

**THE IMPACT OF DAIRY PRODUCTION ON RURAL LIVELIHOODS IN
HAI DISTRICT, TANZANIA**

BY

ELIA NICODEMUS MACHANGE

**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN
AGRICULTURAL EDUCATION AND EXTENSION OF SOKOINE UNIVERSITY
OF AGRICULTURE. MOROGORO, TANZANIA.**

2010

ABSTRACT

This study was conducted in Hai District, Kilimanjaro Region in order to determine the impact of milk production on rural livelihood. Specifically the study aimed to (i) determine levels of milk production among small scale dairy farmers (ii) explore market outlets of milk produced by dairy cattle keepers and (iii) assess impact of milk production on livelihoods. The study used both primary and secondary data. Primary data were collected from household survey in the study area using structured questionnaires. The collected secondary data included records of milk production, marketing and consumption. These were obtained from the District Livestock Development Office and from dairy cooperative office. Data were coded, entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 16 computer program. Descriptive statistics particularly frequencies and percentages were deployed in the analysis. Results of the study as per objective shows that, annual milk production ranged from a minimum of 600 litres per cow per year to a maximum of 3600 liters per cow per year. Furthermore, the result revealed that 37.1% of the respondents sold their milk to restaurant owners where 35.3% sold their milk to the dairy cooperative milk collection centers. Others sold their milk to milk vendor (19%), schools (6%) and 1.7% of them sold milk to other outlets including kiosk. Moreover, the study also showed that dairy production contributed directly to food security through consumption of milk and use of milk income to purchase food and household assets. It is therefore recommended that deliberate efforts should be made to promote small scale dairy cattle production. Furthermore, it is recommended that reliable market be provided to milk producer in order to encourage the smallholder farmers to increase milk production.

DECLARATION

I, ELIA NICODEMUS MACHANGE, 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.

ELIA NICODEMUS MACHANGE

(MSc Agricultural Education and Extension)

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 am greatly indebted to all individuals whose support, encouragement and assistance enabled me to complete this study. Above all I thank the Almighty God for keeping me alive and healthy during the entire period of my postgraduate studies. I will always praise him and seek his intervention when faced with problems beyond my capacity.

My sincere gratitude and heartfelt appreciation go to my supervisor Dr. D. L. Mwaseba of the Department of Agricultural Education and Extension at the Sokoine University of Agriculture (SUA) for his tireless guidance, close supervision and constructive challenges throughout the study.

My deepest appreciation should also go to all staff of the Department of Agricultural Education and Extension at SUA and my fellow students for their useful encouragement and criticisms during the early stages of proposal development.

Finally, very special thanks go to my beloved wife Agnes Machange who supported and encouraged me during the study. I appreciate and am indebted for her endurance, patience, and for shouldering the household responsibility during my absence. Without her assistance and strong support, I would have never reached this point. I also wish to express deep thanks to our children Amani, Agape, Aika and Albert for their patience, love, understanding, moral support and prayers throughout my study.

DEDICATION

To my late father Nicodemus and my mother Elingikundisa Mariu who laid the foundation for my education.

TABLE OF CONTENTS

ABSTRACT.....	ii
DECLARATION.....	iii
COPYRIGHT.....	iv
ACKNOWLEDGEMENTS.....	v
DEDICATION.....	vi
TABLE OF CONTENTS.....	vii
LIST OF TABLES.....	xi
LIST OF APPENDICES.....	xii
LIST OF ABBREVIATIONS.....	xiii
CHAPTER ONE.....	1
1.0 INTRODUCTION.....	1
1.1 Background Information.....	1
1.2 Dairy Production in Hai District.....	2
1.3 Problem Statement.....	3
1.4 Justification of the Study.....	3
1.5 Objectives of the Study.....	4
1.5.1 General objective.....	4
1.5.2 Specific objectives.....	4
CHAPTER TWO.....	5
2.0 LITERATURE REVIEW.....	5
2.1 Concept of Livelihood.....	5
2.2 Concept of Impact, Income, Food Security and Assets.....	5

2.2.1	Impact.....	5
2.2.2	Income.....	6
2.2.3	Food security.....	6
2.2.4	Assets.....	7
2.3	Milk Production.....	7
2.4	Milk Market Outlets.....	8
2.5	Milk Consumption.....	10
2.6	Impact of Milk Production on Livelihood.....	10
2.6.1	Impact of milk production on household income.....	10
2.6.2	Impact of milk production on household food security.....	11
2.6.3	Impact of milk production on household asset.....	12
CHAPTER THREE.....		13
3.0 METHODOLOGY.....		13
3.1	Location of the Study Area.....	13
3.2	Research Design.....	13
3.3	Sampling Procedure.....	13
3.4	Population and Sampling Procedure.....	14
3.5	Data Collection Method.....	14
3.5.1	Primary data collection.....	14
3.5.2	Secondary data.....	14
3.6	Data Analysis.....	15
CHAPTER FOUR.....		16
4.0 RESULTS AND DISCUSSION.....		16
4.1	Overview.....	16

4.2	Socio-economic Characteristics of the Respondents.....	16
4.2.1	Age.....	16
4.2.2	Sex.....	17
4.2.3	Marital status.....	17
4.2.4	Level of education.....	18
4.3	Dairy Cattle Milk Production.....	18
4.3.1	Experience in keeping dairy cattle.....	18
4.3.2	Acquisition of dairy cattle.....	19
4.3.3	Reasons for keeping dairy cattle.....	20
4.3.4	Livestock feeding materials.....	20
4.4	Levels of Milk Production.....	21
4.4.1	Milk production.....	21
4.4.2	Constraints affecting milk production.....	22
4.5	Milk Marketing Outlets.....	22
4.5.1	Milk marketing.....	22
4.5.2	Problems encountered in selling milk.....	23
4.6	Impact of Milk Production on Livelihood.....	23
4.6.1	Impact on income.....	24
4.6.1.1	Status of household income.....	24
4.6.1.2	Distribution of annual income from milk.....	24
4.6.1.3	Expenditure of income derived from milk.....	24
4.6.2	Impact of milk production on household food security.....	25
4.6.3	Household assets purchased using income derived from milk.....	26
	CHAPTER FIVE.....	27
	5.0 CONCLUSIONS AND RECOMMENDATIONS.....	27

5.1	Conclusions.....	27
5.1.1	Level of milk production among dairy cattle keeping households.....	27
5.1.2	Market outlets of milk.....	27
5.1.3	Impact of milk production on livelihood in terms of income, food security and assets.....	28
5.2	Recommendations.....	28
	REFERENCES.....	29
	APPENDICES.....	38

LIST OF TABLES

Table 1: Age.....	17
Table 2: Sex.....	17
Table 3: Marital status.....	18
Table 4: Level of education.....	18
Table 5: Experience in keeping dairy cattle.....	19
Table 6: Acquisition of dairy cattle.....	19
Table 7: Reasons for keeping dairy cattle.....	20
Table 8: Feeding materials.....	20
Table 9: Average annual milk production per animal from July 2008 to June 2009.....	21
Table 10: Constraints on milk production.....	22
Table 11: Milk marketing outlets.....	23
Table 12: Problems encountered in selling milk.....	23
Table 13: Impact of milk production on household income.....	24
Table 14: Distribution of annual income from milk.....	24
Table 15: Expenditure of income derived from milk.....	25
Table 16: Impact of milk production on household food security.....	25
Table 17: Assets purchased using income derived from milk.....	26

LIST OF APPENDICES

Appendix 1: Questionnaire for Small Scale Dairy Cattle Farmers.....38

Appendix 2: Checklist Questions for Dairy Cooperative Society Managers.....44

LIST OF ABBREVIATIONS

AI	-	Artificial Insemination
FAO	-	Food and Agriculture Organization
GDP	-	Gross Domestic Product
HIT	-	Heifer International Tanzania
IFAD	-	International Fund for Agricultural Development
ILRI	-	International Livestock Research Institute
MoAC	-	Ministry of Agriculture and Cooperatives
MWLD	-	Ministry of Water and Livestock Development
NGOs	-	Non Governmental Organizations
SACCOS	-	Savings and Credit Cooperative Societies
SPSS	-	Statistical Package for Social Sciences
SUA	-	Sokoine University of Agriculture
TAS	-	Tanzanian Shillings
TDL	-	Tanzania Dairies Limited
UHT	-	Ultra High Temperature
UNDP	-	United Nations Development Programme
URT	-	United Republic of Tanzania

CHAPTER ONE

1. 0 INTRODUCTION

1. 1 Background Information

Cow milk is an important protein source that is universally accepted and consumed by majority of the world population wherever cattle are raised. World milk production from cattle is estimated at 502 325 000 metric tons per year (FAO, 2003a) 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 produce less than 4% of global milk produce, with an average cow producing only 454 litres/year (Morgan 1999). Africa is estimated to produce 20 643 000 metric tons of milk annually.

Tanzania produced a total of 1.426 billion litres in 2006/07 from her herd of 18.8 million zebu and 560 000 crossbreed cattle. The production per cow is low, being 200 liters and 1800 litres/per annum for zebu and crossed breed respectively. An estimated 680 million liters of milk is consumed on-farm and about 210 million liters is marketed of which about 40 million liters is processed, thus contributing to household food (Urassa, 1999; Kurwijila and Boki, 2003). Currently, only a small proportion, (10% of marketable surplus of milk produced annually) is filtering through, into the urban markets and processing plants. Remoteness and poor infrastructures constitute the largest bottlenecks to collection and marketing of milk. Thus the milk produced is mostly consumed locally and quite often a significant amount is left for the calves (MWLD, 2006).

Furthermore, milk production in many parts of Tanzania is vital as it provides a major opportunity for poverty alleviation of smallholder farmers through sale of milk and it is sometimes the major source of animal protein in the human diet in rural areas.

Recommended milk consumption for the world stands at 105 litres/capita/year (URT, 2002). Milk consumption in Tanzania is estimated at 39 litres/capita/year, which is below the recommended consumption for Africa and far below that recommended for the world (URT, 2002). Kurwijila (2002a) reported that milk consumption has risen faster in urban and peri-urban areas of Tanzania than rural areas because of the growth in peri-urban dairy herds and the increased availability of milk and dairy products for urban consumer.

1.2 Dairy Production in Hai District

Livestock production is an integral part of the farming system in Hai District (Mdoe, 1993). Hai District dairying has been expanding, resulting in milk production above the amount that can be consumed locally in dairy producing villages. Low cash crop prices have made dairying an important income earner. However, development of smallholder dairy systems has been marked by declining farm size, upgrading to dairy breeds and an increasing reliance on purchased feeds both concentrates and forage. The dairy sub sector needs more inputs in terms of credit to farmers, feeds, pharmaceuticals and availability of milk processing plants to achieve optimal growth and good return to farmers. In late 1980 there were few research programmes conducted in Hai District on dairy cattle milk production. The study conducted by Urio and Mlay (1984) shows that dairy animal feeds are one of the major constraints facing small scale dairy cattle keepers. Grass carried on one head is not enough to feed dairy animal regardless of the quality and quantity. A survey of the marketing system for dairy products in Hai District suggests the absence of milk cooperative groups as marketing agents. The presence of a large number of small milk traders suggests that the market for dairy products in Hai District and nearby areas is competitive and not in the hands of few operators. In joining together to form more

cooperatives to undertake milk-marketing functions, dairy producers are setting up alternative marketing channels to those already available and thus raising the level of competition. These cooperatives are contributing effectively to market efficiency, by providing competition needed to prevent other market intermediaries from paying the farmers too little (Mdoe and Kurwijila, 1998).

1.3 Problem Statement

Small scale dairy production is important to the economy of Hai District as it contributes directly to the household economy and employment. Despite this, there are some constraints which hinder increased production. Such constraints include unavailability of credit, poor feeding due to lack of improved pasture and concentrates, low potential animal, land tenure, poor milk equipment and cooling facilities. Although many studies have been conducted in Hai District about dairy farming production, most of them concentrated on feeding, milk marketing, and fodder production (Urio and Mlay, 1984; Urio, 1985; Mdoe, 1998). However there is no up-to-date information about the impact of small scale dairy farming and the contribution of milk to the livelihood of rural households keeping dairy cattle. Thus this study will document and explore the impact of dairy production on rural livelihood in Hai District Tanzania.

1.4 Justification of the Study

In many parts of Tanzania milk production is vital as it provides a major opportunity for poverty alleviation of small scale dairy farmers through sale of milk, and is sometimes the major source of animal protein in the human diet in rural areas. Improving small scale dairy production is considered to be cost effective in increasing the availability of milk for public consumption and also improving the economic status of small scale dairy farmers. This research is important since it will generate information on the contribution of small scale dairy farming to poverty reduction through improvement of the small scale dairy

farmers, income and food. Such information could inform the design of relevant interventions aimed at improving the development of smallholder dairy production in Tanzania.

1.5 Objectives of the Study

1.5.1 General objective

To investigate the impact of dairy milk production on rural livelihoods in Hai District.

1.5.2 Specific objectives

1. To determine the level of milk production among dairy cattle keeping households.
2. To explore market outlets of milk produced by small scale dairy cattle keepers.
3. To assess the impact of small scale dairy milk production on livelihoods in terms of income, food and assets.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Concept of Livelihood

The “livelihood” concept has been extensively discussed among academics and development practitioners (Chambers and Conway, 1992; Bernstein *et al.*, 1992; Ellis, 1998; Carney, 1998; Francis, 2000, 2002; Batterbury, 2001; Radoki, 2002). Generally, there is a consensus that livelihood is about the ways and means of ‘making a living’. However, different authors have defined and discussed livelihood in different ways. For example, according to Carney (1998) a livelihood comprises the capabilities, assets both material and social resources and activities required for a means of living.’ On the other hand, Ellis (2000) defined livelihood as ‘the activities, the assets, and the access that jointly determine the living gained by an individual or household’. Generally, these definitions and interpretations share common meaning that ‘livelihood’ deals with people, their resources and their utilization which has an impact on the livelihood.

2.2 Concept of Impact, Income, Food Security and Assets

2.2.1 Impact

According to FAO (2000a) impact refers to “the broad, long- term economic, social and environmental effects resulting from an intervention”. Furthermore, FAO(2000b) argues that 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. Like crop production, contribution of milk in livelihood is highly appreciated. Its impact on livelihood is not limited to income and food security alone; it goes beyond to acquisition of assets. Impact can be measured using intermediate goals and objectives of an intervention. In this study impact is simply measured in terms of income, food security and assets.

2.2.2 Income

The word income has been defined by several authors in various ways. Barr (2004) defined household income as the consumption and savings opportunity gained by an entity within a specified time frame, which is generally expressed in monetary terms. He concluded that households and individual's income is the "sum of all the wages, salaries, profits, interest 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 (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 irregular and typically one time receipts (Case and Fair, 2007). They further comment that household income receipts are available for current consumption and do not reduce the net worth of the household through a reduction of its cash, the disposal of its other financial or non-financial assets or an increase in its liabilities. In the context of this study income is defined as total amount of money which small scale dairy cattle keepers get from selling of milk and its products, manure, live animal and hides.

2.2.3 Food security

Food security is defined as a situation whereby 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, 2003b). It is further argued that food security is mostly concerned with food supply, usually in the form of grain stock and is applied at regional or district level. The definition is also supported by World Bank (2003:145) which defines food security as the access by all people at all times to enough

food for an active and healthy life. However, according to the World Bank, food security encompasses many issues: It deals with production in relation to food availability, distribution and consumption for the health of individuals. In the country which depends on agriculture like Tanzania its food security can be attained mainly through improved crop and livestock production.

2.2.4 Assets

Chimilila (2005) defined an asset as any item having economic value that is owned by an institution or an 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). According to Ellis (2000) assets are defined as: human capital, physical capital, social capital, financial capital and natural capital. Chimilila (2005) shows that, assets that people pursue depend heavily on the resources they can access (by owning the resource, borrowing or renting) and use. All these forms of assets by one way or another can be acquired through income from milk. Thus the impact can be assessed in terms of household assets. The assets available to the household represent the basic platform upon which the household livelihood may be built.

2.3 Milk Production

According to a report by FAO (2008) global milk production is estimated to expand by 2.2 % to 693 million tons in 2008 and by another 2.5 % to almost 710 million tons in 2009, a far slower pace than in recent years. This growth prospects have been affected by a number of factors as international markets have been responding to the historically high international price levels of the past two years. Therefore on balance, prospects for the

world's six major milk product exporters, which supply 77 percent of global trade, have improved somewhat in recent months. Their milk production is now expected to amount to 280 million tons (or 40 % of global production) and to grow 1.5 % in 2009.

Milk production in Africa is anticipated to advance by 1 % in 2008, consistently below world average growth, showing weaker supply response to the price spike according to FAO (2008). Most of the milk produced in Tanzania is reported in a study by Kyomo *et al.* (2006) is from northern regions of Tanzania (Kilimanjaro, Arusha, Mwanza, and Mara) with only small amounts of milk produced coming from eastern parts including Morogoro. According to Ministry of water and Livestock Development (MWLD) milk production in Tanzania is still low and does not meet the growing demand from the increasing human population (MWLD, 2003). Although MWLD reports that Tanzania produced a total of 1.426 billion litres of milk per annum this amount is still low and most are consumed at farm level.

However, there are cases where high quantity of milk production has been recorded for example Hai district in Kilimanjaro region have recorded high quantity of milk production beyond the amount that can be consumed locally in dairy producing villages (Mdoe and Nyange, 1995).

2.4 Milk Market Outlets

Milk marketing in Tanzania has been studied by several researchers including, Kurwijila *et al.* (2003), who found that most of the small scale dairy farmers sell their milk to the cooperatives and self help groups. As observed by Omore *et al.* (2004) raw milk is the primary product sold in most areas, although in some parts of Tanzania like Mwanza, cultured milk is important. The milk markets display a wide variety of interactions between

market agents and market channels. In some cases milk producers sell raw milk directly to consumers, with no other intermediaries while in other cases the trader also played the role of middlemen, by selling directly to the consumers (Omore *et al.*, 2004).

A report by FAO (2008) describes an efficient milk marketing chain as one which enables farmers to receive at least 50% of the retail price of milk. In their observation the number of intermediaries involved will have a bearing on both producer and consumers milk price. The shorter the channel the more likely that the consumer price will be low and the producer will get a higher return. In general as observed by Mdoe and Nyange (1995), the overall picture of milk marketing system in Tanzania is characterized by multitude of channels and relatively long market chains, which tend to increase in complexity in larger urban areas where demand may be more differentiated.

Furthermore, Mdoe *et al.* (2002) reported that most development economists seem to believe that improvement in milk marketing systems is desirable for small dairy producers and traders, and more generally the poor in low income countries. Yet in allocating resources to promote dairy development in poor communities, the tendency has been to emphasize production and neglect investment in marketing. They argue that, relatively large investments are made in research, training and extension to promote milk production without similar investments designed to improve the milk marketing systems. Mdoe and Mnenwa (2004) point out that, constraints in milk marketing appear to exceed the advantages, despite the opportunities available for dairying in Tanzania. Also Mdoe (1993) reported that in Hai District, the opportunity of selling the surplus milk directly to consumers in the dairy producing villages has been declining over time due to increase in the number of households keeping dairy cattle.

2.5 Milk Consumption

Milk consumption and production are somehow related. In fact Mutagwaba (2005) reported that, consumption of milk has a catalytic effect in improving levels of milk production and processing. Thus the author calls for concerted efforts in cultivating a habit of taking milk as food/ drink especially by children hence the continued efforts in promoting milk consumption through annual milk consumption events such as annual milk week and school milk feeding programmes. Kurwijila and Boki (2003) reported that most of the milk produced in the country is consumed at farm level or sold to neighbors. Mwijarubi (2007) show that, volume of milk consumed in household per day remains too low and sometimes milk remain as food for children. The cause for such a low consumption rate in Tanzania, among others, is attributed to low production, cultural beliefs and traditional taboos making people refrain from consuming milk. The other important reason behind low milk consumption according to the author is that, most Tanzanians mainly from non cattle keeping communities do not have a milk drinking habit.

2.6 Impact of Milk Production on Livelihood

2.6.1 Impact of milk production on household income

For most farmers, the assurance of a daily income from milk sales is an important feature in their livelihood (Utiger *et al.*, 2000). In a similar study conducted in Morogoro Municipality by Urassa and Raphael (2002) it was found that income or profit from the dairy enterprise is mainly used on the following activities: furnishing houses, house, construction/ rehabilitation, investing in other income generating activities, education and on other things (such food, health services). Thus, there are many advantages that small scale dairy farming brings to a community, but the most measurable is its impact on the income.

Furthermore a study conducted in southern highlands of Tanzania by 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 their dairy business. Utiger (2000) established that, in two districts in Kenya, dairy cattle farming was cited as the most valued source of livelihood in terms of its profit, dependability and utility. The highest ranked advantage associated with dairy farming was milk for home consumption and income, followed in order of importance by manure production, direct income from the sale of livestock, meat, and self employment, resource for bride wealth and prestige, and bio-fuel. In essence, the advantages of dairy farming are tied to its dependability and reliability as a source of income.

2.6.2 Impact of milk production on household food security

It has been evident that, dairy cattle production contributes to household food security either directly through consumption of dairy cattle products or indirectly through use of income obtained from sales of dairy cattle products to purchase other food items (Minja, 2007). In Kagera Region Lwelamira *et al.* (2010) observed that apart from household income and values of durable assets, dairy farming households are better-off nutritionally compared to non-dairy farmers and hence relatively more food secure. The study indicates the potential role played by small scale dairy farming in reducing malnutrition whereby frequency of intake of milk as nutritious food stuffs, differed significantly between categories of dairy farmers and non-dairy farmers.

According to 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 animals 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.

Similarly, 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.

2.6.3 Impact of milk production on household asset

Income obtained as a result of milk sales has significantly contributed to household assets. In a study conducted in Kagera Region by Lwelamira *et al.* (2010) showed that dairy farming households had significantly higher average annual income and were relatively better off in terms of value of assets owned compared to their counterparts. Furthermore, a study in southern highlands of Tanzania by Bayer and Kapunda (2006) reported that income from milk sales helped some smallholder families acquire assets like land and improve their house. Likewise Mwankemwa (2004) reported that household income, current value of durable assets and food security status of a household are among the measures of household welfare.

3.0 METHODOLOGY

In this chapter the following will be reviewed, the location of the study area, research design, sample procedure, population and sampling procedure, data collection method and data analysis.

3.1 Location of the Study Area

Hai District is located on the western part of Kilimanjaro Region. The District is bordered by Arumeru District to the west, Simanjiro District to the south, Moshi District to the east and Siha District to the north. Hai District has a population of 256 958 people. The number of household is 58 056 with an average of 4.5 people. The District, although classified as tropical savannah area, has considerable climatic variation due to influence of Kilimanjaro Mountain situated to the north eastern corner of the District. The rainfall ranges from 2000mm on the south slope of mountain Kilimanjaro to 400 mm in low land areas (URT, 2002).

3.2 Research Design

A cross-sectional design was used in collecting data. This allows collection of data at one point in time (Babbie, 1990). Because of limited time and resources for data collection, information on households status were obtained from a randomly selected sample of small scale dairy farmers; in this case the treatment/intervention was dairy farming.

3.3 Sampling Procedure

Two out of the three Divisions in Hai District were selected purposively because they are the ones with large number of dairy cattle. These are Machame and Masama Divisions. Two wards were selected randomly from each division, that is: Machame North, Machame West in Machame Division, and Masama East and Masama West in Masama Division.

3.4 Population and Sampling Procedure

The population for this study was composed of 69 410 small scale dairy farmers in Hai District. Proportionate sampling was used to obtain the actual number of respondents from each Ward in order to come up with appropriate sample size. Thus Machame North, Machame West, Masama West and Masama East with 22 464, 5 622, 20 574 and 20 750 dairy farmers respectively; contributed 39, 10, 35 and 36 respondents in that order making a sample size of 120 respondents.

3.5 Data Collection Method

Both primary and secondary data were collected as detailed below.

3.5.1 Primary data collection

Primary data were collected using an interview schedule at the respondents' homesteads. To ensure validity the first draft of the interview schedule was pre-tested in the study area. Necessary changes were made to the schedule based on the pre-testing results before administering it.

3.5.2 Secondary data

Secondary data related to the records of milk production, marketing, consumption, achievement and problems were involved during reviewing of literature from books, journals, websites, thesis, and unpublished reports at SUA National Agricultural Library (SNAL). Furthermore, details of the amount of milk produced and sold were obtained from the dairy co-operative office and district livestock office. The data were useful to identify the trend and status of milk production in the study area.

3.6 Data Analysis

Data collected were sorted, coded and statistically analyzed using the Statistical Package for Social Sciences, (SPSS) version 16.0 computer software. Descriptive statistics, particularly frequency distribution, percentages, cross tabulation, and comparison of mean were done.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Overview

This chapter presents results from the study. It consists of five sections; the first section describes the socio-economic characteristics of the respondents. The second section describes small scale dairy cattle production which includes size of the land owned and how the land was acquired. It also describes other types of livestock kept, duration of keeping dairy cattle, reasons for keeping dairy cattle, experience of keeping dairy cattle, and source of material to feed the animal, and the feed of concentrates and minerals. The third section presents the levels of milk production, number of cows milked and amount of milk produced and consumed at household level per day. The fourth section explains how milk is marketed and the problems faced in selling it. Lastly in section, the study presents the impact of milk production on income, food security and assets, by showing expenditure derived from milk, status of food security and the assets purchased by using income derived from milk.

4.2 Socio-economic Characteristics of the Respondents

4.2.1 Age

Table 1 presents the age distribution by respondents where it is shown that 55% of respondents fall within the 41-60 years age bracket, with about 21% and 24% falling in the 20-40 and 61-80 year age bracket respectively. Age can affect experience, wealth and decision making which in turn affects how one works and hence can influence individual productivity. Indeed the age of an individual has an influence on productivity as well as milk consumption (Singh *et al.*, 2003). 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.

Table 1: Age distribution of respondents

Age (years)	Respondents (N=120)	
	Frequency	Percentage
20-40	25	20.8
41-60	66	55.0
61-80	29	24.2
Total	120	100.0

4.2.2 Sex

In the present study both male and female small scale dairy farmers were interviewed. There were 58.3 % and 41.7 % male and female respondents respectively (Table 2). The higher population of male respondents shows that they are actively engaged in dairying than female respondents. In actual fact some women refused to be interviewed on the ground that their husbands were more conversant as they were the ones who did most of the management and supervisory work concerning dairy farming. Similar observations have been reported in Tanga region by Mulangila *et al.* (1997) and in Turiani by Mollel *et al.* (1999).

Table 2: Sex of respondents

Sex	Respondents (N=120)	
	Frequency	Percentage
Male	70	58.3
Female	50	41.7
Total	120	100.0

4.2.3 Marital status

Table 3 presents the marital status of the respondents. According to the table, majority (84.2%) of the respondents were married. On the other hand, 9.1% were widowed, 2.5 % were single, 1.7% were divorced, 1.7% separated and 0.8% live with partners. Novart (2005) asserts that married couples are likely to be more productive than single ones because married women or men provide extra labour in accomplishing farm and non-farm activities.

Table 3: Marital status of respondents

Status	Respondents (N=120)	
	Frequency	Percentage
Married	101	84.2
Widow	11	9.1
Single	3	2.5
Divorced	2	1.7
Separated	2	1.7
Live with partner	1	0.8
Total	120	100.0

4.2.4 Level of education

Survey results, according to Table 4, show that 64.2% of the respondents had primary level of education, while 27.5% had ordinary level secondary education. Moreover, about 8% (7.5%) had college level education where respondents who had no formal education consist only 0.8% of the sample (Table 4). Level of education of farmers is very important as it influences their ability to utilize efficiently the advice and information offered by the extension services and development agents (Regnar *et al.*, 2002).

Table 4: Level of education of the respondents

Level	Respondents (N=120)	
	Frequency	Percentage
Primary school education	77	64.2
Secondary school education	33	27.5
College/ University	9	7.5
No formal education	1	0.8
Total	120	100.0

4.3 Dairy Cattle Milk Production

4.3.1 Experience in keeping dairy cattle

The results of the study shows that, 14.2% of the respondents have been keeping dairy cattle for a period between 16-20 years, 13.3% for a period of 11-15 years, 33.3% for a period of 6-10 years and finally 39.2% of the respondents had kept dairy cattle between 1-5 years.

Table 5: Experience in keeping dairy cattle

Years	Respondents (N=119)	
	Frequency	Percentage
1-5 years	46	39.2
6-10 years	40	33.3
11-15 years	16	13.3
16-20 years	17	14.2
Total	119	100.0

4.3.2 Acquisition of dairy cattle

The acquisition of improved cattle was limited by supply and high prices of dairy animals. The survey shows that 70% of the respondents acquired improved dairy cattle through buying. Majority of the respondents used their own capital to start dairy farming. In poor economies like Tanzania, initial capital may be the most limiting entry barrier to dairy farming since individual savings may be inadequate to serve as a starting capital. Dairy farming requires large sums of money to buy expensive heifers, and extra money for operational cost before the cow start producing milk for sale (Banda *et al.*, 2000; Bebe *et al.*, 2003). According to Table 6, 14.2% of the respondents received dairy animal as a gift, 7.5% from neighbors and 8.3 % from the project (Heifer International Tanzania). According to the survey results most of the respondents started with 1-2 dairy animals. The small number of dairy cows owned is as a result of the fact that these animals are expensive and that owning them entails a number of risks including losing them due to bad management or diseases (Ngongoni *et al.*, 2006).

Table 6: Acquisition of dairy cattle

Acquisition	Respondents (N=120)	
	Frequency	Percentage
Buying	84	70.0
Gift	17	14.2
From the project	10	8.3
From neighbour	9	7.5
Total	120	100.0

4.3.3 Reasons for keeping dairy cattle

Table 7 shows the reasons for keeping dairy cattle among the respondents. The reasons for doing so were income (63.3%), food (34.2%) and manure (2.5%). Similar findings have been reported by (Banda *et al.*, 2000; Bebe *et al.*, 2003).

Table 7: Reasons for keeping dairy cattle

Reasons	Respondents (N=120)	
	Frequency	Percentage
Income	76	63.3
Food	41	34.2
Manure	3	2.5
Total	120	100.0

4.3.4 Livestock feeding materials

Feeding is a very important aspect in keeping dairy animals as it gives energy and nutrients necessary for body maintenance and for milk production. Proper feeding when combined with other factors such as proper management will enable the farmer to optimize the genetic qualities of the dairy animals translating into optimum productivity (Ngongoni *et al.* 2006). Banana leaves and stem (50%) is the main source of animal feeds under the intensive (zero-grazing) dairy production in the surveyed area (Table 8). The table also shows that natural pasture (23.3%) is the second most important feeding material, followed by established pasture (15%) and lastly maize stovers and rice stovers (11.7%). Crop residue like banana peels and sweet potato vines are also fed to animals in a small quantity.

Table 8: Feeding materials

Feed material	Respondents (N=120)	
	Frequency	Percentage
Banana leaves and stem	60	50.0
Natural grass	28	23.3
Established pasture	18	15.0
Maize and rice Stover	14	11.2
Total	120	100.0

Despite the use of crop residue and pastures, supplementary feeds (concentrates) such as complete dairy meals and maize bran's are given to the cows under zero-grazing. The survey shows that all (100%) the respondents give supplements to their cows. However, when asked about availability of concentrates about 92% (91.6%) said that concentrates are available but at high price, while only 8.4% said that concentrates are not readily available. Although dairy farmers know the importance of supplements to their dairy animals, cash and labour limit the amount and frequency of feeding supplementary feeds. According to the study these were mostly obtained from farm inputs shops. These were found to be important sources of dairy meals, salts, concentrates, milking buckets, and milk cans.

4.4 Levels of Milk Production

4.4.1 Milk production

Table 9 shows average annual milk production ranging from a minimum of 600 litres per cow per year to a maximum of 3600 litres per cow per year. Distribution of the respondents in the survey shows that, 33.9% of the respondents produced between 1801-3 600 litres; followed by 29.7% who produced 300-900 litres; 21.1% of the respondents produced between 901-1 800 litres, and 15.3% of the respondents records production above 3 600 litres per lactation period. However, the average milk production per cow reported in this study is much lower than that reported elsewhere in Tanzania (Sarwatt and Njau, 1990; Biwi, 1993; Aboud *et al.*, 1995; Mulangila, 1997; Urassa, 1999).

Table 9: Average annual milk production per animal from July 2008 to June 2009

Milk production (Litres)	Respondents (N=118)	
	Frequency	Percentage
300-900	35	29.7
901-1800	25	21.1
1801-3600	40	33.9
Above 3600	18	15.3
Total	118	100.0

4.4.2 Constraints affecting milk production

Table 10 presents the major constraints to dairy production as perceived by the sample farmers. The table show that 40% of the respondents indicated livestock diseases and parasites as the biggest problem while about 36% (35.7%) mentioned lack of enough pasture as the second most important constraint to dairy production. Other constraints faced were high price of concentrates (5.8%), veterinary costs including AI services (7.5%), low milk price (7.5%), unreliable milk markets (2.5%) and transport problems (0.8%). The mentioned constraints were similar to constraints faced by other smallholder dairy farmers in the country (Sarwatt and Njau, 1990; Urassa, 1999).

Table 10: Constraints on milk production

Constraints	Respondents (N=120)	
	Frequency	Percentage
Diseases/ parasites	48	40.0
Lack of enough pasture	43	35.7
Lack of AI- services	9	7.5
Low milk price	9	7.5
High price of concentrates	7	5.8
Unreliable market	3	2.5
Transport problems	1	0.8
Total	120	100.0

4.5 Milk Marketing Outlets

4.5.1 Milk marketing

Survey results in Table 11 reveal that 37.8% of the respondents sold their milk to restaurant owners and 36% sold their milk to the dairy cooperative milk collection centers. Other respondents sold their milk to milk vendor (19.3%), schools (6%) and .9% of them sold milk to other outlets including kiosks. Those who sell milk to the restaurants, cooperatives and schools are being paid monthly, while those who sell milk to the neighbors and milk vendors are paid daily.

Table 11: Milk marketing outlets

Market	Respondents (N=114)	
	Frequency	Percentage
Restaurants	43	37.8
Milk collection centres	41	36.0
Milk vendors	22	19.3
Schools	7	6.0
Others (e.g., Kiosk and individuals)	1	0.9
Total	114	100.0

4.5.2 Problems encountered in selling milk

Regarding problems faced in selling milk, majority (75.5%) of the respondents indicated low milk price as the most important one. Other problems were distance from the market (12%), lack of buyers (8.3%), and lack of transport (4.2%). These findings partly support the study conducted in Mbeya by Bayer and Kapunda, (2006) which showed that, distance to markets in major towns, limited number of customers and impassable roads were identified as constraints in dairy production.

Table 12: Problems encountered in selling milk

Problems	Respondents (N=117)	
	Frequency	Percentage
Low milk price	88	75.5
Distance from the market	14	12.0
Lack of buyers	10	8.3
Lack of transport	5	4.2
Total	117	100.0

4.6 Impact of Milk Production on Livelihood

The following sub section presents results and discussion on the impact of milk production on livelihood of the smallholder dairy farmer with specific reference to income, food security and assets.

4.6.1 Impact on income

4.6.1.1 Status of household income

Results in Table 13 indicate that majority (72.3%) of the respondents acknowledged that their income had increased as a result of keeping dairy cattle. On other hand 17.6% reported that their income had remained the same while 10.1% indicated that their income had decreased.

Table 13: Impact of milk production on household income

Income status	Respondents (N=119)	
	Frequency	Percentage
Increased	86	72.3
Remained the same	21	17.6
Decreased	12	10.1
Total	119	100.0

4.6.1.2 Distribution of annual income from milk

Table 14 shows that 33.6% of the respondents obtained a minimum of TAS 100 000 to 360 000 income from the sale of milk per year and 14.7% obtained highest income of TAS 1 440 000 and above per year.

Table 14: Distribution of annual income from milk

Income (TAS)	Respondents (N=116)	
	Frequency	Percentage
100 000-360 000	39	33.6
361 000- 720 000	29	25.0
721 000-1 440 000	31	26.7
Above 1 440 000	17	14.7
Total	116	100.0

4.6.1.3 Expenditure of income derived from milk

Income obtained from milk was spent on different items/services by the respondents as shown in Table 15. The table shows that majority of the respondents spent their income from milk on meeting household expenses such as food, furniture and clothes. Other

expenditures in order of importance were school fees (23.3%), animal feeds (15.0%), and treatment/vaccination of animals (12.5%), health services (5.0%) and building /rehabilitation of house (4.2%).

Table 15: Expenditure of income derived from milk

Expenditure	Respondents (N=120)	
	Frequency	Percentage
Household expenses (eg.food, clothes)	48	40.0
School fees	28	23.3
Buying animal feed	18	15.0
Treatment/vaccination of animals	15	12.5
Health services	6	5.0
Building/ rehabilitation of house	5	4.2
Total	120	100.0

4.6.2 Impact of milk production on household food security

The study revealed that 70% of the respondents reported that household food security had increased as a result of dairy keeping (Table 16). However, 18.7% of the respondents said that their household food security had remained the same while 11.3% claimed that household food security had actually decreased following their involvement in milk production. Generally these results indicate that milk production had greater impact on household food security. The findings support earlier findings from a study conducted in Kenya by Muriuki *et al.* (2001) which showed that dairy production had made a major contribution to food security and poverty alleviation among smallholder farmers.

Table 16: Impact of milk production on household food security

Status	Respondents (N=120)	
	Frequency	Percentage
Increased	84	70.0
Remained the same	22	18.7
Decreased	14	11.3
Total	120	100.0

4.6.3 Household assets purchased using income derived from milk

Household assets were also used to assess whether dairy farming had any impact on livelihood or not. Table 17 shows selected household assets bought using income derived from selling milk. The result show that 30.8% of the respondents bought radio, 25.8% of the respondents purchased furniture, 23.3% bought television and 20.1% bought bicycles.

Table 17: Assets purchased using income derived from milk

Assets	Respondents (N=120)	
	Frequency	Percentage
Radio	37	30.8
Furniture	31	25.8
TV	28	23.3
Bicycle	24	20.1
Total	120	100.0

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

The general objective of this study was to investigate the impact of dairy milk production on rural livelihoods in Hai district. The specific objectives were (i) To determine the level of small scale milk production among dairy cattle keeping households (ii) To explore market outlets of milk produced by small scale dairy cattle keepers (iii) To assess the impact of small scale dairy milk production on livelihood in terms of income, food and assets. In this chapter the conclusions and recommendations are drawing based on the major findings of the study.

5.1 Conclusions

5.1.1 Level of milk production among dairy cattle keeping households

The major conclusion that can be drawn from the results of this study with regard to levels of milk production in surveyed area is that, milk production was observed to be higher (1801-3600) per annum compared to average production in the country which is estimated at 1800 liters per annum for cross breeds.

5.1.2 Market outlets of milk

Regarding milk marketing, conclusion that can be drawn from this study is that, milk market is available as farmers have wide chance to sell their milk to (restaurants, Milk collection centers, milk vendor, schools, kiosk and neighbors), regardless of low milk price.

5.1.3 Impact of milk production on livelihood in terms of income, food security and assets

In general it can be concluded that small-scale dairy farming in Hai District contributes a great deal to the household welfare in terms of food security, income generation, household assets and other social services.

5.2 Recommendations

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

- (i) Government should facilitate to improve production by providing adequate extension services, training, short courses, study tours, attending farmers show and adequate inputs supply.
- (ii) There is a need to have well organized market channels.
- (iii) Dairy farmers have to be encouraged to form their own cooperatives that will contribute effectively to market efficiency.

REFERENCES

- Aboud, A. O., Biwi, K. O. and Juma, K. A. (1995). Abstract: Some aspects of milk production and reproductive performance of cows under smallholder systems in Pemba. In: *Proceedings of the Tanzania 22nd Scientific Conference of the Society of Animal Production*. (TSAP) 22.
- Babbie, E. (1990). Survey Research methods. 2nd Edition. Wards worth, publishing company, Belmont California.
- Banda, J. W., Phoya, R. K. D., Chilera, F. C., Mvula, Q .A. C. and Chiwayula, C. L. K. (2000). Small holder dairying in Malawi. *Proceedings of the/RVAU/DIAS/DANIDA/-ENRECA project review workshop held in Harare, 10-13 January 2000*. pp.30-45
- Barr, N. (2004). Problems and definition of measurement. In *Economics of the welfare state*. New York: Oxford University Press. pp. 121-124
- Basnayake, B. M. J. K. and Gunaratne, L. H. P. (2002). Estimation of technical efficiency and its determinants in the tea small holding sector in the mid country Wet zone of Sri-Lanka. *Journal of Agricultural economics* 4:137-150.
- Batterbury, S. P. J. (2001). ‘Landscapes of diversity; a local political ecology of livelihood diversification in south-western Niger’, *Ecumene*, 8. pp. 438-464.
- Bayer, W. and Kapunda, L. B. (2006). Dairy cattle for poverty alleviation in Southern Tanzania. In: Proceeding of the conference on International Agricultural Research for Development.11-13, October 2006 Bonn, Germany. [<http://www.tropentag.de/2006/abstracts/full/415.pdf>]. site visited on 10/5/2010.

- Bebe, O. B., Udo, H. M. J., Rowlands, G. J. and Thorpe, G. (2003). Smallholder dairy system in Kenya Highlands: Breed preferences and breeding practices. *Journal of Livestock Production Science* 82(2-3):117-127.
- Bernstein, H., Crow B, and Johnson, H. (1992). *Rural livelihoods: crises responses*, Oxford. Oxford University Press.
- Biwi, K. M. (1993). Developments of smallholder dairying in Zanzibar. In: *Proceedings of a workshop on Future of Livestock Industries in East and Southern Africa*. 20-23 July 1992. Kadomo Ranch hotel, Zimbabwe, (Edited by Kategile, J. A. and Mubi, S), ILCA (International Livestock Center for Africa), Addis Ababa, Ethiopia. 173-176pp.
- Carney, D. (1998). *Sustainable rural livelihoods: what contribution can we make?* London, for International Development.
- Case, K. and Fair, R. (2007). *Principles of Economics*. Upper Saddle River, NJ: Pearson Education.
- Chambers, R. and Conway, G. (1992). *Sustainable rural livelihoods: practical concepts for the 21st century*, Brighton, Institute of Development Studies, University of Sussex.
- 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. 13-25pp.

Ellis, F. (1998). 'Survey article: Household strategies and rural livelihood diversification. *The Journal of Development Studies*. 35, (1): 1–38.

Ellis, F. (2000). *Rural Livelihoods and Diversity in Developing Countries*, Oxford, Oxford University Press.

FAO (1996). *Food security: A domestic Approach*.44pp.

FAO (2000a). *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.

FAO (2000b). *Water harvesting for improved rainfed production and supplementary irrigation*. [<http://www.fao.org>]site visited on 3/5/2010.

FAO (2003a). *FAO Bulletin of statistics*.Vol.4.No.1 Rome, Italy.

FAO (2003b). *Water and food security-World food summit, Rome-Italy* [<http://www.world.foodsummits>] site visited 22/3/2010.

FAO (2008). *Food Outlook Global Market Analysis*, Rome-Italy 16pp. [<http://www.world.foodMarket>] site visited 26/7/2010.

Francis, E. (2000). *Making a living: changing livelihoods in rural Africa*, London, and Routledge.

Francis, E. (2002). 'Rural livelihoods, institutions and vulnerability in North-West Province, South Africa', *Journal of Southern African Studies*. 28, (3). 531- 550.

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 6th National Dairy Development Conference*. 2nd June 2006, Morogoro, Tanzania. pp. 52 -67.

Kurwijila, L. R. (2002). Dairy development in Tanzania: County paper in; Rngnekar D. and Thorpe W. (Eds), *small dairy production and marketing-opportunities and constraints*. Proceeding of south-south workshop held at Anand, India, 13th-16th.March 2001. NDDDB (National Dairy Development Board), Anand, India, and ILRI (International livestock research) Nairobi, Kenya. [<http://www.ssdairy.org/programme/html>] sited on 17 March 2010.

Kurwijila, L. R. and Boki, K. J. (2003). *Assessment of dairy development in Tanzania/UN Food and Agriculture Organization (FAO), ROME*.pp.47

Lwelamira, J., Binamungu, H. K. and Njau F. B. (2010). Contribution of Small Scale dairy farming under zero-grazing in improving household wale fare in Kanyanga ward, Karagwe district, Tanzania. [Livestock Research for Rural Development. Institute of rural development planning .22\(2\)](#).

- Mdoe, N.S.Y. (1993). Constraints to Milk Marketing in the Kilimanjaro Highlands of Hai Districts in: *Proceedings of the 20th scientific conference of Tanzania Society of Animal Productions*. (Edited by Muhikambe, V.R.M) 12; -15 September 1993, Tanzania 20:247-254.
- Mdoe, N. S. Y. and Kurwijila, L. R. (1998). Economic reforms in Tanzania: Impacts on dairy production Marketing and processing. In: *Proceedings of Tanzania Society of Animal Production 25:187-193*.
- Mdoe, N. S. Y. and Nyange, D. A. (1995). Dairy industry in Tanzania and the prospect for small-scale milk producers: Strategies for market orientation of small-scale milk producers and their Organizations. In; *Proceeding of workshop held at Morogoro Hotel, Morogoro, Tanzania*. 39,44pp.
- Mdoe, N. S. Y. and Mnenwa, K. R. (2004). Improving Dairy Processing and Marketing Efficiency in Developing Smallholder Dairy Systems. In Final Technical Report for Capacity Development (AICAD), Nairobi. 42pp.
- Mdoe, N. S. Y., Kurwijila, L. R. Staal, S. Omore, A. Burton, D. and Mnenwa, K.R. (2002). Investigation mechanisms in Greater Dar es Salaam and Mwanza: Result of participatory rural appraisal. In *proceeding of the 3rd. Scientific conference of the agricultural economics society of Tanzania AGREST*). Arusha.
- Minja, M. G. (2007). The contribution of smallholder dairy cattle production to household food security in Kilombero district. Tanzania. Dissertation for Award of MSc Degree at Sokoine University of Agricultural, Morogoro, Tanzania. 68 pp.

- Mollel, E. L, Lekule, F. P, Kurwijila, R. L, Turuka, F. M. and Petersen, P. H. (1999); A Socio-economic study on the role of gender in small scale crop-livestock farming in Turiani, Morogoro. Proceedings of the 26th Scientific Conference LITI-TENGERU Arusha. TSAP conferences series vol. 26.
- Morgan, R. (1999). Artificial insemination results from AI in Africa farming and processing. Charles Publishing Ltd London UK 16. pp..15-17.
- Mulangila, R .C. T. (1997). A study on dairy cattle productivity in Tanga Region. Dissertation for Award of MSc Degree at Sokoine University of Agriculture, Morogoro, Tanzania. 132pp.
- Muriuki, H. G; Mwangi, D. M and Thorpe, W (2001). How Smallholder Dairy Systems in Kenya Contribute to food security and Poverty Alleviation: *Paper for Oral Presentation at the 28th Tanzania Society of Animal Production Conference, Morogoro, 7th - 9th August, 2001.*
- Mutagwaba, C. M. D. (2005). Sustainability of school milk programmes. A paper presented at the first Eastern and Southern Africa school milk conference.27 September, 2005. Kampala, Uganda. [<http://www.fao.org>] site visited on 27/4/2010.
- Mwakalobo, A. and Shively, G. (2001).Food Security and Natural Resource Management in Developing Countries. Staff Paper No 1-12, Department of Agricultural Economic: Purdue University, West Lafayette Indiana.22pp.

- Mwankemwa, A. S. (2004). Performance of saving and credit co-operative societies and their improvement on rural livelihoods: a case study of Morogoro rural and Mvomero districts, Tanzania. Dissertation for Award of MSc Degree at Sokoine University of Agriculture, Morogoro, Tanzania. 132pp.
- Mwijarubi, B. K. (2007). Assessment of Marketing and Consumption of locally processed milk in Tanzania. Dissertation for Award of MBA Degree at Sokoine university of Agriculture, Morogoro, Tanzania. 35pp.
- MWLD (2006). Prospects for the School milk Feeding Programme in Tanzania. A paper presented at the Round Table discussion. National milk Week 2006 Iringa, Tanzania.
- Ngongoni, N. T., Mapiye, C., Mwale, M. and Mupeta, B. (2006). Factors affecting milk production in the smallholder dairy sector in Zimbabwe. *Livestock Research for Rural Development* 18 (05). [<http://www.lrrd.org/lrrd18/5/ngon18072.htm>].
- Novartis, A. (2005). Population Dynamic and Food Security on Slope of Mountain Rungwe Mbeya, Tanzania. Dissertation for Award of MSc Degree at Sokoine University of Agricultural, Morogoro, Tanzania. pp.133.
- Omoro, A., Staal, S. J., Osafo, E. L. K., Kurwijila, L., Barton, D., Mdoe, N., Nurah, G and Aming, G. (2004). Market mechanisms, Efficiency, processing and public health risks in per-urban dairy product markets: Synthesis of Findings from Ghana and Tanzania. In: *A revised final technical report* for LPP project 7321(48-62).

- Radoki, C. (2002). *Urban Livelihoods: A People Centered Approach to Reducing Poverty*, London, Earthscan.
- Regnar, O., Borchgrerink, A., Lazaro, E. and Temu, A. (2002). Poverty-reducing effects of agricultural development in Tanzania. Noragric Report Number10, December, 2002. Noragric, Agricultural University of Norway. [<http://www.nln.noragric>] site visited on 27/4/2010.
- Sarwatt, S. V., and Njau, F. B. C. (1990). Feeding system for smallholder's dairy farmers in Morogoro Urban. The role and the prospects of smallholder livestock production. In: *Proceedings of seventeenth Scientific Conference of Tanzania Society of Animal Production*. 25-27 September 1990, Arusha, Tanzania. pp.98-104.
- Singh, A. K., Srivastava. R K., Sushil. K., Kalra. A., Bansal. R. P. and Tomar. V. K. S. (2003). Influence of age and literacy level of farmers on adoption of mint based crop rotation in the Indo- Gangetic plains. *Journal of Medicine and Aromatic Plant Sciences*, 25 (3) 689- 697).
- United Republic of Tanzania (URT), (2002). Official website of Tanzania high-commission London Tanzania agriculture Livestock profile. [<http://www.tanzania-on line.gov uk/Agriculture.htm>] site visited 5th-05-2010.
- Urassa, J. K. (1999). A study on the factors influencing milk output of dairy cattle under smallholder farms in Tanga region. Dissertation for Award of MSc degree at Sokoine University of Agriculture, Morogoro, Tanzania. 130pp.

- Urassa, J. K. and Raphael, E. (2002). The contribution of small scale dairy farming to community welfare's case study of Morogoro municipality, Morogoro, Tanzania. [<http://www.fiuc.org>]site visited on 18/3/2010.
- Urio, N.A. (1985). Intensive fodder gardens for increasing forage availability for smallholder dairy production in Hai district, Tanzania. pp56.
- Urio, N. A. and Mlay, G. I. (1984). Progress report on diagnostic survey among smallholder dairy farmers in Hai district Tanzania. pp43.
- Utiger, C., Romney, D., Njoroge, L., Staal, S., Lukuyu, B. and Chege L. (2000). Nutrient flows and balances in intensive crop-dairy production systems in the Kenya highlands. In *Proceedings: The 3rd All Africa Conference on Animal Agriculture and 11th Conference of the Egyptian Society of Animal Production*, 6-9 November, 2000, Alexandria, Egypt. Pp89.
- World Bank (2003). Agricultural change and food security: *World Development* Kluwer. Academic Publishers, Washington D.C. pp145.

APPENDICES

Appendix 1: Questionnaire for Small Scale Dairy Cattle Farmers

District..... Division.....

Ward Village.....

Interviewing schedule No..... Date.....

A: BACKGROUND INFORMATION

Please tick or write the appropriate answer where applicable.

A1. Age of the respondent in complete years.....

A 2. Sex of respondents 1 Female [] 2 Male []

A 3. What is your marital status

- 1) Single []
- 2) Married []
- 3) Divorced []
- 4) Widowed []
- 5) Separated []
- 6) Living with partner []

A4. Level of education

- 1) No formal education []
- 2) Primary education [] Number of years attended.....
- 3) Secondary education [] Number of years attended.....
- 4) 4) College/University [] Number of years attended.....

B: DAIRY CATTLE PRODUCTION

B1. How many plots of land do you have and how do you acquire them?

Plot No	Area (acres)	Tenure status

1. Inherit 2. Bought 3. Rent 4. Allocated by village

B2. Beside dairy cattle what other type of livestock do you keep? Indicate number of livestock kept as appropriate.

No	Types of livestock	Number
1		
2		
3		
4		
5		
6		
7		

B3. How long have you been keeping dairy cow... (Indicate Year/Month)

B4. How did you get your first dairy cattle?

- 1) Buying []
- 2) From neighbor []
- 3) Gift []
- 4) From projects []

B5. What are your three main sources of capital invested in dairy production?

- 1).....
- 2).....
- 3).....

B6. What are the main reasons for keeping dairy cattle in order of importance

- 1) Income []
- 2) Food []
- 3) Manure []
- 4) Dowry []
- 5) Other specify.....

B7. Have you ever received any training in dairy husbandry? (1) YES [] (2) NO []

D8. If YES; for how long did the training take place... (**Indicate number of days/month**)

B9. What are the main sources of feed materials for your livestock? (**Rank in order of importance**)

- 1) Banana leaves and steam []
- 2) Maize stoves []
- 3) Rice stoves []

- 4) Natural grasses []
- 5) Established pasture []

B10. Do you feed concentrates to your animals (1) Yes [] (2) No []

If YES what type of concentrate do you feed your animals?

- 1)
- 2).....
- 3).....
- 4).....

B11. Are these concentrates readily available? 1. YES [] 2.NO []

B12. Explain your answer.....

.....

B13. Do you provide mineral supplement to your dairy cow? (1) YES [] (2) NO []

B14. What type of mineral supplement do you feed your animals?

- 1.....
- 2.....
- 3.....
- 4.....

B15. Are this mineral supplement available? (1)YES [] (2) NO []

B16. Explain your answer.....

.....

C. LEVELS OF MILK PRODUCTION

CI. How many cows are being milked at present.....

C2.During the period 2008/2009 how many cows were milked

Please provide the following information on milk production from July 2008to June 2009

Cow identification	Average production in Liters		Length/duration of milking period (days/month)	AVERAGE TOTAL
	Morning	Evening		
Name/Number				

TOTAL				

C3. On average, how much milk is consumed at household level per day (1) Fresh milk.....liters (2) Sour milk.....liters

C4. What are the major constraints which affect milk production in order of importance.

- 1)
- 2)
- 3)
- 4)
- 5)

D MILK MARKETING OUTLET PRODUCED BY DAIRY CATTLE KEEPERS

D1. Besides milk, do you sell any milk by- products? (1).YES [] (2) []

D2. If YES what type of product?

- 1)
- 2)

D3. Where do you sell your milk?

- 1) Milk collection centre []
- 2) Milk vendor []
- 3) Neighbor []
- 4) Restaurants []
- 5) School []
- 6) .Others (Specify).....

D4 When do you get paid after selling your milk?

- 1) Daily []
- 2) Weekly []
- 3) Monthly []

D5 Please provide information about milk sold during July 2008 to June 2009

Period	Number of milking cow	Average milk produced per day /liter	Average milk sold per day/liter	Length of milking	Average price per liter	Average total income TAS
Wet season						
Dry season						
Total						

D6. What problems do you face in selling your milk? (1)Lack of buyers [] (2) Lack of transport [] (3) Distance from the market [] (4) Low price []

D7. Provide the following information on sources of income other than milk

No	Source of income	Value in TAS.
1		
2		
3		
4		
5		

E. THE IMPACT OF MILK PRODUCTION ON INCOME, FOOD SECURITY AND ASSETS

E1. On average, would you say your income has increased, remained moreless the same or decreased after getting involved in dairy production?

- 1) Increased []
- 2) Remain the same []
- 3) Decreased []

E2. What is the expenditure outlet for your income derived from milk? (**Rank them according to their importance?**)

- 1)
- 2)
- 3)

E3. In order of importance what are the main source of food consumed at household level

- 1) Own produced []
- 2) Purchased []
- 3) Friends/relatives []
- 4) Government support []

E4. On average, how many months in a year can your household adequately feed its self..... (Months)

E5. On average, would say household food security has increased, remained more less the same, or decreased over the past 3-5 years?

- 1) Increased []
 2) Remain more the same []
 3) Decreased []

E6. Please provide information on household assets

No	Type of the assets	Number	Value (TAS)
1	Radio		
2	TV		
3	Furniture		
4	Bicycle		

E7. Of the above assets which one did you purchase using income derived from milk?

No	Type of assets	Number	Value (TAS)

THANK YOU FOR YOUR COOPERATION

Appendix 2: Checklist Questions for Dairy Cooperative Society Managers

F. DAIRY MILK COOPERATIVE SOCIETY

- F1. How many members do you have in your co-operative? []
- F2. How many people sell milk in your cooperative which are not member of the cooperative []
- F3. Which milk do you collect? 1. Morning [] 2.Evening [] 3.Both morning and evening milk. []
- F4. How many liters do you collect every day
- F5. After collection, where do you sell your milk?
 (1) Kiosk [] (2) Hotel [] (3) School [] (4) Household [] (5) Restaurant []
 (6) Processing industry []
- F6. Do you practice any Milk processing (1) YES [] (2) NO []
- F7. What type of milk processing?
 (1) Butter making []
 (2) Sour making []
 (3) Yoghurt making []
 (4) Ghee making []
 (5) Cheese making []
- F8. How many liters do you process per week
- F9. Where do you sell the processed product? (1) Restaurant [] (2) Hotel []
 (3) Retailers [] (4) School Children [] (5) Street passer-by []
- F10. How do you pay your customers money after selling their milk? (1) Every ay []
 (2) Every week [] (3) every month []
- F11. What are the constraints that face your dairy cooperative?
 (1).....
 (2).....
 (3).....
 (4).....
- F12. Do you offer any credit to your customers (1) YES [] (2) NO []

THANK YOU FOR YOUR COOPERATION