17.1552	0.0003
4	LVST	4	0.0240	0.9653	5.0000	17.2330	0.0003