

**IMPACT OF DAIRY CATTLE FARMING ON HOUSEHOLD SOCIO-  
ECONOMIC STATUS: A CASE OF ISAGEHE WARD IN KAHAMA DISTRICT,  
TANZANIA**

**BY**

**SYLVESTER LUBABO BIKUBA**

**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE  
REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN RURAL  
DEVELOPMENT OF SOKOINE UNIVERSITY OF AGRICULTURE.  
MOROGORO, TANZANIA.**

## ABSTRACT

The study was conducted to assess the impact of smallholder dairy cattle farming on socio- economic status of households in selected villages in Isagehe Ward of Kahama District in Tanzania. Specifically, the study assessed the impact of smallholder dairy cattle farming on household income, household food security and household assets. Purposive sampling was employed to select 6 villages keeping dairy cattle, out of which 61 households keeping dairy cattle and 59 households not keeping dairy cattle were systematically randomly selected. A cross-section survey was conducted and a structured questionnaire was used to interview the 120 household heads. Data from the study were coded, entered in computer and statistically analysed using The Statistical Packages for Social Science (SPSS) version 12. The study showed that the average household sizes were 7.7 and 6.7 for households keeping and not keeping dairy cattle respectively. Level of education of household heads keeping and not keeping dairy cattle were respectively 60.7% and 69.5% for primary education and 16.4% and 5.1% for secondary education. Of all sampled households, 85% were headed by males and 15% were headed by females. Mean annual household income was Tshs 1 568 183 and Tshs 752 038 for households keeping and not keeping dairy cattle respectively. The study showed that households keeping dairy cattle consume more energy and protein source foods than households not keeping dairy cattle. The difference in energy food consumption was significantly different ( $p < 0.05$ ). For household assets, there was a statistically significant difference ( $p < 0.05$ ), with households keeping dairy cattle owning more assets than households not keeping dairy cattle. From this study, it is concluded that households keeping dairy cattle have more income and are food secure with more household assets than households not keeping dairy cattle. It is recommended to include dairy cattle farming project when

planning for strategies of improving household income, food security, assets and malnutrition problems in rural community in Tanzania.

## DECLARATION

I, Sylvester Lubabo Bikuba, do hereby declare to the Senate of Sokoine University of Agriculture, that this dissertation is my original work and that it has neither been submitted nor being concurrently submitted for degree award in any other institution.

---

Sylvester Lubabo Bikuba  
(MA Candidate)

---

Date

The above declaration is confirmed

---

Dr. D.L. Mwaseba  
(Supervisor)

---

Date

**COPYRIGHT**

No part of this dissertation may be reproduced, stored in any retrieval system, or transmitted in any form or by any means without prior written permission of the author or Sokoine University of Agriculture in that behalf.

## ACKNOWLEDGEMENTS

I wish to express my deepest appreciation to all members of my family for their moral and material support which made this study possible.

I am very much grateful to my supervisor, Dr. D.L. Mwaseba of the Department of Agricultural Education and Extension (AEE), Sokoine University of Agriculture (SUA) for his valuable guidance, wisdom, encouragement, patience, ideas and constructive criticisms throughout this study. In fact, I am proud to work under him.

I also extend my gratitude to The Ministry of Livestock Development and Fisheries for granting me both study leave and sponsorship. I also appreciate contribution, assistance and encouragement rendered to me by the staff from The Ministry of Livestock and Fisheries Development.

I also appreciate the assistance made by different staff from DSI, DASP, SNAL and my colleagues during compilation for data analysis. I extend my thanks to all respondents who devoted their valuable time in ensuring that I obtain the necessary data for this study.

Lastly but not least, I would like to thank the family of Dr.M.R Ruheta; Mr. C.E. Kimbi; my wife, my children, relatives and friends for their encouragement and patience for the two years of my stay at the University.

## **DEDICATION**

This dissertation is dedicated to my children; Nsengiyunva, Bizimana, Niyonkuru and Mulubeleza, to whom it should serve as an inspiration for them to study hard and do more than this.

## TABLE OF CONTENTS

<b><i>ABSTRACT</i></b> .....	<b>ii</b>
<b><i>DECLARATION</i></b> .....	<b>iv</b>
<b><i>COPYRIGHT</i></b> .....	<b>v</b>
<b><i>ACKNOWLEDGEMENTS</i></b> .....	<b>vi</b>
<b><i>DEDICATION</i></b> .....	<b>vii</b>
<b><i>TABLE OF CONTENTS</i></b> .....	<b>viii</b>
<b><i>LIST OF TABLES</i></b> .....	<b>xi</b>
<b><i>LIST OF FIGURES</i></b> .....	<b>xii</b>
<b><i>LIST OF APPENDICES</i></b> .....	<b>xiii</b>
<b><i>LIST OF ABBREVIATIONS</i></b> .....	<b>xiv</b>
<b><i>CHAPTER ONE: INTRODUCTION</i></b> .....	<b>1</b>
<b>1.1 Background Information</b> .....	<b>1</b>
<b>1.2 Problem Statement</b> .....	<b>3</b>
<b>1.3 Justification</b> .....	<b>3</b>
1.4. Objectives.....	<b>4</b>
1.4.1 Overall objectives.....	<b>4</b>
1.4.2 Specific obbjectives.....	<b>4</b>
<b>1.5 Research Questions</b> .....	<b>4</b>
<b>1.6 Conceptual Framework</b> .....	<b>5</b>
<b><i>CHAPTER TWO: LITERATURE REVIEW</i></b> .....	<b>9</b>
<b>2.1 An Overview of Smallholder Dairy Production</b> .....	<b>9</b>
<b>2.2 Smallholder Dairy Farming in Asia</b> .....	<b>10</b>



<b>2.3</b>	<b>Smallholder Dairy Farming in Africa.....</b>	<b>10</b>
<b>2.4</b>	<b>Approach and Methods for measuring impacts of dairy cattle farming.....</b>	<b>14</b>
2.4.1	Definition of Impact, income, food security and assets.....	14
2.4.2	Household food security indicators.....	15
2.4.3	Subsistence potential ratio.....	15
2.4.4	Assets.....	16
<b>2.5</b>	<b>Classification of household assets.....</b>	<b>16</b>
2.5.1	Impact of dairy production on household income.....	17
2.5.2	Impact of dairy cattle production on household food security and nutrition.....	19
<b>2.6</b>	<b>Dairy cattle farming and malnutrition problems.....</b>	<b>21</b>
<b>2.7</b>	<b>Impact of dairy production on household assets.....</b>	<b>24</b>
 <b>CHAPTER THREE: METHODOLOGY.....</b>		<b>26</b>
<b>3.1</b>	<b>Overview.....</b>	<b>26</b>
<b>3.2</b>	<b>Description and Location of the Study Area.....</b>	<b>26</b>
<b>3.3</b>	<b>Economic Activities.....</b>	<b>28</b>
<b>3.5</b>	<b>Research Design.....</b>	<b>29</b>
<b>3.6</b>	<b>Data Collection Methods.....</b>	<b>29</b>
<b>3.7</b>	<b>Data Processing and Analysis.....</b>	<b>30</b>
 <b>CHAPTER FOUR: RESULTS AND DISCUSSION.....</b>		<b>31</b>
<b>4.1</b>	<b>Overview.....</b>	<b>31</b>
<b>4.2</b>	<b>Characteristics of the Sample.....</b>	<b>31</b>
4.2.1	Household size.....	31
4.2.2	Level of education.....	33

4.2.3	Occupation.....	34
4.2.4	Marital status.....	34
4.2.5	Gender of household heads.....	35
4.2.6	Age of household heads.....	36
<b>4.3</b>	<b>Dairy Cattle Keeping, Milk Production, Consumption and Sales.....</b>	<b>38</b>
4.3.1	Dairy cattle keeping.....	38
4.3.2	Other types of livestock kept.....	38
4.3.3	Milk production.....	39
4.3.4	Household milk consumption.....	41
4.3.5	Milk sales.....	42
4.3.6	Other sources of household income.....	42
4.3.7	Total annual household income.....	44
<b>4.4</b>	<b>Energy/Protein Consumed.....</b>	<b>45</b>
4.4.1	Number of meals eaten per day.....	47
4.4.2	Part of household income spend on food.....	48
<b>4.5</b>	<b>Household Assets Owned by Household Heads.....</b>	<b>49</b>
4.5.1	Land size (acrage) owned.....	49
4.5.2	Household items.....	52
	<b><i>CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS.....</i></b>	<b>53</b>
<b>5.1</b>	<b>Overview.....</b>	<b>53</b>
<b>5.2</b>	<b>Conclusion.....</b>	<b>53</b>
<b>5.3</b>	<b>Recommendations.....</b>	<b>54</b>
	<b><i>REFERENCES.....</i></b>	<b>55</b>
	<b><i>APPENDICES.....</i></b>	<b>68</b>

## LIST OF TABLES

Table 1:	Household sizes of the respondents.....	32
Table 2:	Distribution of households by level of education, occupation and marital status.....	36
Table 3:	Distribution of household heads by age.....	37
Table 4:	Distribution of households by number of animal species kept.....	39
Table 5:	Number of dairy cattle and milk production e.....	40
Table 6:	Average weekly household milk consumption.....	41
Table 7:	Mean annual income from milk sale.....	42
Table 8:	Other sources of household incomes.....	43
Table 9:	Annual incomes for dairy and non dairy cattle keeping households.....	44
Table 10:	Influence of different factors on the household income in Tshs.....	44
Table 11:	Annual households' maize and rice consumption.....	45
Table 12:	Annual per household and per capita consumption of maize and rice.....	46
Table 13:	Weekly animal protein consumption among households.....	47
Table 14:	Number of meals consumed per day.....	48
Table 15:	Part of the household income spent on food.....	49
Table 16:	Land distribution among households.....	50
Table 17:	Mean land ownership between households.....	51
Table 18:	Means of land acquisition among households' heads.....	51
Table 19:	Household assets owned among households.....	52

**FIGURE**

Figure 1: Map of Kahama district showing the study area.....27

**LIST OF APPENDICES**

Appendix 1: Questionnaire.....68

Appendix 2: Checklist for District Agriculture and Livestock Development  
Officer/ ADP-Manager.....78

## LIST OF ABBREVIATIONS

ACP-EU	Africa Caribbean Pacific- European Union
ADP	Area Development Programme
AIDS	Acquired Immune Defficiency Syndrome
CLDD	Community Livestock and Dairy Development
DALDO	District Agriculture and Livestock Development Officer
DASP	Department of Animal Science and Production
DSI	Development Studies Institute
E.U	European Union
FAO	Food and Agriculture Organization
F1	Fillia one
GDP	Gross Domestic Product
HBS	Household Budget Survey
HFS	Household Food Security
HIV	Human Immuno deficiency Virus
HIT	Heifer-In Trust
HPI	Heifer Project International
HTS	Heifer –in Trust Scheme
H/A	Height to Age
ILRC	International Livestock Research Centre
ILRI	International Livestock Research Institute
KALIDEP	Kagera Livestock Development Programme
MALD	Ministry of Agriculture and Livestock Development
MDDP	Malawi Dairy Development Programme
MLD	Ministry of Livestock Development
MoAC	Ministry of Agriculture and Cooperatives
MWLD	Ministry of Water and Livestock Development
SDDP	Small Scale Dairy Development Programme
SDP	Smallholder Dairy Programme
SHMPA	Shire Highlands Milk Processors Association
SNAIL	Sokoine National Agricultural Library
SSA	Sub- Saharan Africa
SUA	Sokoine University of Agriculture
SPSS	Statistical Package for Social Sciences
SPR	Subsistence Potential Ratio
TDDP	Tanga Dairy Development Programme
Tshs	Tanzanin Shilling
UNDP	United Nations Development Programme
UNICEF	United Nations Children Fund
URT	United Republic of Tanzania
USA	United States of America
USAID	United States of America Agency for International Development
US\$	United States of America Dollar
W/A	Weight to Age
WB	World Bank
W/H	Weight to Height
WFP	World Food Programme

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Background Information**

Dairy sub-sector plays an important role as a source of income, which farmers can use for purchasing food and other household assets. Realising this, Tanzania, in early 1980s, implemented several development policies and strategies in the hope of increasing dairy production and achieve self – sufficiency in dairy products (Mdoe and Temu, 1994) with assistance from various donors.

In 1983, the then, Ministry of Agriculture and Livestock Development (MALD) produced, for the first time, a policy pertaining to livestock development in Tanzania. In this policy, importance was stressed on developing smallholder dairying on the periphery of urban areas, where conditions were suitable for milk production and reliable market for the produce. Later, increased attention was given to developing small holder dairy unit farms, not only on the periphery of urban areas but also with dairy smallholders based in rural areas (Ministry of Agriculture and Co-operatives (MoAC, 1998).

The 1983 policy clearly indicated the government's awareness of dairy sub-sector as an important productive sector. However, the poor performance of this sub-sector was also noted. The policy therefore speculated that short, medium and long term interventions were needed in order to meet demands such as increasing availability of dairy derived foods to all Tanzanians and increasing the income to people engaged in production, processing and marketing of livestock and livestock products.

Over time, small scale dairying has been recognized as an important part of farming system in smallholder economy, particularly in places where land for agriculture is a limiting factor (Mdoe and Nyange, 1995). It has been considered as an important avenue for rural development in developing countries through its contribution to increases in dairy products production, income generation from sales of the products, provision of jobs and transfer of money from urban to peri urban and rural areas (Paris, 2000, Kristensen *et al.*, 2004). In Tanzania, farming households integrate dairy with crop to maximize the returns from limited land and capital. In the country dairy production aims to achieve multiple objectives, namely; to improve food security, support crop production, build capital assets and generate cash income (*ibid*).

Despite the efforts made by the government and the potential of the sub-sector in reducing income poverty, improving food security and household assets, in some areas like Kahama District, this has not been the case. The district has for a long period of time been behind, with very few rural communities practicing smallholder dairy cattle farming. The situation has been worse following the current developments in the area; such as construction of the Rwanda - Burundi road and opening up of gold mines, both of which led to a high infections of HIV/AIDS. As a result, income poverty, food insecurity and asset poverty in the area is alarming. Realising this, in 2001, the World Vision (T) introduced the so called Area Development Programme (ADP) in Kahama District. The project provides assistance in agriculture, food production, spiritual growth and economic development. Two wards, namely, Isagehe and Busangi were involved in this project. The project distributed dairy cattle through the Heifer- in -Trust (HIT) credit scheme, whereby selected farmers are trained on dairy cattle management and thereafter are provided with one to two crossbred dairy cows (crossbred incalf heifer) for management under stall feeding regime. Upon calving of the cows, a farmer is supposed to pass on the offspring to



another farmer as a repayment for the credit. Criteria set by the project for a household to qualify to be given dairy cattle were that the household should be vulnerable to poverty and that the household head should be resident of the ward in which the programme is implemented. So far, the programme has distributed 185 dairy cows to 120 households.

## **1.2 Problem Statement**

From the discussion above, it is clear that small scale dairying is important in reducing income poverty, improving food security and household assets. ADP- smallholder dairy cattle farming project in Isagehe Ward, Kahama District was introduced nine years ago. However, introducing dairy cattle among the poor communities is one thing, understanding the impacts of such intervention on income poverty, food security and household assets is another thing completely different, and in the view of this study more fundamental. It involves clarifying the socio economic impact of the programme to the target group involved. There is therefore a need to study the socio-economic impact of the ADP- smallholder dairy development project on the community involved in this project at Isagehe Ward, Kahama District. Consequently, this study was designed to assess the impact of dairy cattle farming on household's socio-economic status in terms of household income, household food security and household assets owned.

## **1.3 Justification**

Many programs/schemes and projects for promotion of smallholder dairy production in the country have been done for years, with the aim of increasing income, improvement of nutritional status and living conditions of rural households. The socio-economic information resulting from this study will help different stakeholders in the smallholder dairy development such as planners and donors who want to establish new smallholder dairy projects. Information from this study can also help to streamline/up-scaling the

already established smallholder dairy development programmes/schemes/projects in the country.

## **1.4. Objectives**

### **1.4.1 Overall objectives**

The general objective of this study was to assess the impact of dairy cattle farming on socio-economic status of the household in rural community.

### **1.4.2 Specific objectives**

Specific objectives were:

- (i) To assess the impact of dairy cattle farming on household income
- (ii) To assess the impact of dairy cattle farming on household food security
- (iii) To assess the impact of smallholder dairy cattle farming on household assets

## **1.5 Research Questions**

1. Do households keeping dairy cattle have more household income than households not keeping dairy cattle?
2. Are households keeping dairy cattle more food secure than households not keeping dairy cattle?
3. Do households keeping dairy cattle own more household assets than households not keeping dairy cattle?

## 1.6 Conceptual Framework

A conceptual framework as an analytical framework, presents a guiding outline of the empirical inquiry of the study. The conceptual framework of this study was conceptualized to address the main goal and objectives of the smallholder dairy cattle farming under the Area Development Programme (ADP) at Isagehe Ward in Kahama District.

DfID (2001) defines impact assessment as the process of identifying the anticipated or actual impacts of a development intervention on those social, economic and environmental factors which the intervention is designed to affect or may advertently affect. According to Anandajayasekeram *et al.* (1996), the term impact assessment is defined as “a special form of evaluation that deals with the intended and unintended effects of a project’s output on the target beneficiaries (also called people level impact)”. Similarly, Baker (2000) and Prennushi *et al.* (2000) defined impact assessment as an assessment of the extent to which interventions or programmes cause changes in the wellbeing of target populations, such as individuals, households, organizations, communities, or other identifiable units to which interventions are directed in social programmes. All these definitions emphasize measurement of the direct and indirect effects of the project on the target beneficiaries.

Impact assessment is done for several practical reasons including accountability, improving programme design and implementation, and planning and prioritizing (FAO, 2000). Impact assessment can be undertaken before initiating the project (ex-ante) or during the project period (mid-term) or after the completion (ex-post) of the project or activity (FAO, 2000; Anandajayasekeram and Martella, 1996). Ex-ante and ex-post impact assessments are most useful for assessing investment projects that have a well-defined technology, a fixed time frame for implementation, a market for output, and a central capital component (Douglas, 1990). The impact can be assessed using the following

procedures for comparison; “before and after”, “with and without” and “the target versus achievement realized” (Kisusu 2003).

Ashley and Hussein (2000) suggest that, when it comes to impact assessment, it means that changes should be measurable (such as cash and yield) and must be assessed not in their own right but in terms of the contribution they make to the target beneficiary group.

Furthermore, in ACP/EU (2011) it is emphasized that, assessing impact means looking for the changes in people's lives as a result of a programme or project. Often, impact assessments relate to a broader set of interventions (e.g., a programme with interlinked projects). They involve looking not only for the expected changes, but also for the unexpected ones, both positive and negative. Impact assessment is usually done when a project or programme has been completed, or at least well on its way towards completion.

#### **Common impact assessment methods/ approach include**

- (i) **Using available data on the target group:** These data might have been collected by the project organisation or stakeholders, or from external sources such as a bureau of statistics. If the data required are available, this is a cost-effective basis for an impact assessment. Often, however, the available data might not be exactly what are needed and therefore do not clearly show what changes the project has brought about. (ACP/EU, 2011)
- (ii) **Surveying the target group:** This involves conducting the assessment among a sample group of the intended project beneficiaries. If the target group is extensive, the sample should be large, but the cost of this needs to be taken into account compared with the total cost of the project. (ACP/EU, 2011)

- (iii) **Participatory method:** Here, people in the target group (and other stakeholders) are asked to describe the key elements of the project and how these have contributed to observed or perceived changes. It is often advisable to use a mixture of methods. (ACP/EU, 2011)
- (iv) **Conventional Approach:** This approach focuses on assessing whether a project has met its stated objectives and contributed to the achievement of the overall project goal. It assesses criteria of project relevance, efficiency, effectiveness and sustainability and looks at both intended and unintended impact. (Ashley and Hussein, 2000).
- (v) **Livelihood Approach:** The core of livelihood models focuses on the relationship between assets(capitals), livelihood strategies composed of various activities (livestock production, off-farm employment, informal sector and exchange activities) and to livelihood outcomes (improved income, food security, sustainable use of natural resources, better functioning of social networks and groups and reduced vulnerability) within a mediating environment. (Barret and Reardon, 2000).
- (vi) **Comprehensive approach** This approach involves the use of indicators and allows for the three categories of impact – direct, intermediate and people level to be addressed simultaneously (Anandajayasekera et al, 1996)

In this study, impact assessment is understood as seeking to find out the socio-economic effects of dairy cattle keeping on the households; in terms of income, food security and assets, following the introduction of ADP- smallholder dairy cattle farming in the study area. The impact was assessed using the procedure of comparison, whereby households “with and without” dairy cattle were compared in terms of household income (total

household income); food security (energy/protein consumption, number of meals eaten per day) and assets (land ownership, land distribution, household items).

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 An Overview of Smallholder Dairy Production

Smallholder dairying is a method of milk production in which small holder farmers keep a small numbers of cows herded near the farm or fed the cut-and- carry grass, crop by-products and milked for family use or local sale (Mathewman, 1993). Farmers usually own a few cows to complement crop farming; they use milk and derive income from sale of milk, male calves or fattened steers. Moussa (1995) categorized dairy cattle keeping as follows: small scale (10-19 dairy cattle); medium scale (20-99 dairy cattle); and large scale (more than 100 dairy cattle). On the other hand, Chantalakhana and Skunmun (2002) categorized dairy farms as: smallholder (up to 20 milking cows plus replacement heifers), semi- commercial (20-50 milking cows plus replacement heifers) and commercial (more than 50 milking cows plus replacement heifers). Therefore, it appears there is no uniform definition of smallholder dairy farming. The criteria for success of this system includes the provision of guaranteed price for milk for the producer, the lack of competition for the use of land between crop production and feed production for milk cows; an adequate infrastructure to allow collection and transport of milk; good extension and back up advisory services (Mathewman, 1993).

Dairy cattle production makes an important contribution to economic development, rural livelihoods, poverty alleviation and meeting the fast growing demands for animal protein in developing countries. The case for promoting increased dairy cattle production is pressing given the rapidly growing demand for animal products, and the global aim to half, by 2015, the proportion of the world population living in abject poverty, most of whom are dependent in part, on food and income derived from dairy cattle production (Mathewman, 1993).

## **2.2 Smallholder Dairy Farming in Asia**

In the countries of the South East Asia Region, dairying is practised by tens of millions of dairy operators - smallholders, traders and dairy entrepreneurs, small and large. With production gains over the last decade double that of global averages, it is estimated that 80 percent of the region's total annual milk production of 240 billion litres is supplied by smallholders with 1-5 cows (Chantalakhana and Skunmun, 2002).

## **2.3 Smallholder Dairy Farming in Africa**

World milk production from cattle is estimated at 502 325 000 metric tonnes per year (FAO, 2003), with an average cow producing 5307 litres per lactation for top producing cows in the European Union (Morgan, 1999). Africa carries 16% of the world dairy livestock but produces less than 4% of global milk production (Morgan, 1999) with an average cow producing only 454 litres/ year. According to FAO (2003), Africa is estimated to produce 20 643 000 metric tonnes of milk annually. Considering ideal lactation yield of 305 days it gives an average of 1.5 litres/cow/day in Africa compared to 17.4 litres/cow/day in Europe.



The smallholder dairy sector is a major pillar in the socio-economic standing of sub-Saharan Africa (SSA); functioning both food security and income generation roles, particularly at household level. In general, dairy cattle farming sub sector remains the key player among the livestock sector, accounting for 80% in the milk industry (De Leeuw *et al.*, 1999).

In Malawi, it was observed that even the poorest families have the opportunity to undertake dairy farming through the heifer loan project administered by Shire Highlands Milk Processors Association (SHMPA), an umbrella group currently funded by European Union (E.U) (Anne, 2008).

In Kenya, according to Muriuki *et al.* (2001), the country has the largest dairy sub-sector in eastern and southern Africa making available annually an estimated 85-90 litres of liquid milk equivalent *per capita* based primarily upon well-established market-oriented smallholder dairy systems. In addition dairying plays a crucial role in sustaining smallholder crop-dairy systems through its contributions to nutrient cycling. It is this smallholder crop-dairy systems, generally based on the cropping of the staple food, maize, that dominate marketed dairy production and underpin the competitiveness of smallholder dairying in Kenya.

These beneficial outcomes of crop and dairy interactions have their basis in the production objectives of smallholders when keeping dairy cattle. Farmers' responses reported in the SDP (Smallholder Dairy Programme) characterisation surveys have shown that even in these commercially-oriented systems, the primary objective of smallholders adopting dairying is to produce milk for home (household) consumption, followed closely by the objective ranked second, milk produced sale to generate income (Bebe *et al.*, 2001b).

Cow milk is an important protein source which is universally accepted and consumed by majority of the World's population wherever cattle are raised; the usage of milk from sheep, goat, camel and other less well known animals varies from one community to another within the same country, region, or even district depending on cultural habits and preferences. Recommended milk consumption for the world stands at 105kg/capita/year and milk consumption in Tanzania is estimated at 25kg/capita/year (URT, 2002). Kurwijila (2002a) reported that milk consumption has risen faster in urban and peri-urban areas of Tanzania than in rural areas because of the growth in peri-urban dairy herds and the increased availability of milk and dairy products for urban consumers.

The livestock sector in Tanzania is dominated by smallholder farmers who constitute 99% of national stock (Mlozi *et al.*, 1989). The livestock sector in the country employs 10% of the total population and it is the most important source of protein (Massae, 1993). Smallholder dairy farmers dominates dairy sector in the country. Smallholder dairy farming in the country is characterized by low productivity. This situation is partly attributed to lack of capital and uses of poor farming technologies by smallholder dairy farmers, drought, and lack of market for the produce (Mwankemwa, 2004). Lack of capital by smallholder dairy farmers is linked to inaccessibility to formal credit institutions due to lack of collaterals by majority of smallholder farmers. In addressing the problem of lack of capital by smallholder dairy farmers, the government of Tanzania has been encouraging the Heifer in-Trust (HIT) credit schemes for the case of dairy cattle farming (Mwakalile *et al.*, 2002; Mwankemwa 2004; Kyomo *et al.*, 2006). In HIT credit schemes some farmers are trained on dairy cattle management and thereafter are provided with one to two crossbred dairy cows (crossbred incalf heifer) for management under stall-feeding regime. Upon calving of the cows a farmer is supposed to pass on an equivalent animal from the off springs to another farmer as a repayment for the credit. These HIT credit

schemes have helped many poor farmers in the country who don't have capital to buy dairy cattle to possess them.

In general, as with other agricultural development projects in Tanzania the main aim of the HIT schemes was to improve welfare of smallholder farmers. In recognition of this central role of smallholder dairy farmers in the development of dairy industry in Tanzania, the government, with assistance of bilateral donor agencies, supported a number of smallholder dairy development programmes in the country, including: The Smallholder Dairy Development Programme (SDDP) in Iringa and Mbeya (Swiss government assistance); The Arusha/Kilimanjaro Dairy Extension project (FAO/UNDP assistance); The Heifer Project International (HPI) Heifer-In Trust Schemes (Massae, 1993). The merits of this sub- sector are that dairy production is more efficient and is better exploited, due to generally better animal husbandry practices followed by smallholders (Kurwijila, 1991).

Smallholder dairy farming is an important part of the household economy of some parts of Tanzania, particularly where land is a limiting factor for agriculture (Mdoe and Nyange, 1993). Smallholder dairy farming gained popularity after the 1983 Livestock Policy and the National Livestock Development Programme. Most farmers in this sector own between 1-10 dairy cows (Massae, 1993). The size of the farmer's holding is usually the major constraint to increase herd size. Approximately 60% of all dairy cattle in the country are owned by smallholders and most of these are found on the slopes of Mount Kilimanjaro (Kilimanjaro region), Mount Meru (Arusha region), Southern Highlands (Iringa and Mbeya regions), Tanga and around Lake Victoria regions. The dairy cattle kept are from improved breeds, which include Friesian, Ayrshire, Jersey, Guernsey and their crosses or crosses with Zebu cattle (Massae, 1993). Furthermore, it has been shown that

in households with improved cattle, the per capita milk consumption was more than twice the national average and that considerable amounts of surplus milk were sold to supplement farm income (Lerenius and Skarback, 1987).

## **2.4 Approach and Methods for measuring impacts of dairy cattle farming**

### **2.4.1 Definition of Impact, income, food security and assets**

#### **Impact**

According to FAO (2000) impact refers to “the broad, long- term economic, social and environmental effects resulting from an intervention”. Furthermore, impacts assess the process of identifying the actual impacts of a development intervention on those social, economic and environmental factors which the intervention is designed to affect.

#### **Income**

The word income has been defined by several authors in various ways. According to Barr (2004), households and individual’s income is the “sum of all the wages, salaries, profits, interests’ payments, rents and other forms of earnings received in a given period of time”. On the other hand household income has been understood as consisting of all receipts whether monetary or in kind of goods and services that are received by the household or by individual members of the household at annual or more frequent intervals, but excludes windfall gains and other such as irregular and typically one time receipts, Case and Fair (2007). In the context of this study the word income is defined as total amount of money which a household head get from selling of milk, livestock and crop produce; and also money obtained from small businesses and wage employment.

## **Food security**

Food security is a complex field of study developed within the disciplines of food sciences, nutrition and economics. It is a multi disciplinary cross-sector concept which combines natural and social sciences in one integrated approach (Makundi *et al.*, 2001). Food security is defined as a situation when all people, at all time, have physical, social and economic access to sufficient, safe and nutritious food which meet the dietary needs and food preferences for an active and health life (FAO, 2003). It is further argued that food security is mostly concerned with food supply, usually in the form of grain stock and is being applied at regional or district level (op.cit). This definition is also supported by World Bank (2003) which defines food security as the access by all people at all times to enough food for an active and health life.

### **2.4.2 Household food security indicators**

According to Frank *et al.* (1999), in most analysis of food security conditions in developing countries, multiple indicators are used to reflect the various dimensions of the problem. Some of the most commonly used types of indicators in the assessment of food security conditions include those related to: (1) Food production (2) Income (3) Total expenditure (4) Food expenditure (5) Share of expenditure on food (6) Calorie consumption and (7) Nutritional status.

### **2.4.3 Subsistence potential ratio**

This is the ratio of the households' ability to feed itself to its need to feed itself (Whelan, 1983). The data needed for calculating this ratio are size of the farm, expected yield, and age and sex composition of household. The subsistence potential ratio compares the amount of food (calculated in energy) which a household can produce over a year with the

energy requirements of the entire household for the year (Frankenberger, 1985). This ratio works best in communities that produce most of their own food.

A similar indicator used in Tanzania is the household food security card (Wagara, 1991). The card is mainly an assessment curve that corresponds to individual household food balance, calculated on a monthly basis. From the month of harvest, the food available for the main crop (maize) is compared to the household food requirement. Each household is then classified as good, average, or poor. This is used as tool by extension personnel for nutrition programming and evaluation. Food adequacy reflects both quantity and quality of the food that is enough to meet daily requirements by providing all essential nutrients for all members of the household or society.

#### **2.4.4 Assets**

Chimilila (2005) defined an asset as any item having economic value that is owned by institution or individual. Furthermore reported that, assets are most commonly grouped into current assets (items like cash, inventory, and accounts receivable that are currently cash or expected to be turned into cash; fixed assets (items like land, buildings, and equipment); and intangibles (items like copyrights, trademarks, brand names, and other intellectual property which are not physical). Chimilila (op.cit) argued that, assets that people pursue depend heavily on the resources they can access (by owning the resource, borrowing or renting it) and use. All these forms of assets in one way or another can be acquired through dairy cattle keeping.

#### **2.5 Classification of household assets**

According to Household Budget Survey (HBS, 2007), household assets are classified into two classes, namely, consumer durables and productive assets.

**Consumer durables;** Many of these are of typical household items in nature, such as radio receiver, chairs, beds and mattresses, household utensils such as pots, saucepans and many more of that kind.

**Productive assets;** many of these assets are of an agricultural nature, such as land, ox-plough, ox-carts, bicycles, livestock and poultry , sewing machines and many much more of that kind. Level of asset ownership among rural households is striking. Within rural areas, only 10% of households own a plough, and 41% of rural households own livestock other than poultry.

### **2.5.1 Impact of dairy production on household income**

In South and East Asia, smallholder dairying has become a good income-earning occupation for crop farmers in mixed farming systems. This is evident in Thailand, Malaysia and Indonesia where crop farmers turned to small-scale dairying and were able to make enough income and savings to give their children a college education. With further improvement in productivity and reduction in production costs, Chantalakhana and Skunmun (2002) believe that smallholder dairying in these countries can become a very sound and sustainable enterprise.

Smallholder dairy farming is an important part of farming throughout the developing world (Mchau, 1991). Dairying represents one of the fastest returns for livestock keepers in the developing world. More importantly, smallholder dairying provides a regular source of income and spreads income risk, whereas income from agriculture is seasonal. In countries like India livestock development, in general, and dairy development in particular, are considered key components of pro-poor development strategies. This is mainly because livestock distribution is much more equitable than land distribution.

In many parts of Africa the dairy sector has been identified for its potential to increase the income generating productivity of smallholders' assets (Walshe *et al.*, 1991; Staal *et al.*, 1997; Thorpe *et al.*, 2000). The SDP (Smallholder Dairy Project) research findings show that smallholder milk production in Kenya is a key driver of rural income and employment. In Kiambu, Nakuru and Nyandarua, people are able to make good profits from dairying, whether they are stall-feeding a cow or two on a small piece of land or grazing their cows in paddocks. In all systems, farmers on average are able, after costs, to make about twice as much income from milk production than from other farm enterprises or rural labour (as high as 244% of the income from alternative wage labour in Nyandarua). And this doesn't include the additional benefits dairy cattle provide farmers by insuring them against financial emergencies, serving as inflation-proof savings, and producing the manure that sustains their smallholder cropping.

The research has also shown that half the dairy farmers in many areas hire fulltime dairy workers. Thus, dairy is a key driving force for sustainable rural incomes and on-farm employment. In Rwanda, according to Rutamu (2004), it is understood that by increasing numbers of dairy cattle in rural settings, there are significant direct contributions at household level of dairy producing households such as; access to high quality nutrients – improved nutritional status of the children, employment of family members, regular incomes for long periods, manure for crops and improved soil fertility and income funds for education and health expenses.

It is easy to identify the difference in living standards of the household with one or two dairy cows compared to those without. Two physical features that are observable are the good health of the children and healthy banana plants near the cattle shed. Most of farmers



use manure for fertilising tomato gardens which produce further income to the household. The vast majorities of the poor and malnourished in Rwanda live in rural areas and depend on crop and dairy cattle farming for income. Malnutrition here is pervasive among women and pre-school children. A glass of milk every day can make a great difference. In short, dairy supports food security first and extra income next.

In Tanzania, (URT, 2002b) it was noted that about half of the smallholder dairy farmers were getting between 151 000/= and 350 000/= Tshs per month from milk sales. This amount was almost similar to what is regarded as lowest salary scale for the government employee in Tanzania. A higher income of between 300 000/= and 500 000/= Tshs a month from a dairy project in Dar-es-salaam was reported by De Wolf (2001). However, the author indicated this to be below break even point and argued for increased milk price.

### **2.5.2 Impact of dairy cattle production on household food security and nutrition**

Dairying represents one of the fastest returns for livestock keepers in the developing world. It enhances household nutrition and food security, fulfils important cultural and social functions as well as creating off-farm employment – as many as one job for each 10 to 20 litres per day of milk processed and marketed (FAO/ ILRI, 2003). Small scale dairying is an important agricultural activity in many parts of the developing world, producing a valuable food products and providing a regular income and work for poor households (de Haan *et al.*, 2003). Milk is nature's most complete food. Furthermore, dairying represents one of the fastest returns for livestock keepers in the developing world. It provides regular returns to farmers, especially to women, enhances household nutrition and food security and creates off-farm employment, as many as one job for each 20 kg milk processed and marketed.

According to Sansoucy *et al.* (1995) livestock production gives increased economic stability to farm households. Small ruminants serve in part as a cash buffer and large animals as capital reserve and a hedge against inflation. In mixed farming systems, livestock can also serve as a form of insurance against the risk associated with crop failures by providing alternative sources of food and income. In addition, the frequent cash flow from the sale of milk and eggs adds to household economic stability by increasing the purchasing power of livestock owners and has been noted as an important determinant of food security. Animal products are also good source of absorbable forms of iron, zinc, vitamin B<sub>12</sub>, ratinal and many more other minerals highly essential for child growth (ILRI, 2003).

According to Food and Agriculture Organization (FAO, 1996), livestock play an important role in food security by helping to alleviate seasonal food availability in many different ways. For example, liquid milk whose production is seasonally processed during periods of surplus into products such as butter, curd, milk powder and cheese can be used throughout the year. Similarly, meat can be processed into various products such as dried, cured or smoked meat that can be used when other food sources are scarce. In a household, milk and other dairy products including manure, meat and live aimals can be sold and the income obtained be used to purchase food and other household items. Increase in the ability to purchase food and consumption of milk at household level would improve the malnutrition that is contributed by lack of access to adequate calories, protein, vitamins and minerals. Similary, Mwakalobo and Shively (2001) noted that increase in income increases the ability to purchase food for the family to curb the food insecurity situation in more than 40% of the poor families in the tropics.

Smallholder dairy cattle production is regarded as one of the best means of providing resource poor farmers with regular income to pay for children's education and other family necessities such as food and health services. However, achieving food security through dairy production depends on good policies.

Notable policies and strategies implemented included breeding policies, input supply, and supportive services to smallholder producers, dairy commodity aid programme and investment in large-scale parastatal dairy farming (Mdoe and Temu, 1994). Smallholder dairy sector contributes significantly to poverty and malnutrition reduction particularly in rural and peri-urban areas. It provides regular income to household, self-employment, particularly to women and valuable human food (Mdoe and Temu, *op.cit*).

Dairy cattle production can be important in achieving food security in three ways:

- (i) Directly through increased food production that adds directly to household nutrition,
- (ii) Indirectly through increased cash income that can be used to purchase foods of plant origin, as well as other household items and
- (iii) Through generation of employment.

## **2.6 Dairy cattle farming and malnutrition problems**

Malnutrition is a multifaceted problem particularly in early childhood. Any nutritional deficiencies experienced during this critical period could lead to growth retardation and other adverse effects in future. In many rural areas, most nutrition problems stem from food insecurity, poor complementary feeding practices and poverty. Improved dairy production is likely to enhance access to food by households or individuals thereby reducing the incidences of malnutrition problems.

A number of studies have shown significant positive effects emerging from the consumption of milk on childrens' nutritional status in developing countries. For example, Siereg *et al.* (1992) found that in urban Nicaragua, non-breast feeding children between the ages of 2.5 to 5 years who drank cow's milk were less than half – likely to be stunted compared to non-breast feeding children of the same age who did not drink milk.

Odhiambo *et al.* (2004) examined the impact of dairy production on the nutritional status of preschool children aged between 24 – 59 months .They assessed the nutritional status by taking height, weight and age of the children and compared it with the height and weight of well-fed children of the same age using the WHO/NCHS growth reference standards. The study revealed that 44.7% of the preschool children were stunted, while 10.4% were wasted and 27% were under weight. Stunting was more prevalent (37.2%) among children from households whose main enterprise was sugarcane farming. Analysis of the income and expenditure patterns indicated that men, who did not consider food as a main expenditure priority, controlled income from this enterprise. On the other hand, children from the dairy keeping households including those that farmed sugarcane as well were better off in terms of food security and nutrition as they had regular income.

According to Odhiambo *et al.* (2004) stunting in this Kenyan community may be due to poor households' access to food leading to inadequate dietary intake by pre-school children. It was apparent that consumption of milk resulting from the dairy programmes promoted in the area, contributed to the improved nutritional status of young children. Dairy production is clearly a positive activity in food security program (Odhiambo *et al.*, 2004).

In a study conducted by Vosti and Witcover (1992) in rural coast of Ecuador, access to food market as measured by per capita food expenditure and ownership of livestock, mostly cows, showed the strongest correlation with children's nutritional status (H/A, W/A and mid-arm circumference measures). Children from farm households owning livestock were found to be less likely to be growth retarded compared to children of farmers not owning livestock. Analysis of data from Zona Da Mata, Minas Gerais, Brazil, showed that children from households keeping livestock tended to be healthier in according to all three nutrition anthropometric measures (W/A, H/A and W/H) due to income accruing from livestock products (Vosti and Witcover, 1992).

Findings from the study undertaken by Odhiambo *et al.* (2004) showed that animal protein intake by children from Kenya was positively and significantly associated with height for age and weight for age. A similar pattern was also reported in Mexico. Controlling for morbidity, maternal education and nutritional knowledge, and socio-economic status, higher consumption of foods of animal origin (as percent of energy or protein intakes) was associated with children being heavier and taller at 30 months in India (Alleyne *et al.* 1989). In India, children consuming foods of animal origin were found to be less likely to suffer from malnutrition compared to children on vegetarian diets (Alleyne *et al.*, op.cit). The addition of cow's milk to the diet of children after weaning can increase linear growth and reduce stunting in populations with low milk intake. In a study conducted by Vaughan *et al.* (1989) in Khartoum Province of Sudan, children aged 6-26 months given fortnightly home supplement dry skimmed milk or local beans as home food supplement, were found to have increased linear growth and reduced stunting.

Bowonder *et al.* (1985) in their study at India on impact of dairy development programmes, examined whether dairy development has any positive influence on

economic and nutritional benefits. Conclusions from that study were that, food intake per capita was 25.7kg per household in dairy producing villages and 18.5 kg for households in non dairy producing villages, suggesting that dairy development helped the landless population to stabilize its nutritional intake. Consumption of milk and milk products was substantially higher in households with dairy cattle development programmes than in households without dairy cattle development programmes.

Findings from a study undertaken by Kisusu *et al.* (2002) showed that dairy production increased food security in Mvumi area, Dodoma Tanzania in two ways; First, increased consumption of milk by dairy producing households had improved the nutritional quality of food eaten by members of the households. In other words, there was increased access to nutritious food items by the people keeping dairy cattle, which consequently led to improvement in health. Furthermore, the findings indicate that the benefits in terms of improved nutritional status of the poor households also extended to non dairy keeping households who purchased the surplus milk. Second, the additional and reliable income from sale of milk increased purchasing power of the people involved in the dairy production. The earned income from dairy products enabled purchase of cereal grains such as maize during grain scarcity periods. Mdoe and Temu (1994) found out that improved smallholder dairy cattle production contribute to food security through increased consumption of home produced milk and income from sale of milk.

## **2.7 Impact of dairy production on household assets**

Household income, current value of durable assets and food security status of a household are among the measures of household welfare (Mwankemwa, 2004). In their study in southern highlands of Tanzania Bayer and Kapunda (2006) observed that income from milk sales helped some smallholder families acquire additional land, improve their houses

(and cattle sheds), finance small-scale businesses, send their children to secondary school, and expand the dairy business. As an asset, livestock can be liquidated at a time of great need to stabilize food production and consumption. Livestock provide multi-purpose uses such as skin, fibre, manure, draught power, fuel and capital accumulation (ILRI, 2003).

The distribution of assets in an economy is a major factor in the determination of income distribution and therefore purchasing power. In rural areas, land is the dominant asset. Land is the principal source of income and consumption, of status, wealth and security. Most rural households with access to land have the ability to produce at least some of their own food requirements.

It is reported (URT, 2003b) that, assets provide people with opportunities and options in the face of impoverished forces. Thus, being asset poor limits people's capacity to improve and safeguard their well being. However, Rutasitara (2002) argued that wealth symbolizes peace and prestige, a sign that the owner is well-off at least by the standards of his community and wealth in form of assets, land, and capital is in addition a source for further wealth. Three forms of wealth are used to describe the poverty profile namely; land, livestock and ownership of simple consumer durables. Likewise, Kamuzora (2001) supported that, possessions of assets reflect income levels.

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 Overview**

This chapter is divided into the following sub-sections: description and location of the study area; research design; sample profile, size and sampling technique; data collection method and data processing and analysis.

#### **3.2 Description and Location of the Study Area**

This research was conducted at Isagehe ward in Kahama district. Kahama District is one of the eight (8) districts in Shinyanga Region. It is in the Northwest of Tanzania (South of Lake Victoria). Roughly the district lies between latitudes 3°15 and 4°30 south of Equator and longitudes 31°00 and 33°00 East of Greenwich (Fig. 1). The total land area covers an area of about 8477 Km<sup>2</sup> (or 847 695 ha).

The District is bordered by Shinyanga and Nzega districts in the East, to the North by Geita District, to the West by Bukombe District and the South by Tabora District (Fig. 2). The District covers an area of 19 943 square kilometers, with a population of 594 891 people (294 572 males, 300 319 females). The district is divided into 31 wards, out of which 8 are mixed wards, (i.e. have both urban and rural villages) and 23 wards are rural wards. Per capita income in Kahama district is approximately 250 000/= as per the 2002 Household Budget Survey. This has been accelerated due to the higher growth of small town of Isaka, Kagongwa, Segese, Bugarama and others.



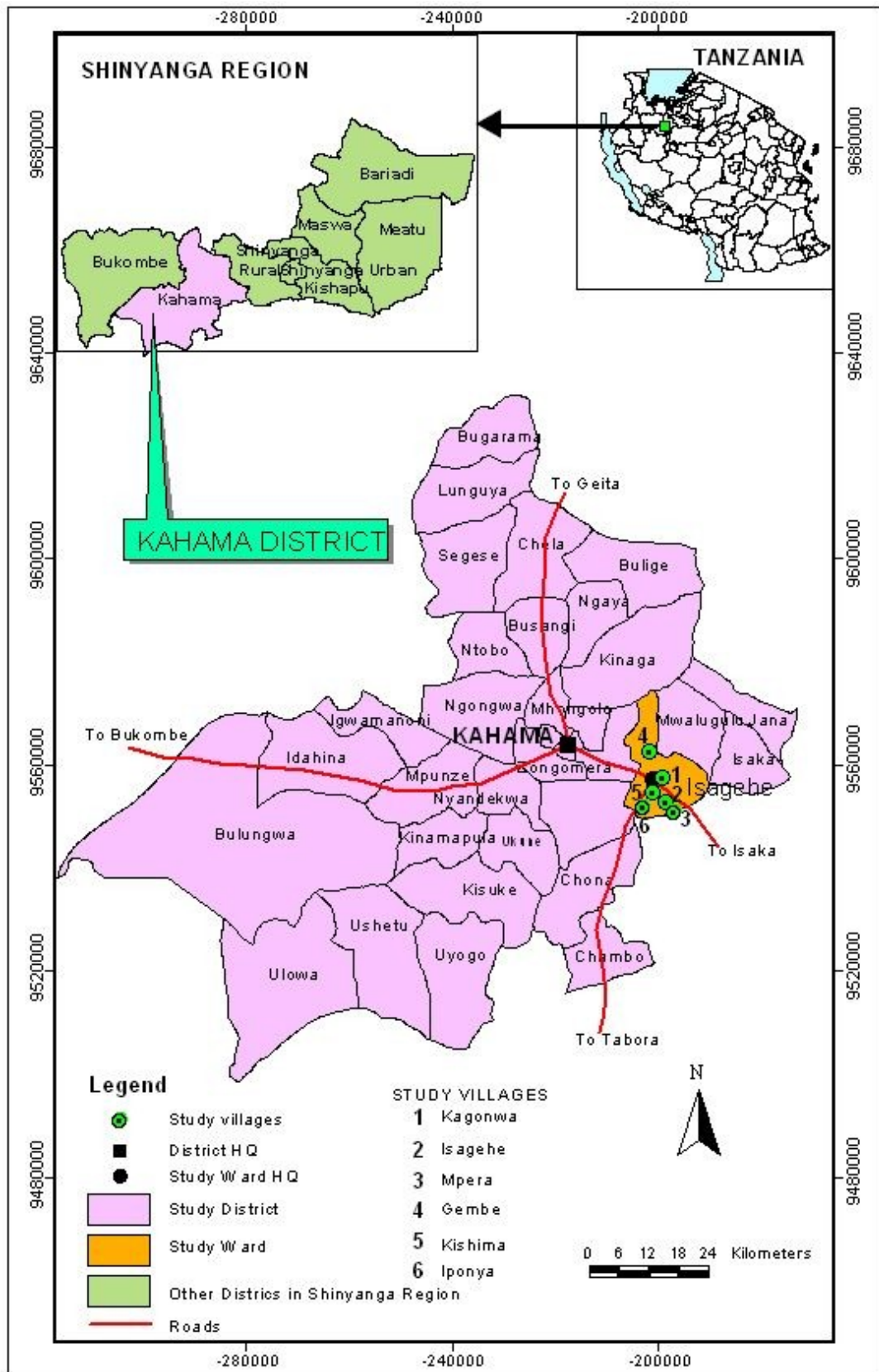


Figure 1: Map of Kahama district showing the study area

### **3.3 Economic Activities**

The economy in Kahama District largely depends on agriculture, livestock and mining. Approximately 483 320 ha is arable land and is presently being utilized, either for crop production or livestock grazing. Basically agriculture and livestock employs more than 80% of the district population. There are five major crops named as main income earning crops, these are; cotton, paddy, tobacco, maize and chickpea. These crops contribute more than 40% to the District economy.. There are two official mines in operation, Kahama Gold Mines (Underground mining) and Buzwagi mines (Open ground mining), small scale gold mining is done at Mwabomba and Mwime. Small-scale diamond mines are found at Nyang'hwale where large mining companies were operating in the past.

The majority of Kahama residents depend on subsistence agriculture and livestock rearing as their main source of income. Most households in this district keep different animal species such as cattle, goats, sheep, donkeys and poultry. Livestock production is considered as a major source of income, food, solving social and cultural issues as well as a way of storing wealth. Farm sizes vary from 0.4 to 20 ha per farming household, averaging to 2.4 – 6.0 ha. Main food crops are maize, cassava, sweet potatoes, sorghum, groundnut, millet and beans. Cotton, tobacco and rice constitute the main cash crops. However, the production of all these crops suffers from unreliable rainfall, prolonged drought and unfavorable market outlets.

Isagehe ward in Kahama District is one of the eight mixed wards in Kahama district with both rural and urban villages. The ward has a population of 32 923 people (16 050 males, 16 873 females) in 14 villages.

### **3.5 Research Design**

A cross-sectional design was employed in which data were collected at a single point in time. According to Babbie (1994), this approach is suitable for a descriptive study, determination of relationship between and among variables, using interviewing schedule and checklists since it requires minimum time and resources.

### **3.6 Data Collection Methods**

Interview schedule composed of closed and open ended questions were used to obtain primary data from both households keeping dairy cattle and those that did not. Interviews were done with the household head or in his/her absence, with his/her representative. Interviews guided by a checklist was done to obtain information on records of production, consumption and marketing of milk, achievements and problems facing the dairy farmers involved in the project, and finally information on coordination/linkage between the offices of the District Agriculture and Livestock Development Officer (DALDO) and Area Development Project Officer

Six villages namely Kagongwa, Isagehe, Mpera, Gembe, Kishima and Iponya were selected out of 13 villages which make up the Isagehe ward. The villages were purposely selected because they are the ones involved in the implementation of the Area Development Programme (ADP) smallholder dairy cattle keeping. From each of the six villages above, a list of households keeping small scale dairy cattle which was about 20 households in each village was obtained from each village office. From this list of small scale dairy cattle keeping households, which was used as a sampling frame, systematic sampling was used to select 10 sample households from each of the six villages. For households not keeping dairy cattle, a list of households from each of the six villages

was obtained at each village office. Simple random sampling method was used to select 10 sample households from each village.

### **3.7 Data Processing and Analysis**

After the interviews, responses on each interview schedule were inspected for their accuracy, then coded and entered into a computer. The coded information in the computer were analysed using the Statistical Package for Social Science (SPSS) version 12 computer programme. Specifically descriptive statistics were computed and used to assess levels of income, food security and assets owned in both households keeping small scale dairy cattle and households not keeping small scale dairy cattle. Further analysis was done so as to find out factors having influence on income, food security and assets in the study area.

## **CHAPTER FOUR**

### **RESULTS AND DISCUSSION**

#### **4.1 Overview**

This chapter presents empirical findings of this study on the following:

- (i) Characteristics of the sample
- (ii) Dairy cattle keeping, milk production and consumption,
- (iii) Households' income generating activities,
- (iv) Total household income,
- (v) Household food security,
- (vi) Household assets

#### **4.2 Characteristics of the Sample**

The following characteristics are addressed; household size, level of education, occupation, marital status, gender and age.

##### **4.2.1 Household size**

Results from the study showed that household sizes varied from an average of about 8 and 7 people for households keeping and not keeping small scale dairy cattle respectively as shown in Table 1 below. The minimum and maximum household size of household keeping small scale dairy cattle was 4 and 17 people respectively. On the other hand, the minimum and maximum household size for households not keeping small scale dairy cattle was 1 and 14 people respectively.

**Table 1: Household sizes of the respondents**

Statistics	Households		Households not		Total	
	keeping dairy cattle		keeping dairy cattle		(n= 120)	
	(n= 61)		(n= 59)			
	Freq.	%	Freq.	%	Freq.	%
< 5persons	9	14.75	15	25.42	24	20.00
6-10 persons	47	77.05	42	71.19	89	74.17
11-15 persons	4	6.56	2	3.39	6	5.00
>15 persons	1	1.64	0	0.00	1	0.83
Total	61	100.00	59	100.00	120	100.00

The average household size of the study area is 7.2 persons and the average household size of the district is 4.7 persons. According to URT (2006), average household size in Tanzania is 5.2 persons per household, with Shinyanga region having the highest number than other regions (6.4) and Mtwara region having the smallest number (4.0) persons per household. The household size in the study area is higher than the average household size for the district and the region; probably due to the fact that the study ward contains both rural and urban villages which have more people per household. Also the study area is near the Buzwagi Gold mine and it is along the Isaka Rwanda/Burundi road, both of which may be factors responsible for attracting many people to come to the area in search of jobs including pet trading.

Household size influences labour availability for crop production and dairy farming activities, because both activities are labour demanding. Household members are the main source of labour for different activities in the study area and other different areas in the region.

#### **4.2.2 Level of education**

Majority (60.66%) of the household heads among households keeping small scale dairy cattle had primary school education level, about 16.39 % had secondary school education, and 21.31 % had no formal education. On the other hand, households not keeping small scale dairy cattle, 69.49 % have attended primary school, 5.08 % had secondary education and 23.73 % had no formal education (Table: 2). The results show that majority of the respondents have acquired basic education (primary education) which can enable them to get knowledge, skills and attitude on how to solve some problems associated with managements of dairy cattle.

According to URT (2006), the overall literacy rate in Tanzania is 66.3%; the literacy rate of the heads of households is 69%, Kilimanjaro region being the highest (87%) and Tabora region the lowest (53%). URT (Op.cit) further asserts that in Tanzania, 40% of the rural agricultural population have never attended school and more than half of the rural agricultural heads of households have attained primary school level of education (57%). The results show that on average, 65% of household heads in the study area had attained primary school level of education, which is higher than the average (57%) for Tanzania. Levinger and Drahman (1980) as cited by Mchomvu (2000) noted that poor and less educated people generally lack confidence in their ability to improve their lives. It can therefore be said that, level of education has a positive relationship with smallholder dairy cattle keeping. The high proportion of household heads with secondary school education among smallholder dairy cattle farming shows that some educated villagers in the study area are engaged in dairy cattle keeping.

### **4.2.3 Occupation**

Table 2 shows that 95% of the respondents were engaged in farming while 2% were wage employees and 3% were involved in non-farming activities (pet businesses). In Tanzania, according to URT (2007), 87% of the people in rural areas are engaged in agriculture (crops, livestock, and fishing), 6% are self employed, 5% are wage employees (formal and informal) and 2% are involved in family pet businesses. A higher percentage of household heads engaged in farming in the study area than the average for the rural areas in Tanzania, could be due to the fact that in the study area, food crop farming (maize and rice) is the only main activity that provides for both income and food for households as opposed to some parts of Tanzania where farming is not necessarily for provision of both food and cash. In some parts of Tanzania, farming can only be for cash. Also, the fact that in the study area there are no fishing activities and people who could otherwise be involved in fishing are all engaged in agriculture, while, on the other hand fishing is inclusive as part of farming in the figure for other parts of rural Tanzanian farming systems. This could be the reason for higher percentage of household heads getting engaged in farming than the average figure for Tanzania in general.

Also, the high proportion of pet business (3%) in the study area compared to other Tanzanian rural areas in general (2%), could be due to the fact that the study area consists of both rural and urban villages, and that the study area is located along the main road (Isaka- Rwanda and Burundi road) a factor which attracts many people to come and do businesses in the study area.

### **4.2.4 Marital status**

The study showed that 51.9 % of the interviewed dairy farming household heads were married while 48.1% of the non dairy farming household heads were also married



(Table 2). Married couples are likely to be more productive than household headed by single person due to increased labour supply and can share responsibilities in managing dairy cattle activities and thus reducing the burden which could otherwise be borne by one person. Mtama (1997) as cited by Mwatawala (2006) observed that marriage has an effect on the production process as it increases labour availability in the households.

The study also, show that in the study area, single person headed households (which could be due to death/divorce) were 9.84% in households keeping dairy cattle compared to 13.56% in households not keeping dairy cattle. The reason for these differences could be that households keeping dairy cattle are more educated with about 17%, (16.39%) having completed secondary education, and more involved in agriculture (98.36%), and are therefore likely to be food secure. This could make their marriage more stable. On the other hand, households not keeping dairy cattle are less educated with only 5.08% having completed secondary education, and less involved in agriculture (94.92%) and are therefore likely to be food insecure. This could lead to marriage instability (divorces).

In female headed households, single parent unit women have no choice but to do all tasks including traditional male roles. Sigot *et al.* (1995) in Katheera Kenya found that women did all the tasks like land clearing which is traditionally a male role. Also Abel (2000) found that in some of polygamous families in which men could not offer sufficient labour, women did all the tasks.

#### **4.2.5 Gender of household heads**

About 85.2 percent of dairy cattle household heads interviewed were males and 14.8 percent were females. For non dairy cattle household heads interviewed 86.4 percent were males while 13.6 percent were females. These results show that, many households in both

dairy and non dairy cattle keeping households are headed by men, which is a common feature in rural communities in most African societies.

**Table 2: Distribution of households by level of education, occupation and marital status**

Variable	Household keeping dairy cattle (n= 61)		Household not keeping dairy cattle (n= 59)		Total (n= 120)	
	Freq.	%	Freq.	%	Freq.	%
<b>Level of education</b>						
Non formal	13	21.31	14	23.73	27	22.50
Primary education	37	60.66	41	69.49	78	65.00
Secondary education	10	16.39	3	5.08	13	10.83
Higher education	1	1.64	1	1.70	2	1.67
<b>Total</b>	<b>61</b>	<b>100.00</b>	<b>59</b>	<b>100.00</b>	<b>120</b>	<b>100.00</b>
<b>Occupation</b>						
Farming	60	98.36	56	94.92	116	96.66
Wage employee	1	1.64	1	1.69	2	1.67
Non farm activities	0	0.00	2	3.39	2	1.67
<b>Total</b>	<b>61</b>	<b>100.00</b>	<b>59</b>	<b>100.00</b>	<b>120</b>	<b>100.00</b>
<b>Marital status</b>						
Married	55	90.16	51	86.44	106	88.33
Single	5	8.20	6	10.17	11	9.12
Divorced	1	1.64	2	3.39	3	2.50
<b>Total</b>	<b>61</b>	<b>100.00</b>	<b>59</b>	<b>100.00</b>	<b>120</b>	<b>100.00</b>

#### 4.2.6 Age of household heads

The age of an individual has an influence on productivity as well as food consumption. According to Basnayake and Gunaratne (2002), the age of a person is usually a factor that can explain the level of production and efficiency. A very old individual is likely to be less productive than one in the active age. In the study area for households keeping dairy cattle the mean, maximum and minimum ages were 49.8; 85 and 28 years while for households not keeping dairy cattle it was 42.7; 85 and 29 years respectively. The results in Table: 3 below show that about 40.83% of the interviewed heads of households keeping and not keeping dairy cattle were middle-aged people (between 36-45 years of age), in which

households not keeping dairy cattle had a higher proportion (44.07%) of household heads in this category. A small proportion (1.67%) of the sample household heads in households keeping dairy cattle were older than 75 years old and would normally give the dairy cattle to their children or grand children to manage them. This is because old age and its associated physical and economic constraints would limit the household head to manage the dairy cattle.

**Table 3: Distribution of household heads by age**

Statistic	Households keeping dairy cattle (n= 61)		Households not dairy cattle (n= 59)		Total (n= 120)	
	Freq.	%	Freq.	%	Freq.	%
	Age (years)					
<25 years	0	0.00	0	0.00	0	0.00
25-35 years	4	6.56	17	28.81	21	17.50
36-45 years	23	37.70	26	44.07	49	40.83
46-55 years	18	29.51	8	13.56	26	21.67
56-65 years	13	21.31	4	6.78	17	14.17
66-75 years	1	1.64	4	6.78	5	4.17
>75 years	2	3.28	0	0.00	2	1.67
Total	61	100.00	58	100.00	120	100.00

### 4.3 Dairy Cattle Keeping, Milk Production, Consumption and Sales

#### 4.3.1 Dairy cattle keeping

In the study area the dairy cattle kept were mainly F1 cross breed animals of Holstein Friesian and Ayrshire (bulls) and Boran (cows) off springs. The F1 dairy cows in the study area were bought and distributed by World Vision (T) from Mabuki farm in Mwanza and others from individual farmers in Arusha

The results in Table 4: below show that dairy cattle keeping households own an average of 2 dairy cattle with a maximum of 4 and a minimum of 0. These results are in conformity with observation made by Kurwijira and Boki (2003) who observed the range of 2 to 3 heads of cattle per household for smallholder dairy farmers in Tanzania. However, these

results are below the observations made by Urassa and Raphael (2001) and Mlay (2001) who observed that in Morogoro urban and peri-urban areas the number of dairy cattle per household was on average 6 and above. This difference can be explained by the fact that in the study area, small scale dairy project was introduced by donors (World Vision Tanzania) who distributed one in-calf heifer per household using the Heifer in Trust Scheme (HTS) with condition that one off spring heifer must be passed over to another household. On the other hand, in urban and peri urban areas, small scale dairying are initiated by individuals who have enough capital to start dairy cattle keeping with more than one dairy heifers and all off spring heifers are kept by the farmer.

#### **4.3.2 Other types of livestock kept**

Sampled households kept different species of animals such as cattle, goats, sheep, donkey and poultry. Livestock production is considered as a major source of income, food, solving social and cultural issues as well as a way of storing wealth. The results in Table 4 below show that, by comparison, households keeping dairy cattle also kept more number of local cattle, goats and chicken (which are all edible species), while households not keeping dairy cattle keep a large number of sheep and donkeys (only one edible species- sheep).

The small proportion of households not keeping dairy cattle and own fewer other animal species suggest a higher probability of being food insecure compared to households keeping dairy cattle. This is because Livestock helps to alleviate seasonal food availability in many different ways. For example, meat processed into various products such as dried, salted, cured or smoked meat can be used when other food sources are scarce. Studies by Abdullai and Delgado (1990) and Mdoe *et al.* (1998) reported livestock keeping as a banking strategy and that it plays the role of capital (wealth) accumulation.

**Table 4: Distribution of households by number of animal species kept**

Other animals kept	Households		Households not		Total	
	keeping dairy		keeping dairy		(n= 120)	
	cattle (n= 61)		cattle (n= 59)			
	Freq.	%	Freq.	%	Freq.	%
Local (Non dairy) cattle	23	37.7	21	35.6	44	36.7
Goats	24	39.3	15	25.4	39	32.5
Sheep	3	4.9	7	11.9	10	8.3
Poultry (Chicken /ducks)	47	77.0	35	59.3	82	68.3
Donkey	4	6.6	5	8.5	9	7.5

### 4.3.3 Milk production

A dairy cow is a very valuable and expensive animal and owning it entails a number of risks. The biggest risk is losing the animal due to bad management or diseases. Thus, to avoid this beneficiaries of ADP – small scale dairy cattle development project in the study area were first trained on basic dairy cattle husbandry practices (feeding, housing, milking, disease control). After the training, they had no choice on the number of cows to start with as they were given only one in-calf heifer.

In addition to the number of dairy cattle owned, sampled households were asked to give information on the quantities of milk produced. The responses summarized in Table 5 below show that on average, milk production per cow per day was 5.27 litres, with a maximum of 15 litres and minimum of 0 litres.

**Table 5: Number of dairy cattle and milk production e**

Statistics	Number of dairy cattle	Milk production level
	owned	(litres per day per cow)
Mean	2.00	5.27
Maximum	4.00	15.00
Minimum	0.00	0.00
Range	4.00	15.00

Std Deviation	0.75	2.92
---------------	------	------

These results show variations in milk production per cow per day. Haile *et al.* (2007) found that cross breed cows of Ethiopian Boran with Holstein Friesian had milk production potential of not exceeding 10 litres per cow per day. In the study area, it was observed that few households with dairy cattle gave supplement feeds to the dairy cows. The supplement feeds used were cotton seed cakes and maize bran. The reason for not supplementing their cows is largely due to the high cost of the supplement feeds. Similar observation was also reported by Luoga (2005) in Rungwe District and Mwatawala (2006) in Kagera Region. Lack of supplementary feeds could be one of the reasons for low milk production in the study area. Other factors that could explain this difference in milk yield between households may include differences in dairy cattle breeds kept, dairy cattle keeping husbandry practices (housing and milking) and animal health management practiced among the households.

#### **4.3.4 Household milk consumption**

In this study household heads were also asked to indicate how many days in a week do household members drink milk. Table 6 below shows that, on average, households keeping dairy cattle drunk milk almost 6 days per week (5.77), while households not keeping dairy cattle drunk milk for only about 2 days only per week (1.64). These results suggest that households keeping dairy cattle are likely to be more food secure than households not keeping dairy cattle, because milk normally improves nutritional quality of starch foods. In addition, household heads were asked about the category of household members who get first priority to drink milk. The study indicated that all household heads (both keeping and not keeping dairy cattle households) mentioned children under five years as being the category given the first priority to drink milk. This again shows that children from

households keeping dairy cattle consume more milk and are likely to be less vulnerable to malnutrition disorders compared to those children from households not keeping dairy cattle who consume less milk. This is again another indication that households keeping dairy cattle are more food secure than those not keeping dairy cattle.

**Table 6: Average weekly household milk consumption**

Statistics	Households with dairy cattle	Households without dairy cattle
Mean (days/week)	5.77	1.64
Maximum (days/week)	7.00	7.00
Minimum (days/week)	0.00	0.00
Range	7.00	7.00
Std Deviation	2.46	2.60

#### 4.3.5 Milk sales

In the study area, small scale dairying was carried out as a component to complement other production activities. Out of all household heads' keeping dairy cattle interviewed, 62.3% admitted to have had enough milk for sale after meeting home consumption needs, and disclosed the income they earned annually on average. Table 7 below shows the average income from milk sale. The results show that majority (81.58%) of the households who earn income from milk sales get between 500 000 Tshs to 600 000 Tshs per annum (US\$ 357.14 - US\$ 428.57). This income is almost twice the income mentioned by the District Agricultural and Livestock Development Officer (DALDO), who, during interviews indicated that the average income earned by the project (ADP) beneficiaries ranges from 200 000 to 300 000Tshs. All in all, these results are in line with other studies which showed that the average income of smallholder dairy cattle was 208 – 486 US\$ per annum (Rugambwa *et al.*, 1997).

**Table 7: Mean annual income from milk sale**

Mean income (Tshs)	Frequency	Percentage
--------------------	-----------	------------

50 000 – 200 000	10	26.32
200 001 – 400 000	13	34.21
400 001 – 600 000	8	21.05
600 001 – 800 000	3	7.90
800 001 – 1 000 000	2	5.26
1 000 001 – 1 200 000	2	5.26
Total	38	100.00

#### 4.3.6 Other sources of household income

Off-farm income refers to cash generated from non-agricultural activities for those aged 15 years and above (URT, 2006). This can be either from permanent employment, temporary employment or casual labour. Whilst off-farm income is not the most important livelihood activity amongst rural agricultural households in Tanzania, most of these households have at least one member involved in this type of income generating activity during the year, and that 72% of rural agriculture households have at least one member doing off-farm income (URT, 2006).

The study revealed that both dairy and non dairy cattle keeping households were getting their income from different sources, such as crop production, small businesses and wage employment (Table 8). It can be seen that 50 % of the household heads were getting their income by dairy cattle and doing crop farming, followed by 31.7% who were getting their income by doing crop farming alone, 15% who were getting their income by owning local cattle and doing crop farming, 1.7% getting their income by means of wage employment and also 1.7% getting their income by doing small businesses. It should be noted that small businesses in this study included small kiosks, small consumer goods shops (retail), beer and local brew bars, house renting and buying and selling of agricultural crops.

**Table 8: Other sources of household incomes**

Activity	Frequency	Percent of household heads
Crop farming only	38	31.7



Local cattle and crop farming	18	15.0
Dairy cattle and crop farming	60	50.0
Wage employment	2	1.7
Small businesses	2	1.7
Total	120	100.0

#### 4.3.7 Total annual household income

In this study, annual household income was obtained as a total sum of income from all income generating activities including milk sales. From Table 9 below, it can be observed that the average, minimum and maximum annual income for households keeping dairy cattle was Tshs 1 568 183; 76 000 and 6 200 000 respectively. On the other hand, the average, minimum and maximum annual income for households not keeping dairy cattle was Tshs 752 038; 100 000 and 2 000 000 respectively. These results show that households keeping dairy cattle, on average, earn twice as much as households not keeping dairy cattle.

**Table 9: Annual incomes for dairy and non dairy cattle keeping households**

Statistic	Income from milk sales		Income from other		Total household Income	
	(Tshs)		activities (Tshs)		(Tshs)	
	Household s keeping dairy cattle	Households not keeping dairy cattle	Households keeping dairy cattle	Households not keeping dairy cattle	Households keeping dairy cattle	Households not keeping dairy cattle
Maximum	4 800 000		1 400 000	2 000 000	6 200 000	2 000 000
Minimum	36 000		40 000	100 000	76 000	100 000
Range	4 764 000		1 360 000	1 900 000	6 124 000	1 900 000
Mean	494 997		1 073 186	752 037	1 568 183	752 038
Standard Deviation	777 364		1 944 151	424 228		

Further analysis showed that the difference between incomes of dairy keeping households and households not keeping dairy cattle was significant ( $P < 0.05$ ), (Table 10).

**Table 10: Influence of different factors on the household income in Tshs**

Factor	Level	LSM <sup>1</sup>	SEM <sup>2</sup>
Dairy keeping status	Dairy keeper	1301556.9 <sup>a</sup>	274239.0
	Non dairy	1050060.2 <sup>b</sup>	284458.6
P value & significant		0.05*	

<sup>1</sup>Least square means, <sup>2</sup> Standard error of the mean, \* (P < 0.05), \*\* (P < 0.01), \*\*\* (P < 0.001), NS = Non significant. TZS= Tanzanian shillings.

#### 4.4 Energy/Protein Consumed

In this study household food security was assessed by comparing households keeping dairy cattle and households not keeping dairy cattle in terms of energy/protein food consumed; number of meals eaten per day and part of household income spend on food. Furthermore, in the study area, staple foods included maize, rice, cassava and sweet potatoes. For purposes of this study, comparison on consumption was limited to energy and protein providing foods. Findings in Table 11: below show that households keeping dairy cattle consumed more maize and rice (energy providing foods) compared to households not keeping dairy cattle. On average, households keeping dairy cattle consumed about 624 kg of maize and 15056 kg of rice per household annually compared to 505 kg of maize and 577 kg of rice consumed per household for households not keeping dairy cattle in 2008. This suggests that dairy cattle keeping households are more likely to meet energy requirements and hence more food secure than households not keeping dairy cattle.

**Table 11: Annual households' maize and rice consumption**

Statistics	Households with dairy cattle (n= 61)		Households without dairy cattle (n= 59)	
	Maize (kg)	Rice (Kg)	Maize (kg)	Rice (kg)
Mean	624.12	15056.08	506.09	577.39
Maximum	1600.00	720000.00	1200.00	960.00
Minimum	240.00	270.00	80.00	180.00
Range	1360.00	719730.00	1120.00	780.00
Std Deviation	273.35	100696.64	246.17	243.00

Further analysis was done to find out whether the energy food consumption is statistically significant different between households keeping and not keeping dairy cattle. Results are summarized in Table 12 below. The table shows that there was significant difference in maize consumption whereby households keeping dairy cattle consumed more maize than households not keeping dairy cattle. However, there was no statistically significant difference in consumption of both maize and rice between the two categories of households in terms of per capita annual consumption.

**Table 12: Annual per household and per capita consumption of maize and rice**

Mean annual consumption of food item	Households with dairy cattle	Households without dairy cattle	t-test and significant
Per household consumption (kg)			
Maize	624.12 <sup>a</sup>	506.09 <sup>b</sup>	0.0284*
Rice	672.35 <sup>a</sup>	577.39 <sup>a</sup>	0.0540 NS
Per capita consumption (kg)			
Maize	79.35 <sup>a</sup>	77.89 <sup>a</sup>	0.7709 NS
Rice	92.56 <sup>a</sup>	91.75 <sup>a</sup>	0.9060 NS

\* (P < 0.05), NS = Non significant

The significant difference in maize but not in rice consumption could be due to the fact that irrespective of rice produced, both households use rice as a cash crop. Regarding protein consumption per week, 88.5% households consume milk and 72.1% households eat beef/fish/*dagaa* in households keeping dairy cattle against 45.8% who consumed milk and 66.1% who eat beef/fish/*dagaa* in households not keeping dairy cattle (Table 13). URT (2006) reports that most households in Tanzania consume animal protein at least once in a week and 49% of households eat animal protein at least 3 times a week. These results indicate that, most households consume animal protein, similar to what is generally reported for other households in Tanzania. Furthermore, the figure for animal protein consumption is higher than the average households' consumption in Tanzania.

**Table 13: Weekly animal protein consumption among households**

Protein source	Percentage consumption per week among households					
	Households keeping		Households not		Total	
	dairy cattle		keeping dairy		(n= 120)	
	(n= 61)		cattle (n= 59)			
	N	%	N	%	N	%
Drink milk	54	88.5	27	45.8	81	67.5
Eat beef/fish/dagaa	44	72.1	39	66.1	83	69.2
Eat chicken	23	37.7	22	37.3	45	37.5
Eat eggs	12	19.7	10	16.9	22	18.3

#### 4.4.1 Number of meals eaten per day

The recommended feeding frequency regime for an adult is three meals per day and for under five year's children is four to six times per day (UNICEF, 1985). URT (1992) mentioned that among factors that determine food accessibility in the household is feeding frequency. Feeding frequencies of less than the recommended feeding regimes for both adults and under five year's children is considered inadequate (Kavishe, 1993). Most rural agricultural households in Tanzania take two meals per day and this is closely followed by three meals per day. Very few households take more than three meals per day or one meal per day. However, large differences exist between regions with Tanga region having the highest proportion of households that take three meals per day and Rukwa and Kagera the lowest (URT, 2006).

Results in Table 14 below show the number of meals taken per day by adults and children under five years in households keeping and not keeping dairy cattle. For children under five years, the maximum number of meals in both households keeping and not keeping dairy cattle is 5, but the minimum number of meals per day is 3 in households keeping dairy cattle and 0 in households not keeping dairy cattle. These results show that there are some under five year's children in households not keeping dairy cattle who do not have

access to food. This is an indication of food insecurity in households not keeping dairy cattle. According to the recommended feeding frequencies, and when under fives children are considered, the results of this study suggest that households keeping dairy cattle are more food secure compared to households not keeping dairy cattle.

**Table 14: Number of meals consumed per day**

Statistic	Household keeping dairy cattle		Households not keeping dairy cattle	
	No. meals eaten by children /day (<0.5yrs)	No. meals eaten by adults/day (>5yrs)	No. meals eaten by children /day (<0.5yrs)	No. meals eaten by adults /day (>5yrs)
Mean	3.28	2.89	3.09	2.79
Std Deviation	0.64	0.32	0.71	0.41
Minimum	3.00	2.00	0.00	2.00
Maximum	5.00	3.00	5.00	3.00
Range	2.00	1.00	5.00	1.00

#### 4.4.2 Part of household income spend on food

Part of household income spent on food is one of the indicators used to assess household food security, (see 2.4.1 above). In this study, household heads were also asked to indicate part of the total household income that is used to purchase food for home consumption. The results are summerised in Table 15 below. The results show that 34.7% and 51.6% of total annual household income for households keeping and not keeping dairy cattle respectively is spent on food. The results show that households keeping dairy cattle spend less income on food than households not keeping dairy cattle, which is an indication that they are more food secure than households not keeping dairy cattle.

**Table 15: Part of the household income spent on food**

Occupation	Total annual household income	Part of total household income used for food	% of Total income spend on
------------	-------------------------------	--	----------------------------

	(Tshs)	(Tshs)	food
Households with dairy			
cattle	66 647 900.00	23 144 000.00	34.7
Households without			
dairy cattle	44 048 200.00	22 713 000.00	51.6

#### 4.5 Household Assets Owned by Household Heads

Beyond household consumption and expenditure pattern, assets ownership and quality of housing are important measure of households' well-being (HBS, 2007). With respect to household assets owned by household heads keeping and not keeping dairy cattle, the study focused on the following assets; land and household items, such as bicycle, ox-carts, ox-plough, wooden household furnitures (beds, chairs, and coaches).

##### 4.5.1 Land size (acrage) owned

Land is the most important asset which is needed for all rural households to carry out their economic activities. In Tanzania all land is publicly owned and vested in the state, but individuals have user rights (Ministry of Agriculture and Co-operatives (MoAC, 1999). There are three major land tenure systems, namely, customary or communal, commercial leasehold and the right of occupancy. Households own land under communal system acquired through inheritance from parents, purchased, hired and given by village government.

Table 16: below shows different sizes of land owned by households keeping and not keeping dairy cattle in the study area. More than half (58%) of household heads owned land of the size 0-3 acres, followed by those owning land size of 4-6 acres (21%). The findings in this study on land size are some how similar to findings of the study carried out by Willis and Ackello (1995) in Kiambuu Kenya on 1225 livestock producers. The study found that the majority of dairy farms were small in size, whereby about 47% of the farms

were below 2 acres in size; 28% were between 2-4 acres; 21% between 4-10 while only about 4% were above 10 acres. Those with relatively small farms were associated with the practice of zero grazing. Small land size owned by both households keeping and not keeping dairy cattle can be explained by the fact that the study area contained both rural and urban villages. Furthermore, despite being in the agro-pastoral zone, the study area (Isagehe ward) is on the main road to Burundi and Rwanda and is located near to Buzwagi gold mine (10km) and Kahama district head quarter (20km), all factors which attract more people from different parts to come to the area to look for different means of earning living.

**Table 16: Land distribution among households**

Statistic	Houseolds keeping dairy cattle (n= 61)		Households not keeping dairy cattle (n= 59)		Total (n= 120)	
	Freq.	%	Freq.	%	Freq.	%
Land size (acres)						
0 - 3	29	48.34	39	69.64	68	58.62
4 - 6	14	23.33	11	19.64	25	21.55
7 - 9	8	13.33	6	10.72	14	12.07
10 - 12	6	10.00	0	0.00	6	5.17
13 - 15	1	1.67	0	0.00	1	0.86
19 - 21	2	3.33	0	0.00	2	1.72
Total	60	100.00	56	100.00	116	100.00

Table 17 below shows that mean, minimum and maximum land owned by households keeping dairy cattle is 4.85, 0.25 and 20 acres respectively. For households not keeping dairy cattle, mean, minimum and maximum land owned is 3.09, 0.00 and 9.00 respectively. Further analysis by t-test showed that there is significant difference in land ownership between households keeping dairy cattle and households not keeping dairy cattle ( $p < 0.01$ ), with households keeping dairy cattle owning more land than households not keeping dairy cattle.

**Table 17: Mean land ownership between households**

Statistic	Household keeping	Household not	Significant difference (t-test) (P<0 .01)
	dairy cattle	keeping dairy cattle	
Mean (acrage)	4.85	3.09	0.002
Std Deviation	4.12701	2.16841	
Minimum	0.25	0.00	
Maximum	20.00	9.00	
Range	19.75	9.00	

The influx of many people who immigrated to the study area and therefore causing more land pressure is supported by the fact that many people in the study area acquired land by purchase (57.89%) followed by inheritance (34.59%) and renting (7.52) (Table 18).

**Table 18: Means of land acquisition among households' heads**

Means of land acquisition	Frequency	Percentage
Purchasing	77	57.89
Inheritance	46	34.59
Renting	10	7.52
Total	133	100.00

#### 4.5.2 Household items

The study area is located in an agro-pastoral zone where households do both crop farming and livestock keeping. Most common household assets in the agro-pastoral zones include ox-plough, ox-carts, bicycles and other common rural Tanzanian household items like kerosene lamp, wooden chairs and coaches, wooden bed with mattress and mosquito nets. In this study, household heads were asked to tell whether they owned households' assets such as radios, bicycles, kerosene lamp, wall clock, chairs, bed with mattress and mosquito net, sewing machines, ox-cats and ox-ploughs. Table 19 below shows that, for all kinds of household assets, a higher proportion of households keeping dairy cattle own more of them than households not keeping dairy cattle. Again, this is another indicator that households keeping dairy cattle are relatively better off in terms of income than those not keeping dairy cattle since one need to have money to acquire those household assets.



**Table 19: Household assets owned among households**

Household assets owned	Households keeping dairy cattle (n= 61)		Households not keeping dairy cattle (n= 59)		Total (n= 120)	
	Freq.	%	Freq.	%	Freq.	%
	Bicycle	57	93.4	53	89.8	110
Radio receiver	55	90.2	34	57.6	89	74.2
Kerosene lamp	47	77.0	39	66.1	86	71.7
Chairs	53	86.9	36	61.0	89	74.2
Coaches	21	34.4	4	6.8	25	20.8
Wall clock	20	32.8	8	13.6	28	23.3
Bed/mattress/net	60	98.4	55	93.2	115	95.8
Sewing Machine	14	23.0	3	5.1	17	14.2
Ox-plough	25	41.0	20	33.9	45	37.5
Ox-cart	7	11.5	5	8.5	12	10.0

## **CHAPTER FIVE**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Overview**

The general objective of this study was to assess the impact of dairy cattle farming on socio-economic status of the household in rural community. The specific objectives were; (i) to assess the impact of smallholder dairy cattle farming on household income, (ii) to assess the impact of smallholder dairy cattle farming on household food security, (iii) to assess the impact of smallholder dairy cattle farming on household assets. This chapter presents the conclusions and recommendations derived from the major findings of the study.

#### **5.2 Conclusion**

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

- (i) Households keeping dairy cattle earn more annual income than households not keeping dairy cattle.
  
- (ii) Households keeping dairy cattle consumed more energy and animal protein foods than households not keeping dairy cattle. Furthermore, for energy food consumption, which in this study was maize and rice, the t- test done revealed that there was a significant difference in maize consumption (but not rice), with households keeping dairy cattle consuming more maize than households not keeping dairy cattle. Thus, households keeping dairy cattle were more food secure than households not keeping dairy cattle.

- (iii) Majority (58%) of both households keeping and not keeping dairy cattle owned small pieces of land size (between 0-3 acres).
- (iv) Generally, with exception of bicycle item which showed no significant difference, all other household assets, such as land, radio receiver, ox-plough and ox-carts, showed significant difference in ownership, with households keeping dairy cattle owning more than households not keeping dairy cattle.

### **5.3 Recommendations**

The following recommendations are made from the major findings of this study.

- (i) The results of this study showed that households keeping dairy cattle had more income and food secure with more household assets owned as compared to households not keeping dairy. It is therefore recommended to keep dairy cattle as one of the means to improve rural households in Tanzania, in terms of income, food security and assets.
- (ii) The results of the study have also shown that consumption of energy and protein source foods differ between households keeping dairy cattle and households not keeping dairy cattle. Households keeping dairy cattle consume more of both types of food than households not keeping dairy cattle. It is therefore recommended to include dairy cattle keeping when planning for strategies of solving malnutrition problems in rural communities in Tanzania.

## REFERENCES

- Abdullah, A. M. and Jahnke, H. E (1990). Some aspects of supply behaviour and rural livestock marketing in Africa In: Pasture production Systems in Africa. A study of nomadic household economy and livestock marketing in Central Somalia. pp. 341 – 359.
- Abel, Y. K. S. (2000). Impact of the Southern Highlands Dairy Development Project Workload and gender relations in Njombe district. Un published Msc Dessertation. Sokoine Unniversity of Agriculture, Morogoro, Tanzania. pp. 341 – 359.
- ACP-EU Tecnhical Centre for Agricultural and Rural Cooperation: Impact Assessment/Smart ToolKit (<http://www.cta.int/>) site visited 30/10/2011.
- Alleyne, G. A; Hay, R.W; Picon, D. J; Stanfield, J. P and Whitefield, R. G. (1989). Protein Energy Malnutrition, Jaypee Brothers, New Delhi, India. 244pp.
- Anandajayasekeram, P. and Martella, D.R. (1996). Conceptual frmawork to assess the impact of agricultural research. *Journal of Agricultural Economics and Development* 1(1): 3-9
- Anandajayasekeram, P; D.R. Martella and M.Rukuni. (1996). *A training manual for biological scientists on impact assessments of investments in agricultural and natural resources research*. Gaborone: Southern African Centre for Co-operation in Agricultural and Natural Resources and Training.
- Anne Drew, (2008). Uniterra Volunteer in Malawi. [<http://www.fao.org/ag/againfo/projects/en/pplpi/publications.html>].

- Ashley, C. and Hussein, K. (2000). Developing methodologies for livelihood impact assessment: Experience of the African Wildlife Foundation in East Africa. Overseas Development Institute, London. pp. 55-65.
- Babbie, E. R. (1994). Survey Research Methodology: Second edition: Wadsworth Publishing Company Inc. Belmont California. 395pp.
- Baker, J. (200). Evaluating the Impact of Development Projects on Poverty: A hand book for practitioners. Directions in Development. International Bank for Reconstruction and Development . World Bank, Washington DC. 225pp.
- Barr, N. (2004). Problems and definition of measurement. In *Economics of the welfare state*. New York: Oxford University Press. pp. 121 – 124.
- Barret, C and Reardon, T. (2000). Asset, activity and income diversification among African Agriculturalists: Some practical Issues. Project Report to USAID BASIS CRSP, March 2000.
- Basnayake, B. M. J. K and Gunaratne, L. H. P (2002). Estimation of technical efficiency and its determinants in the tea smallholding sector in the Mid county West zone of Sri Lanka. *Journal of Agricultural Economics* 4:137-150.
- Bayer, W and Kapunda, B. L (2006). Dairy cattle for poverty alleviation in Southern Tanzania. Conference on International Agricultural Research for Development, Tropentag, University of Bonn, 11<sup>th</sup> – 13<sup>th</sup> October 2006.
- Bebe, B. O; Udo, H. M. J and Thorpe, W. (2001b). Breed preferences and breeding practices in smallholder dairy systems in Central Kenya Highlands.

- Bownder, B. N; Dasgupta, B; Prasad, S. S. R and Prakash, R. B (1985). Energy Use in Eight Rural Communities in India. *World Development* 13(12): 1263 – 1286.
- Case, K., and Fair, R. (2007). *Principles of Economics*. Upper Saddle River, NJ: Pearson Education. 54pp.
- Chantalakhana, C and Skunmun (2002). Smallholder Dairying, in Asia in L. Falvey and C. Chantalakhana, eds., *Smallholder Milk Production in the Tropics*. Nairobi, International Livestock Research Institute.
- Chimilila, I. C. (2005). Assessment of smallholder dairy farmers and processors access to emerging niche markets. A case of supermarkets in Morogoro and Dar es Salaam .Dissertation Sokoine University of Agriculture, Morogoro, Tanzania. pp. 13 – 25.
- De Haan, L and Zoomers, A. (2003). Development geography at the cross roads of livelihood and globalization. *Tijdschrift Voor Economische en sociale Geografie* 94(3): 350 – 362.
- De Leeuw, P. N; Omore, A; Staal, S. and Thorpe, W. (1999). Dairy Production Systems in the Tropics. A reiew: In: Falvey, L and Chantalakhama, C (Editors): *Smallholder Dairying in the Tropics*. ILRI, Nairobi, Kenya. <http://www.fao.org/wairdocs/ILRI>.
- De Wolf (2001). Economics of producing milk in Dar-es-salaam. In: *Proceedings of Tanzania Society of Animal Production (TSAP); 5<sup>th</sup> -7<sup>th</sup> December 2001, AICC, Arusha-Tanzania*. 27: 24 – 32.
- DfID (2001): *Evaluation Guardelines*. Evaluation Department . Department for International Development (DfID), London, United Kingdom. 23pp.

Douglas E.Horton (1990). Assessing the Impact of International Research: Concepts and Challenges. Proceedings of the International Service for National Agricultural Research, Volume .II; Assessing The impact of Agricultural Research. 54pp.

FAO (1996). Food Supply Situation and Crop Prospects in Sub-Sahara Africa. Global Information and Early Warning System on Food and Agriculture. FAO, Rome, Italy. 56pp.

FAO (2000). *Impact assessment of Agricultural Research: Context and state of the Art*. Revised version of a paper presented by the impact assessment and evaluation group (IAEG) of the Consultative Group on International Agricultural Research (CGIAR) for the ASARECA/ ECART/CTA Workshop on Impact Assessment of Agricultural Research in Eastern and Central Africa, Uganda, November 1999, 28pp.

FAO (2003). FAO Bulletin of Statistics, Volume 4 No 1, Rome, Italy 11pp.

FAO (2005). Contribution of Livestock to Poverty Alleviation; Animal production and health (<http://fao.org/ag/ag/project/home.html>) site visited on 12.01.2010.

Frank R., Nancy. M., Bruce, C., Laura, B., and Eric, K. (1999). Food and Nutrition Technical Assistance Project (FANTA), Academy for Educational Development, 1825 Connecticut Avenue, NW, Washington, D.C. 20009-5721. (<http://www.wvafrica.org/index>.) site visited 5.7.2010.

Frankenberger, T. R and Goldestein, D. M. (1991). Linking Household Food Security with Environmental Sustainability through an Analysis of Coping Strategies. In *Growing Our Future*, K.Smith, ed. New York: Kumarian Press.

- Frankenberger, T. R. (1985). *Adding a Food Consumption Perspective to Farming Systems Research*. Report prepared for USDA, Office of International Co-operation and Development, Nutrition Economics Group. Washington D.C.: U.S. Department of Agriculture.
- Haile, A; Joshi, B. K; Ayalewi,W; Tegegne, A. and Singh, A. (2007). Economic comparison of Ethiopian Boran and their Crosses with Holstein in Central Ethiopia. *Ethiopian Journal of Animal Production* 7(1): 77 – 87. <http://ilri.catalog.cgiar.org/dbtw-wpd/exe>.visited on 11.6.2009.
- Household Budget Survey (HBS) Tanzania, (2007). United Republic of Tanzania, Government Printers, Dar-es-Salaam Tanzania.
- Kamuzora, C. L (2001). *Poverty and Family Size*, REPOA Research report No.01.3. Mkuki na Nyota Publishers, Dar-es-Salaam, Tanzania. 34pp.
- Kavishe, F. P (1993). *Nutrition Relevant Actions in Tanzania: Country Case Study Supported by UNICEF*. XV Congress of International Union of Nutritional Sciences. Adelaide, 209pp.
- Kisusu , R.W. (2003). *Adoption and impact of dairy and irrigated rice technologies on poverty alleviation: A case of Dodoma in Tanzania*. A thesis for award of PhD degree at Sokoine University of Agriculture, Morogoro , Tanzania,. 204 pp.
- Kisusu, R. W; Mdoe, N. S. Y; Turuka, F and Mlambiti, M. E. (2002). Contribution of Smallholder dairy Production to food security, household income and Poverty Alleviation: The case of Mvumi Dairy Development Project, Dodoma; In *Tanzania Veterinary Journal* 21(2): 155 – 157.



- Kristensen, E; Larsen, C. E. S; Kyvsgaard, N. C; Madsen, J and Henriksen, J. (2004). Livestock Production – The Twenty First Century’s Food Revolution. Livestock Research for Rural Development.
- Kulwijira, L, R. and Boki, K. J. (2003). A review of the Small Scale Dairy Sector In Tanzania. Milk and dairy products, post harvest losses and food safety in Sub Saharan Africa and the Near East. FAO Prevention of Food Losses Programme 9: 1 - 38.
- Kulwijira, R. L. (1991). Basic Dairy Husbandry and Management Practices under Tropical Environment. Lecture notes for Bachelor of Science Courses at Sokoine University of Agriculture, Morogoro, Tanzania.
- Kulwijira, R. L. (2002a). Dairy Development in Tanzania: Country Paper. In Rangnekar, D and Thorpe, W. (Editors): Smalldairy Production and Marketing; Opportunities and Constraints. Proceedings of a South –South Workshop held at Anand, India, 13<sup>th</sup>- 16<sup>th</sup> March 2001. National Dairy Development Board (NDDB), Anand, India and International Livestock Research Institute (ILRI), Nairobi, Kenya. (<http://ssdairy.org/programme/html>), site visited on 10.06.2009.
- Kyomo, M. L., Maiseli, N. G and Haule, A. (2006). Production of adequate dairy cows in Tanzania and examples of dairy breeding models in Tanga and Kagera milkshed areas, Tanzania. In: Proceedings of the 6<sup>th</sup> National Dairy Development Conference. 2<sup>nd</sup> June 2006, Morogoro, Tanzania, pp. 52 – 67.
- Larenius, C and Skarback, G. (1987). Milk- the new cash crop? A survey of small dairy farms in Rungwe district, Tanzania, 1986. A report from two minor field studies.

- Luoga, W. P. (2005). The effect of market access on dairy performance and market orientation of smallholder farmers in Rungwe District, Mbeya Region. Unpublished MSc. Dissertation, Sokoine University of Agriculture, Morogoro, Tanzania. 135pp.
- Makundi, L. K; Kawa, I. H; Makuki, A. F; Ndunguru, P. C. (2001). Food Security: A review of Tanzanian Situation. Uongozi, *Journal of Management Development* 13 (1): 52 – 61.
- Massae, E. E. (1993). Experience with Dairy Development in Tanzania. In: Seminar Proceedings; Dairy Development Policy and Implementation, 12 – 16 July 1993 Harare, Zimbabwe. pp.56 – 62.
- Mathewman, R.W. (1993). Dairying; the Tropical Agriculture/CTA/ Macmillan. The Macmillan Press Ltd, London and Basingstoke. 152pp.
- Mchau, K.W. (1991). The impact of upgrading the Tanzania Short horn Zebu on Smallholder Dairy Production. Ph.D Thesis. Sokoine University of Agriculture, Morogoro, Tanzania. 180pp.
- Mchonvu, M. N. (2000). Socio-economic factors influencing farmers' participation in the traditional irrigation schemes: A case study of the traditional irrigation improvement programme (TIP) in Kilosa District. Unpublished MSc Dissertation, Sokoine University of Agriculture, Morogoro, Tanzania 117pp.
- Mdoe, N. S. Y and Nyange, D. (1995). Competitive Performance of Formal and Informal Milk Marketing Channels in Northern Tanzania; The case study of Hai district. In: Proceedings of FAO Workshop on Market Orientation of Small Scale Milk Producers and their Organizations. 20– 24 March 1995, Morogoro, Tanzania. pp. 211 – 223.
- Mdoe, N. S. Y and Temu, A. E. (1994). Dairy Production and Food Security in Tanzania: Policies and Future Prospects. Proceedings of the 21<sup>st</sup> Scientific Conference of the Tanzania Society

of Animal Production. 16 – 18 August 1994, Arusha International Conference Centre (AICC), Arusha, Tanzania. pp. 80 – 95.

Mdoe, N. S. Y. and Nyange, D. (1993). Competitive Performance of Formal and Informal Milk Marketing Channels in Northern Tanzania: The case of Hai District. In Seminar Proceedings: Dairy Development Policy and Implementation, Harare, Zimbabwe. pp. 211 – 222.

Mdoe, N. S. Y; Hella, J. P and Turuka, F. M. (1998). Livestock Production and Poverty Alleviation in Tanzania. Tanzania Veterinary Association Journal 18 (4): 239 – 249.

Ministry of Livestock Development (MLD) 2006. Investment Opportunities in the Livestock Industry. (<http://www.mifugo.go.Tz>) site visited on 15.4.2010.

Mlay, P. N. S. (2001). Enhancement of Smallholder Dairy Production Under Tropical Conditions Through Supplementation to optimize Roughage intake, Digestibility and Microbial Protein Synthesis. PhD Thesis (Unpublished). Department of Animal Science and Animal Health. The Royal Veterinary and Agriculture University, Copenhagen.

Mlozi, M. R. S; Lupanga, I. J and Mvena, S. K. Z. (1989). Urban Agriculture: The livestock dimension and its implications. In: Proceedings of the sixth Scientific Conference of the Tanzania Society of Animal Production. Arusha, Tanzania. pp.199 – 200.

MoAC/SUA/ILRI (1998). The Tanzania Dairy Sub-Sector. Collaborative Report by Ministry of Agriculture and Co-operative (MoAC) Dar-es-Salaam, Sokoine University of Agriculture (SUA), Morogoro and International Livestock Research Institute (ILRI), Nairobi, Kenya. February 1998.

Morgan, (1999). Artificial insemination results from A.I, In: Africa farming and processing. Alain Charles Publishing Ltd, London, pp. 15 – 17.

- Moussa, A. A. M (1995). Egypt: Country Status Report. In; Mycobacterium bovis infection in Animals and Humans. (Edited by Thoen, C. O and Steele, J. H.). Iowa State Press/Ames U.S.A pp. 269 – 273
- Mtama, L.Y. (1997). Factors influencing female- headed households' involvement in the Sasakawa Global 2000 in Rukwa Region. Dessertation for Award of Msc Degree at Sokoine University of Agriculture, Morogoro, Tanzania.
- Muriuki, H. G., Mwangi, D. M and Thorpe, W. (2001). How Smallholder Dairy Systems in Kenya contribute to food security and poverty alleviation. Results of Recent Collaborative Studies; In: 28<sup>th</sup> Tanzania Society of Animal Production (TSAP) Conference, 7 – 9 August 2001.
- Mwakalile, I. N; Bachman, F; Mshana, Y. and Mugittu, V. F. (2002). A report on improved livestock management and rural livelihood: Twenty years of experience of Southern Highlands – Dairy Development in Mbeya and Iringa Regions. pp. 35 – 54.
- Mwakalobo, A. and Shively, G. (2001). Food Security and Natural Resource Management in Developing Countries. Staff Paper No. 1-12, Deptment of Agricultural Economics: Purdue University, West Lafayetteee Indiana. 22pp.
- Mwankemwa, A. S. (2004). Performance of saving and credit co-operative societies and their impact on rural livelihoods: A case study of Morogoro rural and Mvomero districts, Tanzania. MSc. Dissertation, Sokoine University of Agriculture, Morogoro, Tanzania. 132pp.
- Mwatawala, H. W. (2006). Evaluation of Performance of Kegera Region herds of cattle. Un published PhD Thesis, Sokoine University of Agriculture, Morogoro, Tanzania 205pp.

- Odhimbo, M. O; Mbagaya, G. M; Onion'go, R. K. (2004). Dairy production: A nutrition Intervention in a sugarcane growing area in Western Kenya. *African Journal of Food Agriculture Nutrition and Development* 4 (1): 204 – 226.
- Paris , T. R. (2000). Crop-Animal Systems in Asia. Socio-economic benefits and impacts On rural livelihoods, *Agricultural Systems*, 71: 147 - 168.
- Prenuishi,G.; Rubio, G; and Subbarao, K. (2000). Monitoring and Evaluation . Source book for Poverty Reduction Strategies. Washington, DC. World Bank. 41pp.
- Rugambwa, V. K; Nholope, D. and Stanslaus, D. (1997). Socio-economic Impact Study of The Kagera Livestock Development Programme (KALIDEP). Unpublished Internal Report.
- Rutamu, I. (2004). Investment Opportunities in the Dairy Sub- Sector of Rwanda. Final Report. [www.rwandinvest.com](http://www.rwandinvest.com) site visited 03.09.2010.
- Rutasitara, L. (2002). Economic Policy and Rural Poverty in Tanzania: A Survey of Three Regions, *Research on Poverty Alleviation (REPOA)*, Research Report No. 02, 1.
- Sansoucy, R; M. A. Jabbar; S. Ehui and H. Fitzhugh (1995). The Contribution of Livestock to food security and Sustainable Development. Proceedings of the joint FAO/ILRI round table on livestock development strategies for low income countries, ILRI, Addis Ababa, Ethiopia, pp. 67 – 106.
- Seireg, M; Zeitlin, M; La Montagne, J; Morales, C. M. (1992). Field Validation of the Tallstick in Marginal Communities in Nicaragua. *Journal of Tropical Paediatrics* 38: 214 – 223.

- Sigot, A; Thrupp, L. A and Green, J. (1995). Gender and Natural Resources Management in Africa. Africa Centre for Technology Studies. Nairobi Kenya. 54pp.
- Staal, S. J; Owango, M; Muriuki, H; Kanywanjui, M; Lukuyu, B; Njoroge, L; Njubi, D; Baltenweek, I; Msembi, F; Bwana, O; Muriuki, K; Gichungu, G; Omore, A ; and Thorpe, W. (2001). Dairy Systems Characterization of the Nairobi milk shed. Application of Spatial and Household Analysis. Kenya Agricultural Research Institute (KARI), Ministry of Agriculture and Rural Development (MoARD)/ International Livestock Research Institute (ILRI), Nairobi, Kenya.
- UNICEF (1985). Programme for Child Survival and Development in Morogoro Region 1987-1991. University of Dar es salaam, Tanzania.46pp.
- Urassa, J. K and Raphael, E. (2001). Contribution of Small-scale dairy farming to community welfare: A case study of Morogoro Municipality. A paper presented at the 19<sup>th</sup> Scientific Conference of Tanzania Veterinary Association (TVA), Arusha, Tanzania. 80pp.
- URT (1992). The National Informal Sector (TNIS), Government Printers, Dar es Salaam.
- URT (2002). Population and Housing Census. Regional and District Census Data in Brief. Central Census Office: National Bureau of Statistics, President's Office, Planning and Privatization, Dar-es-Salaam. June 2004.
- URT (2002b). Poverty and Human Development Report. The Research and Analysis Working Group; Mkuki na Nyota Publishing, Dar-es-Salaam, Tanzania.
- URT (2003b). Poverty Strategy Paper. Vice President's Office. Government Printers, Dar-es-Salaam.

- URT (2006). Ministry of livestock Development: Investment Opportunities in the livestock Industry. [<http://www.mifugo.go.tz>] site visited on 3/3/2010.
- URT (2006). National Sample Census of Agriculture 2002/2003, Volume IV: Smallholder Characteristics and Access to Services and Natural Resources.
- Vaughan, P; Harpham, T; Lusty, T. (1989). Health care: Community Health, Urban Population: Urban Poor, Oxford University Press, Washington D.C. 237pp.
- Vost, R and Witcover, S (Eds), (1992). (Dairy Marketing in Sub- Sahara Africa. Proceedings of a Symposium held at ILCA, Addis Ababa, Ethiopia, 110pp.
- Wagara, A. O. (1991). Simple Quantitative Models and Results from Tanzania Studies. Paper presented at UNICEF/Sokoine University of Agriculture Course in “Food and Nutrition in Society”.
- Walshe, M. J; Grindle, J; Nell, A and Bachmann, M. (1991). Dairy Development in Sub Sahara Africa. A study of Issues and Options: Technical Paper No.135.
- Whelan, W. P. (1983). Inco-operating Nutritional Consideration into Farming Systems Research. In Proceedings of Kansas State University’s 1982 Farming Systems Research Symposium.
- Williams, T. O; Powell, J. M. and Renard, C. (1993). Livestock and Sustainable nutrient cycling in mixed farming systems of Sub-Saharan Africa (SSA): Proceedings of International Conference, International Livestock Centre for Africa (ILCA), 22 - 26 November 1993 Addis Ababa. 560pp.
- Willis and Ackello (1995). Overview of smallholder dairy farming in East Africa. (Edited by G. M Karanja and E. N Sabiti) In: FAO, Proceedings of the workshop on Integrated

Smallholder Dairy Farming Systems in Peri-urban Areas with Emphasis on Forages and Fodder Tree Utilization, Embu, Kenya, 13<sup>th</sup> – 17<sup>th</sup> June 1995.

World Bank (1996). Tanzania: The Challenges to Reforms: Growth , Income and Welfare. Volume II: World Bank Report No. 14952-TA. Washington DC. 123pp.

World Bank, Washington, D.C. World Bank (2003). Agricultural change and food security: *World Development* Kluwer. Academic Publishers, Washington D.C.1 45pp.



## APPENDICES

### Appendix 1: Questionnaire

Questionnaire no.....

#### HOUSEHOLD IDENTIFICATION

Name of the household head -----

Household serial number-----

Village-----

District-----

Ward-----

Date of interview-----

Name of interviewer-----

#### SECTION A: DEMOGRAPHIC INFORMATION

A1. Please, I would like information about your household members or relatives who live in your household and are now staying with you.

S/N.	Name	Relation to HH	Sex	Main Occupation	Age	Education	Marital. Status (>15yrs)
No	1	2	3	4	5	6	7
1							
2							
3							
4							
5							
8							

Key:

<b>Quest.2:</b>	<b>Qn 3.</b>	<b>Qn 4</b>	<b>Qn 6.</b>	<b>Qn. 7.</b>
1= Head of HH	1 =Male	1=Farming crops only	1 = none	1 = Engaged
2 = Wife/Husband	2 = Female	2=Dairy cattle and crops	2 = standard 7	2 = married
3 = Son/Daughter		3=Local cattle and crops	3 = form 4	3 = widowed
4 = Relative		4=Wage employee	4 = form 6	4 =living with partner
5 = House helper.		5=Non farm activity.	5 = College (diploma; degree)	5 = divorced
6 =Other (specify)				6 =separated

A2. Do you own land?

Yes.....1

No.....2

A3. How did you acquire land?

Purchase.....1

Rented..... 2

Inherited.....3

others (specify).....4

A4. How big is your land.....acres.

A5 Have you expanded your acreage for the past five years? Yes....1 No.....2.

Specify the means for expanding.....

## **SECTION B: MILK PRODUCTION.**

B1.How many dairy cattle do you have?

1.adult cows.....3.adult bulls.....

2.young heifers.....4.young bulls.....

5.female calves.....6.male calves.....

B2. How many cows are producing milk now?.....

B3. How many months do you normally milk a cow after calving?.....months.

B4. How much milk do you normally get per cow per day?.....liters/day.

B5. How much milk do you consume at the household per day?.....liters/day.

B6. How much milk do you sell per day?.....liters/day.

B7. What is the price of milk/..... Tshs/liter.

B8. How many live animals do you sell per year?.....

B9. What is the price per animal?.....Tshs.

### SECTION C: INCOME

C1. What were income from crop farming during the last (2008/09) season?

Crop	Type of produce	Amount produced (specify units)	Amount sold (specify units)	Selling price per unit (e.g.shs/bag)	Income (Tshs)

C2. What were the income from the dairy cattle farming during the last (2008/09) season?

Type of Produce	Amount produced (specify units)	Amount sold (specify units)	Selling price per unit (e.g. shs/liter of milk)	Income (Tshs)
Milk				
Live animal sold				
Slaughtered animal				
Other (specify) e.g. cow dung manure.				

C3. What were the non- and off- farm sources of income for your household in 2008/09 season?

Income Source	Amount (Tshs)
Employment (wages)	
Small scale mining	
Timber (lumbering)	
Bee-keeping	
Hunting	

Others (specify)e.g. charcoal making	
--------------------------------------	--

C4. Would you say your household income has increased, remained more or less the same or decreased after getting dairy cattle from ADP-World Vision Program? (Tick as appropriate): 1. Increased..... 2.Remained more or less the same (no change)..... 3.Decreased.....

C5. How reliable is income obtained from a dairy cattle farming?

1. Very reliable.
2. Some how reliable
3. Less reliable
4. Not reliable at all.

C6. Please provide the following information on control over income and access to income/benefits derived from your produce by gender.

Produce	Control of income				Access to income / benefits			
	Husband	Wife	Youth	All members	Husband	Wife	Youth	All members.
1.Milk								
2.Sold live dairy cattle								
3.								
4.								

C7. Who is usually involved in marketing agricultural/dairy products?(tick)

- 1.Husband.....
2. Wife.....
- 3.Youths.....
- 4.Both husband and wife.....
5. All household members.....

8. Have you received any cash income in the past 12 months ?

1. Yes-----
2. No-----

9. If yes, what are the main sources of household income? mainly from

1. Wages-----

- 2. Crop sales-----
- 3. Livestock sales (live dairy animal)-----
- 4. Livestock sales (slaughtered dairy animal)-----
- 5. Livestock sales (Milk)-----
- 6. No reliable source-----
- 7. Business income -----
- 8. Credit-----

10. How much income did you receive?----- Tshs.

11. Is your wife/husband currently

- 1. Self- employed-----
- 2. Wage employed -----
- 3. Not working -----

12. Has your wife/Husband received any cash income in the past 12 months?

- 1. Yes -----
- 2. No -----

13. If yes, mainly from

- 1. Wages -----
- 2. Crop sales -----
- 3. Livestock sale (live dairy animal) -----
- 4. Livestock sales (slaughtered dairy animal) -----
- 5. Livestock sales (milk sales) -----
- 6. No reliable source -----
- 7. Business income -----
- 8. Credit -----

14. How much income did he/she received? ----- Tshs.

**SECTION D: HOUSEHOLD FOOD SECURITY**

D1. Rank the sources of food in your household in 2008/09 in order of importance (Most important = 1)

Source of food	Rank
Own farm	
Purchase	
Given by neighbors/friends/relatives	
Church / other charitable organization	
Government	

D2. On average, how many months in a year is your household able to adequately feed itself?.....(number of months).

D3. Are you able to feed yourself from own produced food or own produced and purchases?.....

D4. On average, how many meals per day can your household provide to its members.....(number of meals ).

D5. What food items do you consider to be luxury or of high value?.....  
 .....

D6. How often do you consume these high value foods per week? (tick)  
 1.very often..... 2.Often..... 3.Rarely..... 4.Not at all.....

D7. Compared to the past, how has the food security situation improved, remained the same or decrease over the past 3 to 5 years? (tick).  
 1.Increased..... 2.Remained the same..... 3.Decreased.....

D8. Do you have any other activity besides dairy cattle keeping, which contributes to your income? Yes/No.

D9. If Yes, which ones:  
 i).....ii).....iii).....iv)  
 .....

D10. Specify the contribution (estimated) of each activity:  
 i).....Tshs/year ii).....Tshs/year; iii).....Tshs/year; iv).....Tshs/yr

D11. What is the contribution of these activities to the family food?

i).....Tshs/year; ii).....Tshs/yaer; iii).....Tshs/year; iv) Tshs/yr

D12. What are the most important staple foods of the family?

i).....; ii).....; iii).....; iv).....

D13.What are the household food requirements/year.....

Elaborate please;.....

D14 Is output obtained from the dairy cattle farming (money/milk sales) enough for the food in your family? Yes/No.

i) If No; Explain .....

ii) If Yes; for how long? (months).....

D15 Do you experience food shortage in this household? Yes/ No.

i) Which months (If Yes).....

ii) What are the main causes of food insecurity in your household?.....

D16. How do you cope during food

shortage?.....

What is your suggestion on solving food insecurity problem in this

village.....

**SECTION E: FOOD QUALITY**

17: Did you eat the following types of food last week?

Type of food	Yes.....1	Frequency (no of days per week)
	No.....2	
Maize		
Millet		
Cassava		
Rice		
Sweet Potatoes		
Beans		
Milk		
Meat		
Eggs		
Fish		
Chicken		

Yellow grams		
Ground nuts		
Any(specify)		

18. Yesterday how many meals did your household have.....for adults, and  
.....for children (0.5 years).

**+SECTION F: ASSET AND EXPENDITURE**

19. Now I'm going to mention some of domestic animals, please tell me if you keep any  
of the following animals.

Item	1 .Yes    2. No	Quantity: No.(and source of money; dairy cattle or others-specify please).
Cattle (local/non-dairy)		
Cattle ( dairy type)		
Goats		
Sheep		
Pig		
Poultry		
Other animals e.g dog, cat		

20. I am mentioning some of household items. Please tell me if you own any of these/  
items and source of income for purchasing them.

Item	1. Yes 2 . No	Quantity	Source of money (Dairy cattle, or others, specify)
Bicycle			
Pressure Lantern /Kerosene lamp			
Radio receiver			
Couches/chairs set			
Clock/Watch			
Mattress/ bed/mosquito net.			
Sewing machine			
Ox-plough			

21. Do you own land?

1. YES
2. No.



22. How did you acquire land? (And source of money to acquire this land)

- 1. Purchase
- 2. Rented
- 3. Inherited
- 4. Other (specify)

23. How big is your land?.....acres.

24. Have you expanded your acreage for the past five years? 1. Yes 2. No

Specify the means for .....

25. Do you have any comment / suggestion which you think is important with regard to;

i) household income generation?

.....

ii) Household food security?

.....  
.....

iii) Household assets ownership?

.....  
.....

**THANK YOU FOR YOUR GOOD COOPERATION.**

**Appendix 2: Checklist for District Agriculture and Livestock Development Officer/  
ADP-Manager**

1. May I know your designation?.....
2. How long have you been with this office at this title.....years
3. When did the programme (ADP-World Vision) start.....
  
4. When did your office start to cooperate with this (ADP- World Vision) program  
.....
5. How do you cooperate /consult in terms of technical services between the district and  
ADP- World Vision Program? .....  
.....  
.....
- 6.What are the criteria / procedure for deciding whom to give a dairy  
cow? .....  
.....  
.....
  
7. Please can we know the number of dairy cattle that has the ADP-World Vision  
distributed to households in the villages within this district?.....8.as  
well as the amount of milk produced,.....9 and the  
income earned by households per year? .....
  
- 10.To what extent has the ADP- World Vision succeeded in this district so  
far.....  
.....
  
11. What major problems do you encounter when implementing the ADP-World Vision  
program?  
i).....  
ii).....

**THANK YOU FOR YOUR CO-OPERATION**

