

**DAIRY CATTLE MILK PRODUCTIVITY IN NAMTUMBO
DISTRICT COUNCIL**

By

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**A Dissertation Submitted in the Preparation of Partial Fulfillment of the
Requirement for the Award for the Degree Master of Science in Project
Planning and Management of the University of Mzumbe**

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CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by the Mzumbe University a dissertation entitled, ***Dairy cattle milk productivity in Namtumbo District Council*** in partial fulfillment of the requirements for the degree Master of Science in Project Planning and Management of the University of Mzumbe.

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ABBREVIATIONS AND ACRONYMS

ASDP	Agricultural Sector Development Programme
DADPs	District Agricultural Development Plans
EU	European Union
FAO	Food and Agricultural Organisation of United Nation
FYDP	Five Year Development Plan
GDP	Gross Domestic Product
IFAD	Food and Agriculture Organisation of the United Nations
MKUKUTA	Mpango wa Kuondoa Umasikini na Kukuza Uchumi
MLFD	Ministry of Livestock and Fisheries Development
NSGPR	National Strategy for growth and poverty reduction
SACCOs	Savings and Credit Cooperative Societies
SACs	Savings and credit Associations

ABSTRACT

Namtumbo district council implemented dairy cattle project from 2008 to 2013 through DADPs with intentions to supply milk as nutritious food and increase income in the households. However, there is low dairy cattle milk productivity ranging 8-12 litres per cow per day. This study assessed the dairy cattle milk productivity in Namtumbo District council from small scale dairy cattle farms, a case of dairy cattle projects. Specific objectives were to determine socio economic factors influencing dairy cattle milk productivity to examine profitability of dairy cattle milk production and determine factors influencing profit in dairy cattle milk production. The design for the study was a descriptive research design specifically cross sectional survey design and questionnaires were used as tools to collect data from respondents. One hundred smallholder dairy cattle farmers were randomly selected by drawing ten respondents of smallholder dairy cattle farmers from ten villages. Data collected were analysed both by descriptive and inferential statistics. Descriptive statistics results revealed that 62% of respondents were males, years of respondents ranged from 41 to 60 (58%), household size ranged from 5 to 8 (52%), 93% respondents were married and 89% respondents engaged in farming activity. Multiple linear regression analysis results revealed a positive influence ($r^2 = 84 \%$; $p < 0.05$) between socio economic factors and dairy cattle milk yield productivity. This indicates that socio economic factors influence dairy cattle milk yield productivity. Four socio economic factors, namely knowledge of the farmer on dairy husbandry, proportion of labour force in the household, herd size and experience had a positive and significant influence on dairy cattle milk yield productivity. Also, the dairy cattle milk production was found profitable with an average profit of 97,815.93/= per cow per month. Also, analysis revealed that there was an influence of factors on profit ($r^2 = 62 \%$; $p < 0.05$), dipping/spraying cost and concentrate cost factors were significant with a positive influence on profit. It is recommended that knowledge of the farmers on dairy cattle husbandry and proportion of labour force in the dairy farmers' households to be strengthened. Profitability of milk production should be improved by value addition through milk processing and forming cooperative unions to enable bulk sell of milk and bulk purchase of livestock inputs.

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CHAPTER ONE

INTRODUCTION AND PROBLEM SETTING

1.1 Introduction

Dairy farming is a livestock enterprise that deals with raising dairy animals such as cattle, goat or other lactating livestock for long term milk production that can either be processed or transported to final retail sale (Shinde, 2011).

Smallholder farmers are defined basing on the amount of land owned and number of livestock kept, smallholder famers usually own only a few heads of livestock, cultivate less than 2 hectares of land and the family being a focal point for planning, decision making and implementation (Salami, Kamara and Brixiova, 2010).

Dairy farming is an important enterprise and one of the key drivers of rural development. It provides relatively quick income, nutritious food important for better health to people of all age (Upton, 2014; Hitihamu and Epasinghe, 2015), manure for improving soil fertility and crop yields, the fuel energy from the cattle dung for cooking and light (Hitihamu and Epasinghe, 2015). Dairy farming also contributes to national income to about 35% to agricultural gross domestic in developing countries and 40% in the World gross domestic product (Swanepoel, Stroebel and Moyo, 2010, Hassane, 2013).

Milk production worldwide has been increasing, in year between 2014 and 2015 milk production increased from 789 to 802.8 million tonnes respectively. Much of milk being produced from developed countries especially in Europe, Asia and the Americans (FAO, 2016) The country with highest average milk production was found to be Israel, whose production per cow per year was 12,546 kg and the lowest country in milk production was New Zealand with 3,974 kg per cow per year (Gerosa *et al.* 2012). Many developing countries have low dairy cattle milk productivity which leads them to supply less in the global market, countries in Latin America contribute 3 percent to global exports, East and South Asian countries contribute 2 percent, the Near East and North Africa countries contribute 1 percent

and countries in South Asia and sub-Saharan Africa each contributes 0.2 percent (Upton, 2014).

Total annual milk production in Tanzania is approximately 2.5 billion litres and of these litres about 70% of the milk produced is from traditional sectors (indigenous cattle) and 30% from improved dairy cattle mainly kept by smallholder producers URT, (2015) and approximately over 2 million households are employed in the dairy sector in Tanzania (Urassa and Martin, 2013).

Dairy cattle is like any other machine that uses inputs to produce outputs, the dairy cattle converts pasture, minerals and water inputs into milk and beef yields. The yields produced can be used for home consumption and surplus sold to bring revenues to the dairy farmers. Potential market is available for dairy farmers from dairy industries, such as an ASAS dairy industry in Iringa region, CEFA Njombe milk factory in Njombe region and a new Mother dairy factory in Ruvuma region, which are under supplied by the milk.

Growth of the animal production especially productivity has been limited by several factors namely insufficient feed, animal source base and socio economic factors to smallholder farmers in the most developing countries (FAO, 1993; Sibuga, Lekule and Kinala, 2004; Ngongoni, Mapiye, Mwale and Mupeta, 2006). Other factors include diseases, shortage of milk market, high price of drugs (Uddin, Uddin, Al Mamun, Hassan and Khan, 2012), lack of land and water (Sikhweniand Hassan, 2013) and unreliable provision of technical support services by the Government (URT, 2011). All these affect livestock productivity including dairy cattle milk.

Improvement of smallholder dairy cattle milk production will help contribute to the availability of milk for public consumption resulting to healthy productive population and improving economic status of the smallholder dairy farmers (Kifaro and Asimwe, 2007).

Since there is little information about influence of socio economic and profitability factors on dairy cattle milk productivity in Namtumbo District council. Therefore, this study was designed to generate new information through assessment of dairy cattle milk productivity from small scale dairy cattle farms, a case of dairy cattle projects.

1.2 Problem Statement

The increase of human population is expected to take place from 2010 to 2020 from 6.5 billion to 8.1 billion respectively (Swanepoel *et al.* 2010). This population increase will cause rise in demand for the livestock products and its products. Thus, improvement of dairy cattle milk productivity of small scale farming sector has become an increasing important feature due to the increase of demand from increased population and income (MacArthur and Weiss, 1994).

More milk output in world is produced by the developed countries accounting to 75 percent (FAO, 1993). Developing countries especially African countries have less milk output and their milk output is less than 4 percent of global milk with an average cow producing only 4546 litres per year compared to 5630 litres for top producing cows in the European Union (EU) (Bayei and Nache, 2014). Milk production worldwide increased from 789 to 802.8 million tonnes in year 2014 to 2015 respectively, a large share being produced by developed countries (FAO, 2016).

A study done by Kurwijira and Boki, (2003) on a review of the small Scale dairy Sector in Tanzania, it was found that Improvements in milk supply in Tanzania has largely been due to increases in dairy cattle numbers rather than increase in milk productivity. This indicates that despite the large number of dairy cattle in Tanzania, production of milk and milk products are low and therefore do not satisfy the milk demand, particularly in the urban centres.

In Tanzania only 2.5 billion litres of milk are produced per year of which 30 percent is produced from dairy sector and 70 percent is produced from traditional sector (indigenous cattle) (URT, 2015). The low dairy cattle milk productivity has made a country unable to meet the local milk market demand.

In the country there are potential market for milk from several dairy industries such as Tanga dairy industry in Tanga region, CEFA Njombe milk factory in Njombe region, an ASAS dairy industry in Iringa region and currently a Mother dairy industry in Ruvuma region. An ASAS dairy industry located in southern highlands zone demands 50,000 tonnes milk supply per day for processing to operate at full capacity but supplied only with 20,000 tonnes of milk per day less by 30,000 tonnes of milk (Nanai, Machumu and Sanga, 2017) and a Mother dairy industry in Ruvuma region demands 3000 litres of milk per day but only supplied with 300-700 litres per day (Ras Ruvuma, 2017).

Despite of the increase in number of dairy cattle in the District through District Agricultural Development plans (DADPs) from 21 to 827, their milk productivity is relatively low with milk yield ranging from 8-12 litres per cow per day and dairy farmers are still poor (Namtumbo DC, 2016) compared to standard production of 18-25 and above litres per cow per day.

Various researchers have urged that decision makers and extension providers need to understand the socio-economic factors and how they influence dairy cattle milk productivity. As confirmed by studies (Kutlar, Ozcatalbas, Akcaoz and Firat, 2010; Hailemichael, Gangwar, Mekuriaw and Tesfay, 2012; Janssens, Yisehak and Belay, 2012; Mamo, 2013, Hitihamu and Epasinghe, 2015), that smallholder dairy cattle production were below the maximum potential and were influenced by socio-economic factors such as age, gender, education level, farming system, experience, family size and marketing.

Since, socio- economic and profitability factors influencing the dairy cattle milk productivity to smallholder farms have not been studied in depth; this study therefore seeks to assess the dairy cattle milk productivity to smallholder farms a case of dairy cattle projects in Namtumbo District Council.

If the problem is addressed, will help improve dairy cattle milk productivity which in turn will increase milk production and influence achievement of sustainable development goals such as end poverty to all (Sdg.No.1), freedom from hunger (Sdg.No.2), health and wellbeing (Sdg. No.3), infrastructure and innovation (Sdg. No. 9) and Sustainable ecosystem (Sdg. No.15) also achievement of a Five Year Development Plan 2016/17-2021 which targets to move a country from low income country to middle income country which is in line with National vision 2025 which focuses on sustainable development, shared growth, free from miserable poverty, enable strong and competitive economy to individuals and the national levels.

If the problem is not solved the outcome could be serious to the country and individual in particular, in which the country will continue spending more money on importing dairy milk and dairy products which will continue affecting negatively balance of payment as well as dairy farmers will be poor due shortage of income and low access to nutritious feed for the households.

1.3 Objective of the study

1.3.1 General objective

The overall objective of the study was to assess the dairy cattle milk productivity in Namtumbo district council, a case of dairy cattle projects.

1.3.2 Specific objectives

- i. To determine socio economic factors influencing dairy cattle milk productivity in Namtumbo District council.
- ii. To examine profitability of dairy cattle milk production to smallholder farmers in Namtumbo District council.
- iii. To determine factors influencing profitability in dairy cattle milk production to smallholder farms in Namtumbo District council

1.4 Null hypothesis and Alternative Hypothesis

- i. H_01 : Socio economic characteristics do not influence the dairy cattle milk productivity in the District.
 H_1 : Socio economic characteristics influence the dairy cattle milk productivity in the District.
- ii. H_02 : Dairy cattle milk productivity is not potential for profit maximization
 H_1 : Dairy cattle milk productivity is a potential for profit maximization
- iii. H_03 : Factors do not influence profitability in dairy cattle milk production
 H_1 : Factors influence profitability in dairy cattle milk production

1.5 Scope of Study

The study was conducted in Namtumbo District council found in Ruvuma region. The study was conducted on five (5) wards, namely Litola, Namabengo, Mgombasi, Rwinga and Namtumbo. These wards were selected among ten (10) wards in which the dairy cattle projects were being implemented. The study was based on the individual households that have benefited from the dairy cattle project from different villages in Namtumbo District council. The individual households were selected from ten (10) villages among the wards to be representative of the whole District on milk productivity from smallholder dairy farms.

Focusing on influence of independent variables, namely Proportion of labour force in household (L), Owned land for pasture establishment (Ol), Herd size (Hs), Amount of other income used in dairy cattle milk production (Ai), Amount of credit used in dairy cattle milk production (Ac), Knowledge of the dairy farmer on dairy husbandry (Kf), Education level of the dairy farmer (El), Dependence ratio (Dr) and Experience of dairy farmer on dairy farming (Edf) on dependent variable (Quantity of Milk yield produced) and influence of independent variables: treatment, labour, concentrate, price on dependent variable; profit

1.6 Significance of the study

The Namtumbo district council is among districts that have implemented a dairy cattle project in which number of dairy cattle increased through purchasing and reproduction however, there is a low dairy cattle milk productivity and little information on socio economic factors affecting dairy cattle milk productivity.

The aim of the study was to assess the socio economic factors influencing dairy cattle milk productivity in Namtumbo District Council. The findings of the study will be used to increase awareness within the members of the community especially on the socio-economic factors influencing low milk productivity among smallholder dairy cattle farms. The results will help to create and raise the interest among society members on how to do away with the bad socio economic characteristics that contribute to the low milk productivity of dairy cattle in terms of milk yield. The findings will also inform both the government and non-government institutions to find a way to fight better against the bad socio-economic factors in smallholder farms in order to improve dairy cattle milk productivity and increase milk production at the district level and national level at large.

The findings will as well expand knowledge of the researcher about socio economic factors affecting dairy cattle milk productivity and also will serve as basis for further studies in this area to other researchers and academicians.

1.7 Organisation of the Dissertation

The dissertation consists of five chapters, chapter One is an introduction which include background of the study, statement of the problem, objectives of the study, significance of the study, scope of the study. Chapter Two comprises theories, theoretical and empirical review of literature. Chapter Three presents Methodology used in the study, which further includes study area, study population, research design, variables and their measurements, sampling techniques, sample size determination, validity and reliability of data, method of data collection, sources of data, and data analysis. Chapter Four presents research findings and discussion and Chapter Five comprises conclusion, recommendations and policy implication.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents theories; detailed variables of research conceptual framework both in theoretical and empirical literature regarding the socio economic factors affecting dairy cattle milk productivity.

2.2 Theoretical review

2.2.1 Theories governing the research

2.2.1.1 Short run Cobb-Douglas production function

Short run production function is a mathematical equation published by Charles Cobb and Paul Douglas (1928) showing maximum amount of output that can be produced from specified set of inputs, given existing technology or state of knowledge concerning available production methods. The theory is applicable since the production being studied in this study is in short run which considers only variable costs and output, of which fixed costs are not involved.

$$Q = f(X_1, X_2, X_3, \dots, X_n)$$

Where Q is the maximum output and X is the level of usage of various inputs.

$$Q = f(K - \text{capital}, L - \text{labour})$$

If capital, K in short run capital is fixed, the Cobb Douglas production function is $Q = \alpha K^\alpha L^\beta = \delta L^\beta$, Where $\delta = \alpha K^\alpha$. If $L = 0$ no output is forthcoming.

When the Cobb-Douglas production function is transformed into linear form by converting it to natural logarithms the equation then becomes

$$\ln Q = T + \beta \ln L$$

Where $T = \ln \delta$ (Maurice and Thomas, 2016).

2.2.1.2 Motivation theory a Herzberg's two factor model

Two factor model of satisfiers (motivators) and dissatisfiers (hygiene factors) was developed by Herzberg *et al.* (1957), the satisfiers are work itself, achievement,

recognition, advancement, responsibility, advancement and growth while the dissatisfies involve the salary, supervision, security, relationship with subordinates or neighbour, Company policy and working condition.

A dairy smallholder farmer may be motivated to increase productivity to his or her dairy farm and there is high possibility of getting profits but the surroundings may affect motivation and hence a dairy farmer may either lower or increase efforts on dairy cattle farm activities. Examples of influencing factors include price change or change of policy (Armstrong, 2009).

By concentrating on using the intrinsic motivating factors such as responsibility, achievement and recognition and using these principles to govern the job design can result in increasing interest, commitment and achievement of the job. Motivation towards the job will be higher when production is more rewarding in terms of productivity and profits. Interest can be created in the job by the quality of willingness that they will continue obtaining increased income through job doing by using their skills and abilities (Armstrong, 2006).

2.2.2 Socio-economic factors

Socio-economic factors refer to the factors relating to or concerning the interaction of social and economic factors (Turnbull, 2010). The socio-economic factors can be measured in a number of ways. The most common schemes relate to income, household density, ownerships of goods, and classification of occupation, education attainment, skills, and training (Whitehead, Todd and Ballinger (2007)). In addition, other schemes include age, sex, marital status, experience, family size, participation in social life, scale of enterprise and production level.

This study will base on socio economic factors influencing dairy cattle milk productivity. Such socio economic factors include, proportion of labour force in the household, herd size, knowledge of the farmer on dairy cattle husbandry, owned land for pasture species establishment and amount of other income used in dairy cattle milk production and amount of credit used in dairy cattle milk production.

2.2.2.1 Proportion of labour force from households

Dairy cattle need to be fed, watered, and milked at a specific time, to live in a clean and safe environment and their health monitored. In order for these activities to be done effectively labour force from smallholder dairy farmer households is required. Dairy farming requires dairy farmers who are determined, hardworking, ambitious and enduring (Mosielele, 2016).

Traditional and labour-intensive production technology continues to function in countries where the average herd size is small (Heikkila, Myyra and Pietola, 2012). In this type of technology, labour intensive is higher than capital intensive. Livestock husbandry involves special determination, knowledge and skills that are human capital assets specific to the stockman (Upton, 2014). When the dairy activities are effectively done by household members, they will increase productivity and are likely to lower transaction cost more than with casual labour, especially if the household has able-bodied members, since the increase in production per herd is at the expense of labour input and capital.

The allocation of labour to different tasks by different age and sex groups of family members could be a strategy used to overcome labour shortage and to utilise the available labour efficiently (Hailemichael *et al.* 2012). The availability of labour force in the households is an important factor in determining its contribution to the productivity of dairy cattle in the smallholder farms. However, households with larger herd size might have low dairy cattle milk productivity due to low labour supply to various activities.

Livestock that are confined or permanently housed help to facilitate management practices such as nutrition, breeding and health management also protects crop from damage however, requires more labour input for feeding, watering and husbandry of the livestock (Upton, 2014).

2.2.2.2 Herd size

The family flock or herd refers to a capital stock or endowment, which results from past productive activity that will increase household income above the one derived from the inputs of land and labour (Upton, 2014).

Most of the livestock owners especially cattle keepers are traditionalists. They do not easily accept to change their way of life. Some keep livestock for prestige, payment of dowry and others for religious use. Most of livestock owners tend to emphasize more on numbers of livestock rather than on quality. Livestock owners tend to keep large numbers of livestock compared to available pasture land. Since they tend to keep as many livestock as possible there occurs overstocking. Large numbers of dairy cattle to smallholder farmers increase dairy produce, though with poor management reduce their productivity (Sibuga *et al.* 2004).

2.2.2.3 Knowledge of the farmer on dairy cattle husbandry

Smallholder farmers need to be trained to produce raw materials at a required amount and quality in order to meet standards and secure market from industrial sector (Nanai *et al.* 2017). Among constraints to increase milk production in smallholder sector is poor animal management such as poor feeding through poor forage use and low supplementation of concentrates (Gerosa and Skoet, 2012).

Most of the livestock keepers have poor knowledge on good animal husbandry, they do not have knowledge on principles and practices of livestock husbandry such proper feeding, breeding and disease control as a result their livestock have low productivity (Sibuga *et al.* 2004). Also, farmers lack the technology and inputs needed to raise their productivity (World Bank, 2008). Dairy farmers with good husbandry knowledge will provide the best care and conditions needed for the cow to produce well (Matthewman, 1993).

Dairy farmers with dairy husbandry knowledge can play their part by ensuring that good dairy farming practices are implemented at his/her farm for increased and quality milk is produced by healthy livestock in a sustainable manner that can compete in the market. Constraints which limit milk production are many and may

fall on environment, biological and genetic, and the way these constraints can be tackled depends on the farmers' knowledge and ability and capital available for investment (FAO, 2011).

Training dairy farmers on dairy husbandry can provide them with the tools and attitudes necessary to improve farm management. These trainings are often very valuable to make farmers aware of the new innovations and intensive techniques in the course of adoption and innovation (Mellor, 1966; Kinsey, 1993; Salami *et al.* 2010). Thus, farmers require continued advice, extension, inputs and training if they are to continue to maintain or expand their enterprise (Matthewman, 2013).

2.2.2.4 Credit borrowed for dairy cattle milk production

Many livestock keepers are prestige in owning large number of animals and they don't have adequate capital to invest (Sibuga *et al.* 2004). Smallholder farmers are often uneducated, undercapitalized and that they do struggle to meet these requirements, they depend on saving from their low incomes which limit opportunities for expansion (Salami *et al.* 2010).

Limited access to credit and saving facilities in rural area has been a challenge on agricultural and rural development; greater improvement may be achieved by improving credit facilities and promoting co-operatives production (Upton, 2014).

Livestock industry requires high capital for investment; most credits available are on short-term basis (URT, 2012). Many financial institutions supporting investment in livestock development include commercial banks, microfinance Institution such as Savings and credit Associations (SACs) and Savings and Credit Cooperative Societies (SACCOs) and other informal financial Institutions (URT, 2012). However, most of these financial institutions are in urban and peri-urban only. Also, shortage of credit on livestock inputs is among challenges that hinder dairy cattle milk productivity (Nanai *et al.* 2017).

2.2.2.5 Owned land for pasture establishment

In an investment in livestock enterprise, land is one of important inputs for livestock development. Land is required for pasture establishment, grazing, cattle house construction and source of water. But as livestock number increases, crop- livestock interactions become increasingly competitive for the use of land and other resources (Upton, 2014). Milk productivity and production increase as the number of livestock is kept according to the available land and pasture resources. Owned land provide opportunity to establish and manage effectively pasture and water sources. Dairy production mainly under small scale farms have shown to be susceptible to seasonal variation and feed supply, though the variation is less in medium and large farms (URT,2011).

Open access pasture land usually leads to overgrazing and finally land degradation. Private or communal ownership are preferable options. Private ownership gives individual with security of ownership and incentive for conservation. Not only that but also individual ownership accompanied with enclosure are important in protecting crops from damage. However, communal land is beneficial can as well overgrazed and degraded if not effective control (Upton, 2014).

Since a key factor of milk prices is the cost of feed that directly affects milk production by increasing production costs and, indirectly, by higher land values (Hemme and Otte, 2010). The availability of land owned by dairy farmer will reduce production cost, through land rent and increase profit to dairy farmer. Also, if the animals are entirely dependent on either household waste or purchased feed then there is truly no competition for land and livestock venture will be supplementing income from agricultural production with little or no interaction between activities (Upton, 2014)

2.2.2.6 Productivity of dairy cattle

Agricultural productivity is one of the key elements of high and continued agricultural growth over the longer term period. Countries with high agricultural growth have a better route to a wider transformation process of raising farm incomes, raising demand for industrial goods, boosting non-farm growth and creating an

additional demand for workers. Also, raising farm productivity motivates broad entrepreneurial activities through new products diversification, developing and expansion of agro processing industries, advancing rural service sectors and new market (Harvey, 2006 cited by Salami *et al.* 2010).

2.2.2.7 Dairy cattle milk production per cow per day

From the world milk yield produced, milk from dairy cattle dominates the global milk yield representing 85% of the global production and it is estimated that about 150 million household around the world are engaged in milk production (Gerosa *et al.* 2012).

Milk yield in the herd depends on the breed, some breeds produce between 15 to 25 litres per cow per day, such breeds include; Friesian which produce 20-25 litres per cow per day, Jersey breed produce between 15-20 litres per cow per day, Guernsey breed produce on average 16 litres/ day and Ayrshire produce on average of 20 litres per day (Mosielele, 2016).

In order to attain maximum potential of milk production from the dairy cattle in low production systems, the dairy farmers should be enabled to manage well their dairy cattle, government to enable supply of inputs at relatively low cost, provide extension services and to overcome bad socio-economic factors (WAP, 2016).

Milk production in the country is low due to low productivity of dairy and indigenous cattle. Approximately, 2.5 billion litres of milk are produced each year in the country of which 30% is produced by improved dairy cattle and 70% from indigenous cattle. The Tanzanian government has been introducing improved dairy cattle by financing dairy cattle projects in order to increase milk production. Due to low milk productivity it necessitates the Government to import about 60% of milk in the processed form to meet the market demand. This shows that there is a gap in the market that has not been met or covered by dairy producers (URT, 2015).

2.2.2.8 Milk market and its products

Milk can be sold either in the form of fresh, fermented or milk products, milk products include whole milk powder, skim milk powder, butter and cheese. Milk and milk products can be sold locally, imported or exported (Upton, 2014).

The increase in demand assures availability of future milk market which alerts the need to improve dairy cattle milk productivity to meet current and expected population demand (Morrison, 2013).

Agricultural markets have extended with growth in international trade. However, trade in livestock products from developing countries represents only a small fraction of total by value if related to developed countries, Latin America contributes 3 percent to global exports, East and South Asia for 2 percent, the Near East and North Africa for 1 percent and South Asia and sub-Saharan Africa each for 0.2 percent (Upton, 2014). The results of this, developing countries have become net importers of agricultural produce including all livestock products and milk being the largest imported item by weight. This implies that there is low productivity of livestock products from developing countries.

2.2.3 Profitability of dairy cattle milk production

Profit serves as the mark in the game of business, is the amount by which revenues exceed cost. In the world of business profit matters most because the value of business and wealth of the owners are determined merely by the profits that firm can earn, and maximizing profit each time means the maximizing the value of the farm (Maurice and Thomas, 2016).

Profit maximizing farm or firm will always mean to choose a method of production that will increase output for a given cost (example available labour time) or lower cost for a given output level. Lack of motivation in agricultural production activities is commonly not due to poor motivation or fear of change but due to unprofitable opportunities (Todaro and Smith, 2012).

An increase in price of one or more of inputs that are used in producing an output will lead to the increase in cost of production, an output becomes less profitable and a producer will want to supply less quantity. The opposite is that; if prices of inputs used in production are low will reduce production cost and a producer will want to supply larger amount of outputs at a given price (Maurice and Thomas, 2016).

In a short run, producer surplus = Total revenue (TR)-Total variable cost (TVC) (Maurice and Thomas, 2016). This helps to calculate the profit earned by the smallholder dairy farmers from milk production. The profit is calculated as Profit (π) = Total revenue (Yield x Price) – Variable costs (Inputs x Price) (Maurice and Thomas, 2016).

When a farm produces maximum output at a given combination of inputs and existing technology, the farm is technically efficient, thus for technical efficiency a farmer who reduces usage of any inputs will cause output to fall. However, the farm should not only base on technical efficiency but also on economic efficiency, in which the farm should produce an output at the lowest possible total cost in order to earn profit (Maurice and Thomas, 2016).

2.2.4 Factors influencing profit in dairy cattle milk production

Profit in dairy cattle milk production can be influenced by several factors such as labour wages, dipping/Spraying cost, concentrate (Animal feed supplement) cost and price of milk per litre.

2.2.4.1 Labour wages

Dairy cattle require more inputs and labourer than beef cattle. The labour force can be from household members or hired. If it the labour force from households, time spent should be converted into money in economic calculation. A monthly wage of labourer is divided by 160 in a month (officially there are 40 working hours a week and there are 160 hours in a month (Bonnier, Maas and Rijks 2004)).

2.2.4.2 Dipping/Spraying cost

Acaricides are chemicals which kill ticks that can be applied to dairy cattle by dipping the animals into dips or spraying the animal in spray race for larger herds, for a small herd a hand spray can be used. In order to control ticks dipping or spraying should be done once a week during rainy season and bi weekly in dry season (Bonnier *et al.* 2004).

2.2.4.3 Price of milk per litre

Dairy farmer is required to milk and maintain good quality of the milk produced, good quality milk will result to better price and demand. A dairy farmer will implement different systems such as zero grazing which requires more labour forces if the milk has good price as it will result into profit making (Bonnier *et al.* 2004).

2.2.4.4 Treatment cost

The health of dairy cattle should be taken care all the time either when it falls sick which require treatment or when it healthy by controlling vectors so as to avoid it from becoming ill. Preventive treatment such as treatment against worms before and after rain season can be done in order to prevent the animal from becoming weak and avoid production losses. Also the benefits obtained from treating the dairy cattle animal should be better than the costs in order to avoid or minimize loss making (Bonnier *et al.* 2004).

2.2.4.5 Concentrate cost

Concentrates are animal feeds that have lot of nutrients and less fibre in comparison with roughage. Animals' diet is usually supplemented with fodder or concentrates. Supplements can be produced on the dairy farmer land or bought on the market. Supplementing feeding is usually done when the animals are brought home from grazing or when they are being milked. Supplementing feeding to dairy cattle is only possible when milk price is high enough and supplements are not too expensive (Bonnier *et al.* 2004).

2.3 Empirical Literature Review

2.3.1 Socio economic factors

2.3.1.1 Proportion of labour force in the household

Household labour force is defined as the proportion of household members by working age and those who can contribute to household income. Household members above 15 but less than 71 years of age formed the active labour force in rural areas (Aikaeli, 2010).

The study done by Hailemichael *et al.* (2012) on assessing the socio economic status of dairy producers and the purpose of dairy keeping in relation to urban and peri - urban area, found that, household members participated in various dairy activities both in urban and peri-urban areas. The allocation of labour to different age and sex groups of family members was based on the nature of the task. Adults were concerned with activities such as purchasing, selling cattle, caring sick animals, feeding animals and watering. Child boys were mostly involved in herding, watering and barn cleaning in both the urban and peri-urban area, but child girls were less involved in the farms and no female children were involved in any dairy activities both in urban and peri –urban area.

2.3.1.2 Herd size

The study on Milk availability trends and demand and medium- term outlook done by Gerosa *et al.* (2012) found that herd size in developed countries in the period between 2001 and 2007 went from 74 to 99 cows per herd in 17 countries covering Europe, Asia, Australia and North America and there is a large difference among countries, ranging from 19 cows per herd in Norway to 337 on average in New Zealand.

The study on socio economic profile of dairy farmers done by Shinde (2011) found that, more than half households had 1-3 dairy animal, few than 10% had more than 15 dairy animals. About 70% of the households keep one to three dairy animals that there were few very large herds.

2.3.1.3 Knowledge of the farmer on dairy cattle husbandry

In the study on socio economic profile of dairy farmers done by Shinde (2011), it was reported that most of the farmers were involved in livestock and especially dairy activity through hereditary; these farmers had no enough knowledge on dairy farming. This implies that shortage of knowledge on dairy farming is the cause of poor management of dairy cattle that results into low milk productivity.

2.3.1.4 Alternative income used for dairy cattle milk production

Dairy cattle farming like any other enterprise generate income through milk production. The study done by Fiestas and Sunil (2011) on Constraints to private investments in the poorest developing Countries found that in order to expand enterprises capital is required to make the necessary investments to increase production capacity and competition.

Several studies found that livestock development was constrained by weak institutions, limited access of farmers on market and credits, inadequate infrastructure and limited political commitment to stimulate the development of rural livestock sector, these factors have hindered productivity growth to smallholder farming (Zwart, 2011; Salami *et al.* 2010).

Also, the study by Salami *et al.* (2010) on Smallholder agriculture in East Africa: Trends, constraints and opportunities found that share of commercial banks loans to agriculture sector has been very low compared to other enterprises such as manufacturing, trade and other services sectors. The low consideration of financial institution on agriculture hinders expansion of technology adoption. This indicates that lack of capital to smallholder farmers is one of the main factors which lead to low milk productivity in dairy farming.

2.3.1.5 Owned land for pasture establishment (for animal feeds)

Pasture establishment is important in dairy cattle management as it ensures availability of animal feeds in terms of quality and quantity. However, pasture establishment requires land availability which is a challenge to many smallholder dairy farmers. Also, there is an unequal access to land among smallholder farmers

which causes undeveloped agriculture and degradation of natural resource. The available land is overly subdivided into small and uneconomic units among smallholder farmers leading to fragmented production systems and low productivity. The farm sizes range from 1ha per household in Ethiopia, 2.0 ha in Tanzania and 2.5 ha in Uganda and Kenya. These sizes remain below those of North America (121 ha), Latin America (67 ha) and Europe (27 ha) (Salami *et al.* 2010).

2.3.1.6 Dairy cattle Milk productivity

The annual milk production in Europe, Asia, North America, Norway, Israel and New Zealand countries between 2001 and 2007 was found to increase from 7,726 to 8,550 kg per cow. The country with highest average milk production was found to be Israel, whose production was 12,546 kg per cow and the lowest country in milk production was New Zealand with 3,974 kg per cow. The difference is due to different production systems, especially in regard to the nutrition of the cows and genetic potential of the animals. The feeding strategy was found to have a major impact on the production obtained. The system in New Zealand is based on all year grazing in comparison to Israel, where the system is based on in barn feeding whereby the supply of energy-rich total mixed rations is done (Gerosa *et al.* 2012).

Also, a study done by Nga, Cuong, Ha and Lebailly, (2013) on Milk production and marketing in small dairy holders in the Northern area of Vietnam to pure Holstein Friesian (HF) breed-small size (LBSZ), pure Holstein Friesian breed-Medium size LBMZ, cross breed –small size CBSZ, and cross breed-medium size (CBMZ), found that the average milk production per cow per day of LBSZ, LBMZ, CBSZ and CBMZ farms were 20.61; 21.25; 20.03; 19.39 kg respectively.

2.3.1.7 Milk market and its products

In a study done by Njehu and Omore, (2014) on milk production, utilisation and marketing channels it was found that of total milk produced, 60 percent was sold as either fresh milk or fermented and the remaining was used for family consumption at the dairy farmer household in the form of fresh or fermented. Milk market was found to be a challenge to dairy farmers who were selling their milk to individual consumers or private milk traders.

2.3.2 Profitability in milk production

Mbatia (2010) observed that, farmers invest on land, cows, animal feeds and labour so that they can provide their families and other customers with milk, they must however earn profit from their activities if they are going to operate as a successful business. Schwalbach, Groenewald and Marfo (2001) reported that farmers made losses and only few made small profits from cattle farming, in which 56% of farmers operated at loss, 27 % of dairy farmers made small profits and 17 % break even

2.3.3 Factors influencing profit in dairy cattle milk production

2.3.3.1 Concentrate cost

Gangasagare and Karanjkar² (2009) reported that farmers who didn't feed the concentrate got lactation yield at significantly reduced than those who practiced feeding concentrate and hence more profit obtained. 54% of dairy farmers realized the importance of concentrate feeding to dairy animals.

2.3.3.2 Dipping/Spraying cost

Ngongoni *et al.*(2006) reported that acaricides was applied routinely at weekly intervals during summer and fortnight during the dry season to control ticks. Cattle travelled to the dip tank and few households controlled ticks on the farm by using the knapsack sprayers.

2.3.3.3 Treatment cost

Ngongoni *et al.*(2006) in the study of factors affecting milk production in smallholder dairy sector, reported different diseases that affect the dairy cattle such as tick borne diseases, internal parasites, mastitis, retained placenta, brucellosis. These diseases if occur to the animal are to be treated in order to save it from death. Some of diseases can be controlled through dipping/spraying, regular deworming and vaccination. Otherwise treatment cost could be higher that can hamper the profit of milk production.

2.3.3.4 Labour wages

Ngongoni *et al.*(2006) reported that most of the farmers hired labour to perform dairy activities such as milking the cows, feeding the cows, herding dairy cattle delivery of the milk to the market and also participated in crop production. Although

family members also assisted in performing the above duties concentrated in crop production. The number of hired labour varied from one in most communal areas to three in the small scale commercial areas.

2.4 Conceptual framework

In order to meet the objectives of the research and identify the variables for data collection a conceptual framework was developed. The conceptual framework developed generates the relationship between independent and dependent variables. Then the hypothetical relationships between and among variables was explained. The conceptual framework grouped the variables into; independent and dependent variables. Independent variables include: proportion of labour force in household, herd size, knowledge of farmer on dairy husbandry, owned land for growing pasture, alternative income, and education level, experience of farmer on dairy farming, dependence ratio and access to credits while dependent variable is dairy cattle productivity in terms of milk yield. From the conceptual framework the independent variables influence the dependent variable. The conceptual framework (Figure 2.1) outlines variables that were studied and information collected being used for empirical analysis.

2.4.1 Proportion of labour force in the household

Dairy farming is a labour intensive enterprise involving many activities such as harvesting pastures, chopping pasture, feeding, watering, cleaning of the cattle barn, milking the cow and selling milk. All these activities require enough manpower to manage them. If there is low labour supply, for example in feeding, watering, milking and taking care for treatment, it will affect dairy cattle milk productivity. However, the intensity of work depends also on the herd size. Dairy farmer with big herd size will require more labour force than the dairy farmer with small herd size. The dairy household farmer may have big number of household members but households may either have many or less abled persons to supply labour power to the dairy cattle farm activities. This variation of proportion of labour force in the household may affect distribution and implementation of work hence affects dairy cattle milk productivity.

2.4.2 Herd size

Milk yield depends on the number of animals being milked in the herd, thus a dairy farmer with big herd size and larger number of cow composition incorporated with good management will have more milk produced compared to other farmers with less herd sizes.

2.4.3 Education level

Education level of dairy farmer has an impact on productivity of dairy cattle due to the fact that a dairy farmer with higher level of education has higher understanding ability of capturing new concepts especially from training and reading that can help in making good decision for improving dairy cattle milk productivity compared to the dairy farmer with low level of education.

2.4.4 Owned land for pasture establishment

Owning land has advantages for establishing different varieties of pasture species that can ensure availability of animal feeds in terms of quantity and quality throughout the year. The land can be protected and there is an assurance of long term use rather than renting. A dairy farmer owning a big piece of land is assured of availability of more pasture (Animal feeds) throughout the year that can be used to feed his /her dairy animals hence increase milk productivity.

Pasture establishment takes more than a year if not well irrigated to generate enough fodder; rent land can be taken at any time by the land owner that can affect pasture production important for improving dairy cattle milk productivity due to shortage of animal feeds.

Also, a farmer with big number of dairy cattle but with small piece of land may experience overstocking that leads into poor animal health due to feed shortage. Poor health has negative impact on animal productivity in terms of milk yield.

According to biological nature of dairy cattle, stomachs do require more pasture and less concentrates. The pastures to be fed to dairy cattle should be enough in terms of quantity, about 3% of animals' body weight and nutritious as well to meet body requirement for maintenance and production. Thus, a farmer with a big piece of land

can establish both local and improved pasture for feeding his /her dairy cattle to increase productivity. Owned land if well grown with pasture species will help ensure availability of feed throughout the year that will improve productivity and hence increase milk yield.

2.4.5 Knowledge of the farmer on dairy cattle husbandry

Farmers who are trained on dairy cattle husbandry are expected to have knowledge and skills as human capital assets, that will enable them manage well by themselves their dairy cattle and be able to improve their productivity to produce more milk compared to those who have not yet trained

2.4.6 Dependence ratio

Dairy farmer household with more dependents will require more milk yield to meet the dependents requirements (in terms of feeding, clothing, health and other services such as education). In order for the dairy cattle to produce such milk more efforts will be engaged in dairy cattle farming compared to the household with no dependents. Therefore, the household will engage more effort in dairy farming in order to ensure that maximum milk is produced through doing all necessary requirements such as feeding, watering, milking and cleanliness which are important in improving dairy cattle productivity in terms of milk yield.

2.4.7 Experience of dairy farmer on dairy farming

Dairy farmer with long experience in dairy farming in the project are expected to have learnt a lot to improve productivity of dairy cattle in terms of milk yield compared to new comers.

2.4.8 Amount credit spent in dairy cattle milk production

Amount of credit spent in dairy cattle milk production is important in increasing dairy cattle productivity in terms of milk yield by enhancing the farmer with purchasing power to purchase animal feed supplements (Concentrates) for dairy cattle and also be able to afford dairy cattle treatment services especially when the dairy cattle is not producing milk. Dairy cattle require special care in terms of treatment and animal feed supplements. Additional animal feed supplements in form of concentrate are required to supply more nutrients required to the animal for

growth both for itself (including mammary glands for milk production) and for the fetus, especially for the pregnant animal, for milk production and replacement of nutrients drained in milk during milk production. Milk is produced from nutrients supplied to the animal through pasture and concentrates. Dairy cattle supplied with less concentrate during pregnancy and after calving produce less milk yield. Therefore, the supply of concentrates to the dairy cattle is vital for improvement of dairy productivity in terms of milk yield.

2.4.9 Dairy cattle milk production per cow per day

Productivity of the dairy cattle will depend on the contribution of the socio economic factors. Good socio economic factors will lead to high dairy cattle milk productivity and bad ones will result in low dairy cattle milk productivity from the dairy cattle.

2.5 Profitability from dairy cattle milk production

2.5.1 Profit

When there is higher productivity of milk from dairy cattle and profit is accrued from production activities, then profit becomes a motivating factor toward dairy activities. More efforts will be exerted on dairy activities to ensure that the dairy cattle produce milk to its maximum potential. Whereas if there is a loss it becomes a dissatisfier factor as much of its efforts and wealth will be spent on dairy activities, the dairy farmer will therefore reduce efforts toward the dairy activities. Hence, production will be low only for subsistence and for the welfare of the dairy cattle not to die. Profit in dairy cattle milk production can be influenced by several factors such as labour wages, dipping/Spraying cost, concentrate (Animal feed supplement) cost and price of milk per litre.

2.5.2 Labour wages

Labour force used in production is important agent as is used to transform knowledge and skills into work. The amount of labour force in the dairy cattle farm depends on the number of activities and herd size.

The higher the labour force in small herd size of dairy cattle the higher the wages and lower the profitability. Dairy cattle farms with larger herd size will require more

labour force than one with less herd size. Large herd size means more labour force hence more wages due to present number of activities from available dairy cattle.

2.5.3 Dipping/Spraying cost

Dairy cattle need to be dipped or sprayed with acaricides in order to control external parasites mainly ticks. Dipping or spraying can be done weekly or bi weekly depending on the season. In rain season tick infestation is higher in the pasture requires weekly control through dipping or spraying. The higher the frequency of dipping/ spraying the higher the cost due to more quantity of acaricides required.

The higher the cost of production in terms of labour wages, dipping/Spraying cost, concentrate (Animal feed supplement) cost the lower the profitability and the lower the cost of production the higher the profit.

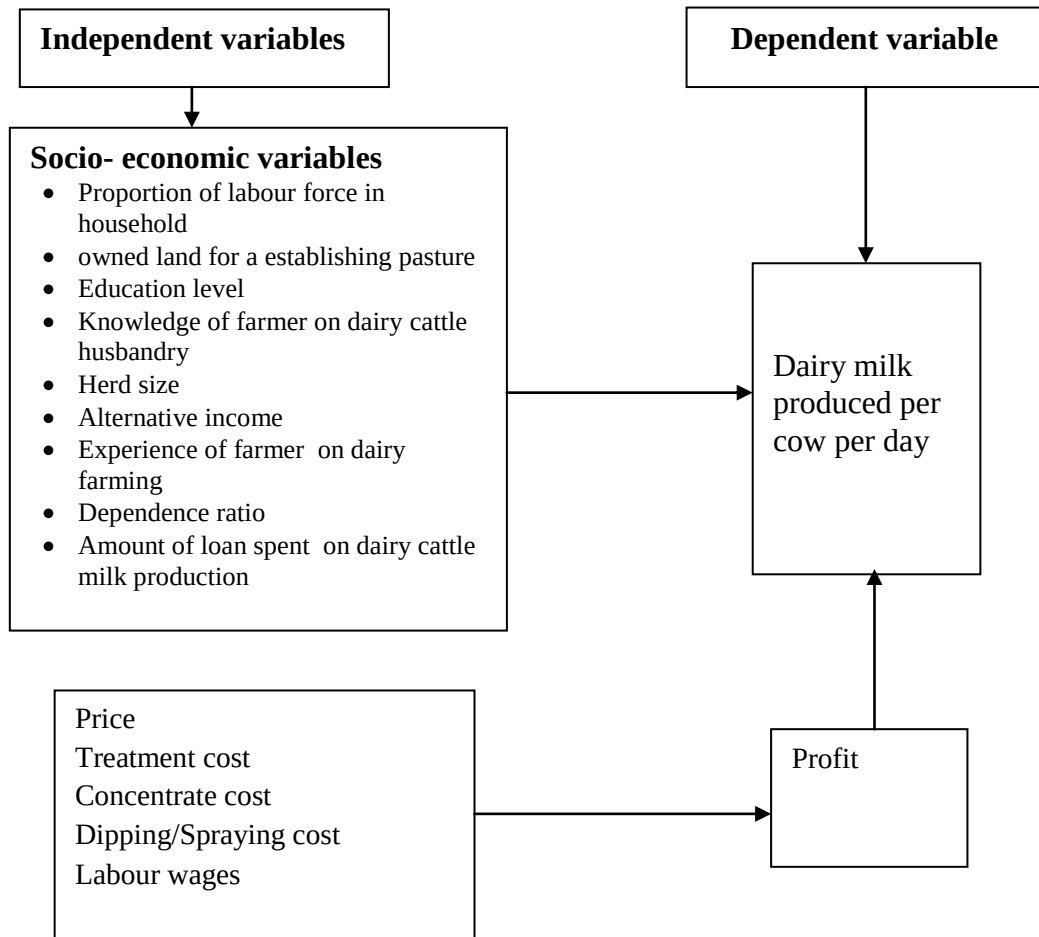
2.5.4 Price of milk per litre

When the price of selling milk per litre is higher will lead to higher profit provided that other factors remain constant.

2.5.5 Treatment cost

The health of dairy cattle should be taken care most of the time, since it is a production entity. When dairy cattle fall(s) sick will reduce production such as milk production but also will be required to be treated, treatment will depend on the magnitude or severity of disease and frequency of disease to the dairy cattle. Frequency of treatment to the dairy cattle means more money spent on treatment hence more cost. The higher the cost of treatment will reduce the profit from milk production.

Figure 2.1: Conceptual framework showing relationship between variables



Source: Field research2017

2.6 Research Model

2.6.1 Econometric model for data analysis

Multiple regression analysis was used to determine the socio economic factors that influence dairy cattle milk productivity in Namtumbo District council. This mathematical model can be used to determine the linear relationship between one response variable and more than one explanatory variable (Kothari and Garg, 2014).

2.6.2 Model specification

The Multiple regression model was used to examine the socio- economic factors that influence the dairy cattle milk productivity. The response/dependent variable was milk yield as continuous variable. The Ordinary Least Square (OLS) was used to

model a continuous response/dependent variable which is dairy cattle milk productivity. The multiple regression model was expressed as shown in the equation

$$Y = a + b_1X_1 + b_2X_2 + \dots + b_kX_k + \text{error}$$

Where Y is the dairy cattle milk productivity, a is the intercept or constant and b_1, b_2, b_k are regression slopes of regression coefficients, $\text{error} \sim N(0, \sigma^2)$, X_s are socio-economic factors which influence dairy cattle milk productivity. In order to fit this model the coefficients a, b_1, b_2, b_k were estimated by the use of least square method (Dielman, 1991 and Kothari, 2004).

2.6.3 Model estimation

From the research model specified, the dependent variable dairy cattle productivity or Milk yield and the dependent variables (knowledge of the farmer, proportion of the labour force in the household, herd size, education level, alternative income, owned land for pasture establishment, experience of the farmer on dairy farming and amount of credit used for dairy cattle milk production) were run using regression analysis approach. The variables, namely milk yield, proportion of labour force from household and knowledge on dairy farming came from short run production function while others emerged from empirical study, thus when combined the model was estimated by Ordinary least square as;

Dairy cattle milk productivity (Milk yield) = $a + \text{Proportion of the labour force in the household } B_1 + \text{Herd size } B_2 + \text{Ownership of land } B_3 + \text{Knowledge on dairy husbandry } B_4 + \text{Experience of the farmer on dairy farming } B_5 + \text{Alternative income } B_6 + \text{Dependence ratio } B_7 + \text{Education level } B_9 + \text{Amount credit used on dairy farming } B_9 + \text{error}.$

Also from the research model specified, the dependent variable profit and the dependent variables (labour wages, price, Concentrate /Animal feed supplement cost and treatment cost) were run using regression analysis approach.

Profit = $a + \text{Labour wages } B_1 + \text{Price } B_2 + \text{Concentrate cost } B_3 + \text{treatment cost } B_4 + \text{error}.$

2.7 Hypothesis

From the research model

Dairy cattle productivity (Milk Yield/cow/day) = f (Proportion of labour force) (L), Knowledge of the farmer on dairy cattle husbandry (Kf), Education level of dairy farmer (El) Herd size (Hs), Amount of other income used for dairy milk production (Ai), Amount of credit spent on dairy cattle milk production (Ac), Dependence ratio (Dr), Ownership of land for growing animal feeds (Ol), and Experience of dairy farmer (Edf)

$MY = f(L, kf, El, Hs, Ai, Ac, Ol, Dr, Edf)$

And Profit = labour wages, price, Concentrate /Animal feed supplement cost and treatment cost

$Profit(n) = f(lbrwages, trtcost, cntrcost, dipcost, price)$

2.7.1 Relation between socio economic factors and dairy cattle milk productivity

H₀1: Socio economic characteristics do not influence the dairy cattle milk productivity in the District.

H₁: Socio economic characteristics influence the dairy cattle milk productivity in the District.

2.7.2 Difference between dairy cattle milk production and profitability

H₀2: Dairy cattle milk production is not a potential for profit maximization

H₂: Dairy cattle milk production is a potential for profit maximization.

2.7.3 Factors influencing profitability in dairy cattle milk production.

H₀3: Factors do not influence profitability in dairy cattle milk production

H₁: Factors influence profitability in dairy cattle milk production

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology and procedures which were used for data collection. It describes the research design, the area of the study, the population, sample and instruments that were used in data collection. The methodologies involved for data analysis were both qualitative and quantitative in nature.

3.2 Study area

Namtumbo District Council was chosen to be study area because (i) farmers in Namtumbo have quite long time experience in dairy production (ii) dairy is one of the key economic sector that bring the major source of income for farmers in Namtumbo District Council.

3.3 Study of population

The target population for this research was households of Namtumbo District Council that keep dairy cattle under dairy cattle projects. According to Namtumbo District report 2016, there were 477 dairy cattle farmers under the dairy cattle projects with 817 dairy cattle.

3.4 Research Design

The study utilised descriptive research design specifically cross sectional survey design to assess the socio economic factors influencing smallholders' dairy cattle milk productivity. The cross-sectional survey was used due to the fact that it allows collection of data from different groups at one point at a time, efficient in time and cost serving (Kothari and Garg, 2004; Msabila and Nalaila, 2013). The study is designed to assess from cross –section survey of dairy smallholder farmers on the perceived influence of socio economic factors on dairy cattle milk productivity from smallholder farms.

3.5 Variables and their measurements

Msabila and Nalaila (2013) defined measurement as the process of observing and recording the observations that are collected as part of a research effort. Also, it should be noted that in quantitative research, aspect of social reality is transformed into numbers in different ways. Measurement is achieved by assignments of objects, events or people to discrete categories or by the identification of their characteristics on a numerical scale, according to arbitrary rules. This means careful attention must be given to level of measurement in quantitative research since the choice determines the methods of the analysis that can be undertaken (Blaikie, 2003).

Table 3:1 Variables and unit of measurement

S/ N	Variable	Definition of variable	Unit of Measurement	Expected sign
1	Productivity	Milk yield produced per cow per day	Litres	+
2	Herd size	Number of dairy animals owned by farmer in the house	Number	+
3	Proportion of labour force in the household	Number of people participating in dairy cattle project activities	Number	+
4	Knowledge of the farmer on dairy husbandry	Number of farmers trained on dairy cattle husbandry	Dummy variable, 2 if trained, 1 otherwise	+
5	Other income spend on dairy milk production	Amount of money obtained from other economic activities apart from dairy cattle	Tanzanian shillings	+
6	Amount of credit spent on dairy milk production	Amount of money borrowed from financial institution to boost the project	Tanzanian shillings	+
7	Experience on dairy farming	Number of years being in dairy farming within the project	Years	+
8	Dependents	Number of people who depends on others people for basic needs	Number	+
9	Owned land for pasture establishment	Piece of land for growing animal feeds (Pasture)	Ha	+
10	Education level	Education level of household head	Number of years spent in school;1=no schooling,2=primary school,3=secondary school,4=superior education	+
11	Casual labour	Wages	Tanzania shillings	-
12	Concentrate	Cost incurred on concentrates or maize bran	Tanzania shillings	-
13	Treatment	Cost incurred on animal treatment	Tanzania shillings	-
14	Dipping	Cost incurred on animal dipping or spraying	Tanzania shillings	-
15	Price	Amount of money for selling one litre of milk	Tanzania shillings	+
16	Profit	Amount of money gained after reducing total variable costs.	Tanzania shillings	+

Source: Field research, 2017

3.6 Sampling Techniques

3.6.1 Stratified sampling

In this technique, the population that is to be drawn does not constitute homogeneous group. Stratified sampling is applied to obtain a representative sample. In this technique the population is stratified into number of strata and sample items are selected from each stratum (Kothari, 2004). Survey employed this technique to identify groups and provide summary villages in each. From cumulative list of all strata, ten villages that had dairy cattle projects were selected as strata. The strata contained samples that were keeping dairy cattle in the dairy cattle project.

3.6.2 Simple random sampling

Simple random sampling is a technique which each member of the population has an equal chance of being selected as subject (Msabila and Nalaila, 2013). All households within each cluster were included in the survey. From each village smallholder dairy cattle farmers were randomly selected who finally participated in the research. This was done basing on attendance of respondents in which a sampling frame was constructed from response of dairy cattle farmers on the meeting called by the village executive officer/village/ward extension officer. From sampling frame each member who attended a meeting was allowed to randomly pick one among folded piece of papers that were thoroughly mixed. From those folded piece of papers some had numbers and others had no numbers. Those written piece of papers had numbers up to last number according to the sample size. Therefore, those smallholder dairy farmers who picked piece of papers with no numbers were not allowed to fill in the questionnaire while those dairy farmers with numbers their data were collected through the questionnaires.

3.6.3 Non probability sampling

Also, non probability sampling particularly purpose sampling was used in selecting extension staffs for the study to gather some important data.

3.6.4 Sample size determination

The formula formulated by Yamane (1967) cited by (Polona, 2013) was used in calculating the sample size. Sample $n = \frac{N}{1 + N * (e)^2}$ where 'n' is the sample size, 'N' is the population size and 'e' is the level of precision or acceptable sampling error. A sample size was 100 from 477 dairy cattle farmers at precision level of 0.1.

The sample size was previously planned to be 150 at a precision of 0.07. But due to poor attendance in two villages being 11 and 13 while other villages the attendance was above 15. The sample size was changed to 100 at a precision level of 0.1 by dropping other samples from 150 at a precision level 0.7. In this research 100 samples were collected ten from ten villages and used in the study (Table 3.4). These equal samples from each village helped to minimize errors and bias among dairy cattle farmers in all ten villages.

Poor attendance or non-response rate was due to the fact that, one village was divided into two villages so members from the other village didn't turn up though were in the same group, which resulted only 11 respondents from one village, in the other village only 13 respondents responded as some members had emergencies, some were outside the village for different reasons, other members were sick while others members had no cattle and had a case to respond to village executive officer concerning illegal sale of the dairy cattle.

Table 3.1: Respondents by Location

S/n	Ward	Village	Community members
			Household members
1	Rwinga	Rwinga	10
		Minazini	10
		Mandepwende	10
2	Namtumbo	Namtumbo	10
3	Litola	Litola	10
		Kumbara	10
		Ngwinde	10
4	Mgombasi	Mgombasi	10
		Mtumbatimaji	10
5	Namabengo	Namabengo	10
Total number of respondents			100

Source: Field research, 2017

3.6.5 Validity and reliability of data

Sound measurement must meet the tests of validity and reliability. Validity refers to the extent to which a test measures what was actually supposed to measure, and reliability has to do with accuracy and precision of measurement procedure (Kothari, 2004). In order to ensure validity and reliability of data, a Kuder-Richardson procedure in estimating reliability of measures was applied. According to Msabila and Nalaila (2013) displayed a formula established by Kuder and Richardson (1937) which require only one administration of a test. The formula used was

$$r_{KR20} = \frac{K(S^2 - \sum pq)}{(S^2)(k-1)}$$

Where r_{KR20} = Reliability coefficient of internal consistency or Kuder-Richardson

Formula 20

K = Number of items used to measure the concept or total number of test
Items

$\sum$ = indicate the sum

s^2 = variance of individual items = pq

P = proportion of respondent who pass an item $i(1)$

Q = Proportion of respondents who fail an item $j(0)$

S^2 = Variance of all scores

The KR_{20} provides the mean of all possible split half coefficients. A pilot-testing was applied in which ten respondents from Namtumbo village were subjected to test the questionnaire for its validity and reliability. From the test the following were obtained. The $S^2 = 3.6875$, $K=10$, $\sum P \times q = 1.16375$

$$r_{KR20} = \frac{10(3.6875 - 1.16375)}{3.6875(10-1)} = 0.76045$$

Therefore, the measure had a good reliability to the sample by 76.04%.

As reported by Msabila and Nalaila (2013) that once it has been established a researcher instrument is valid it means the data that will be collected will be accurate and reliable. After the pilot test, other information like frequency of milking was added to the questionnaire.

3.7 Method of data collection

Both primary data and secondary data were collected. This study used documentary review and questionnaire methods for collecting data.

3.7.1 Secondary data

Are those data which have already been collected by someone else and which have already passed through the statistical process (Kothari, 2004). Secondary data especially on dairy cattle milk productivity and socio economic factors were collected from library, internet, Namtumbo district council reports, newspapers so as to improve primary data source and these data were obtained from existing published and unpublished information or literature. These data were accessed through books, text books, journals, previous research, internet, Namtumbo District council July, 2016 monthly report, Namtumbo District council December 2016 report on extension officers and infrastructure, and Namtumbo District council report of July 2016 on number dairy cattle farmers in the district.

3.7.2 Primary data

Primary data were collected through using questionnaires whereby the household heads were subjected to and the researcher asked questions and responses / answers filled in an appropriate space in the questionnaire copies. The questionnaires comprised of open and closed ended questions. Those questions were derived from specific objectives and conceptual framework of the research. The questions were designed to capture both quantitative and qualitative data on socio economic factors influencing dairy cattle milk productivity from smallholder dairy cattle farms (appendix 1). The 100 questionnaires were used, in order to minimize time and obtain the required number of the respondents close supervision was done and respondents were asked questions and answers filled in the questionnaires. The survey collected information on milk yield and socio-economic factors such as knowledge on dairy farming, proportion of labour force in the household, level of education, herd size, amount of other income used in dairy farming, amount of credit used in dairy farming, owned land for dairy farming, experience on dairy farming and dependence ratio as well as livestock support and infrastructure.

3.8 Data analysis

Both descriptive and inferential statistics were used in analysis of the data collected and household was a unit of analysis. The descriptive statistics such as percentages mean and frequencies were used so as to characterise the small households involved in dairy cattle farming, these included age, sex, marital status, household size and other economic activities. The SPSS version 20 was used in analyzing these qualitative data. The inferential analysis of quantitative data such as Socio economic variables was done by using STATA program.

The hypothesis of association was tested using the r^2 and significance was tested by using p-value. The profitability of the dairy cattle was analysed by using the excel sheet in which totals, percentages and frequencies of smallholder farms data from small householder dairy cattle farmers were found in determining the profitability of the dairy cattle milk productivity. Out of these results, conclusion and recommendations were drawn to give possible solution to research problem.

3.9 Data presentation

The results of the study have been organised and presented in tables, charts and raphs form.

CHAPTER FOUR

PRESENTATION OF RESEARCH FINDINGS

4.1 Introduction

The purpose of the study was to assess socio-economic factors influencing dairy cattle milk productivity in Namtumbo District council, Tanzania. This chapter provides the study findings focused on specific objectives. It is divided into five sections, including introduction, demographic characteristics of respondents, socio-economic factors influencing dairy cattle milk productivity, profitability of dairy cattle milk production to smallholder farms. The findings of this research were based on the real situation found during the field work.

4.2 Demographic characteristics of the respondents

The respondents who were involved in the conduct of this research study formed a sample of 100 smallholder dairy milk farmers.

The characteristics of sampled individuals were based on age, sex, marital status, household size, and other economic activities of respondents in relation to dairy cattle milk productivity.

4.2.1 Gender

From research findings it was found that of total respondents 62% were males and 38% females (Table 4.1). This means male were more available and responsive compared to females during data collection and also who were involved in dairy cattle project.

Table 4.1: Distribution of respondents by gender

Gender	Frequency	Percent
Male	62	62.0
Female	38	38.0
Total	100	100.0

Source: Field research2017

4.2.2 Age

Among 100 respondents who were subjected to the research, 58 respondents had the age between 41 and 60 years (58%), 28 respondents had the age between 21 and 40 (28%) and 14 respondents had age above 60 (14%) (Table 4.2). The implication of the findings is that most of the dairy farmers were in active age group which is important in labour supply in the dairy farms. Table 4. 2: Distribution of respondents by age

Table 4.2: Age

Age	Frequency	Percent
tween 21 and 40	28	28.0
Between 41 and 60	58	58.0
Above 60	14	14.0
Total	100	100.0

Source: Field research2017

4.2.3 Marital status

Out of 100 sampled respondents, research findings revealed that; 93% respondents were married, 3% divorced, 3% widow and 1% single. This means that most of the respondents were in couple (Table 4.3) and thus they had commitments to their family needs.

Table 4. 3: Distribution of respondents by marital status

Marital Status	Frequency	Percent
Single	1	1.0
Married	93	93.0
Divorced	3	3.0
Widow	3	3.0
Total	100	100.0

Source: Field research2017

4.2.4 Household size

Household size is the number of people living in the same house getting and sharing all necessary resources within the house such as accommodation and foodstuffs. Study findings (Table 4.4) reveal that, the household sizes were larger ranging from 5-8 (52%), 1-4 (30%) and above 8 (18%). The results indicate that the study area had household size higher 5-8 (52%) compared to 5 of National average according to

NBS, (2013) in household survey conducted in Tanzania Main land. This implies that the study area had larger household size compared to the national average household size.

Table 4. 4: Distribution of respondents by household size

Household size	Frequency	Percent
Between 1-4	30	30.0
between 5-8	52	52.0
Above 8	18	18.0
Total	100	100.0

Source: Field research2017

4.2.5 Other economic activity

Dairy farmers also engaged in other economic activity in order to raise income for home use. The research findings revealed from 100 respondents that; 89% were engaged in farming activity, 5% engaged in business, 4% engaged in other activities and 2% were employed (Table 4.5). The implication is that, dairy farmers apart dealing with dairy cattle project they also engage in other economic activities which is important in raising income when the dairy cattle has not started producing milk. The other income can be used in caring the dairy cattle when fall sick and supply of concentrates (additional nutritive feeds) when need be especially when sick and during pregnancy important of body condition and udder development for milk production after calving.

Table 4. 5: Distribution of respondents by other economic activity

Other economic activity	Frequency	Percent
Farming	89	89.0
Employed	2	2.0
Small business	5	5.0
Other activity	4	4.0
Total		100.0

Source: Field research2017

4.3 Influence of socio-economic factors on dairy cattle milk productivity

Table 4.6 presents the influence of socio- economic factors on dairy cattle milk productivity and the model explains about 84.07 % ($R^2 = 0.84$) of influence of socio economic factors on dairy cattle milk productivity. The influence was found to be positive. The model as a whole was significant, as indicated by p-value on F-statistic of 0.00. The results suggest that socio economic factors influenced dairy cattle milk productivity. Also, the results reveal that of nine main effects, only household proportion of labour force, knowledge of the farmer on dairy farming, herd size and experience had significant effect on dairy cattle milk productivity. The intercept was not statistically significant at any generally used level of significance.

Table 4. 6: Influence of socio- economic factors on dairy cattle milk productivity

Equation	Obs	Parms	RMSE	"R-sq"	F	P
Inmylitre	100	10	.4031409	0.8407	52.77349	0.0000
Inmylitre	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
Lnl	.9553144	.1777315	5.38	0.000	.6022197	1.308409
Lnkf	.7619598	.1515386	5.03	0.000	.4609019	1.063018
Lnel	.3361614	.2455434	1.37	0.174	-.1516533	.8239761
Lnhs	.65285	.1407353	4.64	0.000	.3732547	.9324453
Inaoiufdcp	.004065	.0091091	0.45	0.656	-.0140319	.0221619
Inacufdc	.0079691	.0129652	0.61	0.540	-.0177887	.0337268
Lndr	.0481939	.1421827	0.34	0.735	-.2342769	.3306647
Inolaf	-.042518	.2275417	-0.19	0.852	-.4945693	.4095333
Inedf	.3575622	.0595975	6.00	0.000	.2391613	.475963
_cons	-.6590961	.2176245	-3.03	0.003	-1.091445	-2267471

L=Proportion of labour force, Kf= Knowledge of the farmer on dairy cattle husbandry, El= Education level of dairy farmer, Hs= Herd size, Aoiufdcp= Amount of income used for dairy cattle milk production, Ac= Amount of credit spent on dairy cattle milk production, Dr= Dependence ratio, Ol= Owned of land for growing animal feeds and Edf= Experience of dairy farmer. $P < 0.05$ = Means significant.

In determination of influence of socio economic factors on dairy cattle milk productivity through multiple linear regression analysis ten variables were involved; one dependent variable and nine independent variables, these include Milk yield, knowledge of the farmer on dairy husbandry, proportion of labour force in the smallholder household, amount of credit used in milk production, amount of other

income used in milk production, dependency ration, experience, education level, owned land for pasture establishment and herd size. Other variables were used in the analysis of profit.

4.3.1 Proportion of labour force in the household (L)

Data on labour force were given by respondents based on number of household members who were involved in dairy cattle farm activities. 68% of respondents had 1-2 household members who were involved in dairy farm activities and 1% respondents had 5-6 members (Table 4.7). This shows that most of the dairy cattle farms activities were done mainly by 1-2 household members. This implies that the majority of dairy farmer households were able to supply one to two labour forces to dairy farm activities.

Table 4. 7: Distribution of proportion of labour force supply from respondents

Proportion of labour force	Frequency	Percent
1-2	68	68.0
3-4	31	31.0
5-6	1	1.0
Total	100	100.0

Source: Field research2017

4.3.2 Knowledge of farmer on dairy cattle husbandry (Kf)

Data on knowledge of the farmers were collected by asking the respondents if they had attended training concerning the dairy cattle husbandry. Majority of respondents (56%) attended training on dairy husbandry. This implies that those dairy farmers who were trained had managerial skills that enabled them to manage well their dairy cattle to produce more milk, than those who were not trained.

Table 4. 8: Distribution of respondents on dairy farm training

Dairy farm training	Frequency	Percent
No	44	44.0
Yes	56	56.0
Total	100	100.0

Source: Field research2017

4.3. 3 Herd size (Hs)

Data on herd size presented on Table 4.9, showed 55% of respondents had higher herd sizes ranging from 3 to 4 dairy cattle. As the local people in the study area whose main activity is agriculture involving cultivating crops so having this herd size is a successful to livestock industry especially on dairy industry for milk production.

The implication of the study findings is that respondents with higher herd size were having a big chance of having the more milk yield produced from many cows in the herd than farmers those with low herd size.

Table 4. 9: Herd size distribution from respondents

Number of dairy cattle	Frequency	Percent
No dairy cattle	2	2.0
1-2 dairy cattle	28	28.0
3-4 dairy cattle	55	55.0
Above 4 dairy cattle	15	
Total	100	100.0

Source: Field research2017

4.3.4 Experience on dairy farming (Edf)

According to Table 4.10, the results show that Out of 100 respondents, majority of the respondents (46%) seem to have experience. This implies that there is enough experienced dairy cattle farmers hence helps in influencing dairy cattle milk yield productivity performances.

Table 4. 10: Distribution of respondents by experience

Duration	Frequency	Percent
7Months-1.5 years	7	7.0
2-4 years	13	13.0
5-7 years	46	46.0
8-10 years	28	28.0
Total	6	6.0
	100	100.

Source: Field research2017

4.3.5 Dairy cattle milk productivity to small scale dairy farms

Table 4.11 presents the quantity of milk produced per cow per day. From study findings, among 100 respondents; 36% of respondent had their dairy cattle producing between 6 and 10 litres of milk per cow per day and 4% of respondents had dairy

cattle producing between 16-20 litres per cow per day. Also, the average milk production was found to be 5.97 litres per cow per day. This shows that the dairy cattle milk yield productivity in the study area were low. This implies that; Majority of the dairy farmers their dairy cattle had low milk yield productivity ranging between 6 and 10 litres.

Table 4. 11: Milk yield per cow per day

Milk yield	Frequency	Percent
0	25	25.0
1-5 litres	25	25.0
6-10 litres	36	36.0
11-15 litres	10	10.0
16-20	4	4.0
Total	100	100.0

Source: Field research2017

4.3.5.1 Frequency of milking

Among 100 samples of respondents, the research findings reveal; that 39 (39%) were milking twice per day, 38 (38%) milked once per day and 23(23%) don't milk (Table 4.12).

Table 4. 12: Frequency of milking

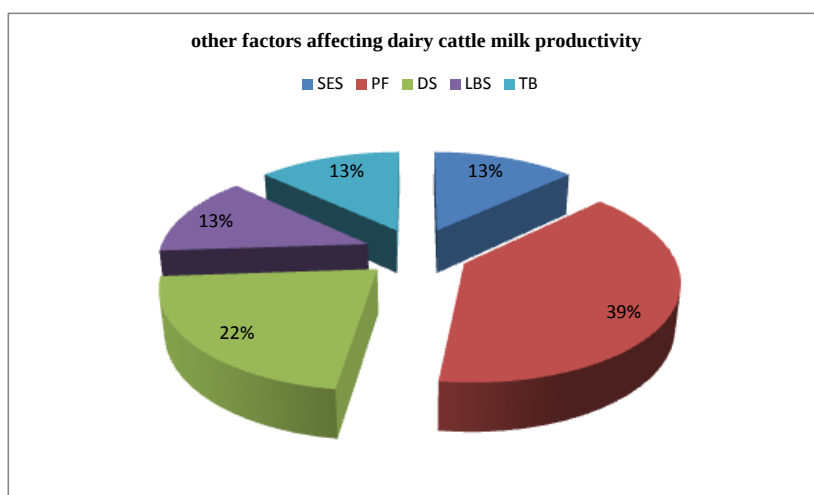
	Frequency	Percent
Don't milk	23	23.0
Once per day	38	38.0
Twice per day	39	39.0
Total	100	100.0

Source: Field research2017

4.3.6 Other factors that influenced dairy cattle milk productivity.

The study results through the extension services reveal that there were some other factors that contributed to low dairy cattle milk productivity. These factors were poor feeding (PF), diseases (DS), shortage of extension services (SES), lack of improved bulls (LB) and type of breed (TB).

Figure 4. 1: Other factors influenced dairy cattle milk productivity



Source: Field research 2017

4.3.7 Milk market and its products

Most of the milk in the study area was sold as fresh and fermented milk. The individual dairy farmers were selling the milk directly to individual consumers, food vendors and restaurants. The price of milk varied from one area to the next ranging from 500-1000/= per litre.

4.3.8 Profitability of dairy cattle milk production to small scale dairy farms

In short run, producer surplus = Total revenue (TR)-Total variable cost (TVC) was used to calculate profit in producing milk from smallholder farms. It was calculated by using the formula; Profit = (Yield x Price) – Variable costs (Inputs x Price) (Maurice and Thomas, 2016).

The research findings from the study area reveal that the dairy cattle projects operated with profit of 9,781,593.36/= for 100 dairy cattle and an average 97,815.93/= for one dairy cattle to smallholder farms in Namtumbo District council.

Table 4. 13: Profitability of dairy cattle milk production to small scale farms

Total revenue per months (Tsh.)	Variable cost per month (Tsh.)	Profit/loss (Tsh.)
14,059,500/=(for 100 dairy cattle)	4,277,907 (for 100 dairy cattle)	9,781,593.36/=(for 100 dairy cattle)
140,595(for one dairy cattle)	42,779.07 (for one dairy cattle)	97,815/=()for one cattle dairy)

Source: Field research, 2017

4.4 Factors influencing profitability in dairy cattle milk production to smallholder farms

Table 4.14 presents the factors influencing profitability in dairy cattle milk production and the model explains about 62 % ($R^2 = 0.62$) of influence of factors on profitability in dairy cattle milk production. The influence was found to be positive. The model as a whole was significant, as indicated by p-value on F-statistic of 0.00. The results suggest that factors influenced profitability in dairy cattle milk production. Also, the results reveal that of four main effects, only Concentrate and dipping/ spraying costs were had significant effect on profitability in dairy cattle milk production. The intercept was not statistically significant at any generally used level of significance.

Table 4.14: Factors influencing profitability in dairy cattle milk production.

Equation	Obs	Parms	RMSE	"R-sq"	F	P
Lnprofit	100	6	2.033988	0.6128	29.74809	0.0000
Lnprofit	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
lnlbrwages	.5735594	.5195161	1.10	0.272	-.4579521	1.605071
lntrtcost	-.0138922	.0730855	-0.19	0.850	-.1590052	1312207
lncentrcost	1.351572	.1203627	11.23	0.000	1.112589	1.590555
lnipcost	-.4849039	.1455953	-3.33	0.001	-.7739868	-.195821
lnprice	-.0578462	.9106637	-0.06	0.949	-1.86599	1.750298
_cons	-5.901039	6.767968	-0.87	0.385	-19.339	7.536919

Profit, lbrwages= Labour wages, cntrcost=Concentrate/Animal feed supplement cost, dipcos=Dipping/Spraying cost and $P < 0.05$ = Means significant.

In determination of factors influencing profitability in dairy cattle milk production through multiple linear regression analysis, five variables were involved; one dependent variable and four independent variables, these include profit as dependent variable and labour wages, Concentrate/Animal feed supplement cost, Dipping/Spraying cost and price as independent variables.

CHAPTER FIVE

DISCUSSION OF THE RESEARCH FINDINGS

5.1 Introduction

This chapter discusses findings on issues about demographic characteristics and specific objectives namely the socio economic factors affecting dairy cattle milk productivity, milk yield productivity to smallholder dairy cattle farms due to the effect of socio economic factors and profitability of dairy cattle milk production to smallholder farms.

5.2 Demographic characteristics of respondents

5.2.1 Gender

Respondents' gender distribution varied greatly. Results (Table 4.1) show that 62% were males and 38% were females. This shows majority of the respondents who were involved in the dairy cattle projects were males. The study findings reveal that more than 50% male were dominating the dairy cattle projects. This implies that, females were given minor opportunity to own dairy cattle in the dairy cattle projects. The result findings are in agreement with findings of Epeju (2010) who observed that women were more concerned about food security tasks where as men worried more about income generation. This contradicts with ECF, (2016) reported that African Union declared 2015 as the Year of women Empowerment and Development towards African' Agenda 2063 with the view to building momentum for gender equality and women's empowerment on the continent. This indicates, gender inequality still persist despite of the government attempts to address it.

5.2.2 Age

Respondents' age distribution varied much. Results (Table 4.2) show that 58% of respondents aged between 41 and 60. This indicates that most of the respondents were economically active groups carrying most of the main responsibilities of the households' living. The results of this study is similar to the argument put forward by Aikaeli (2010) that household members above 15 but less than 71 years age formed

the active labour force in rural areas. Also, the study results are in agreement with findings of Epeju (2010) who observed that middle aged farmers above 45 years were more productive and the age gives maturity to farmers in many ways such as psychologically, physically, economically and socially as well it is associated with social status, wisdom and control of resources especially labour, land and capital including risk taking.

5.2.3 Marital status

During the study the respondents were asked to state their marital status, the association of the marital status to this study is that, it is an institutional factor that has a great influence on the family matters. Study findings (Table 4.3) reveal that, 93 percent of respondents were married while very few (1%) was single. This shows that, majority of the respondents were married. This implies that majority of respondents had commitments to their families to provide necessary requirement for well -being of their families. Therefore, dairy cattle were an important project in producing milk for home consumption and surplus milk for sale as a source of income. The dairy farmers in couples had to share labour force to work hard to fulfill the family requirements.

Responsibilities in the families of the respondents are necessary inputs in the management of the dairy cattle as many efforts are exerted on management of dairy cattle so as to produce more milk for home consumption and excess for sale to raise income for other family requirements.

Also, married couples are likely to be more productive compared to single person because of the labour supply and thus they can share farm activities in the dairy production and other non-farm activities. The results of this study are consistent with Epeju (2010) findings that farmer's marital status was significantly related to output per person which may mean marriage bring in extra labour needed in production through more children and wives.

5.2.4 Household size

As reflected in Table 4.4, majority (52%) of the respondents had up to eight household members, 30% had between one to four household members and only 18 percent of respondents had household members above eight. This showed that, the study area had larger household size. Larger household size could be influenced by extended families and having many children which is common phenomenon in rural areas.

According to Tanzania household budget survey indicated that, household of mainland has five people (NBS, 2013). This implies that the study area had larger household size compared to the National average household size. This means some of the house members were likely to provide family labour to the dairy cattle farm activities. The results of this study are concurring with Epeju (2010) findings that large families were valued as an assured source of family labour and income on the farms.

5.2.5 Other economic activities

Table 4.5, presents other economic activities of respondents in the study area as source of income. The study findings reveal that, 89% of dairy farmers engaged in farming activities and 11 percent engaged in non -farm activities. Majority of respondents who engaged in farming activities cultivated various crops. Major crops grown in the study area as source of income were maize, paddy, beans, soya, simsim, sunflower, groundnuts, cassava and banana. The results of this study correspond to NBS, (2013) household budget survey which reveals that, Mainland Tanzanians are still depending on agriculture as their main occupation and about three quarters (74%) of them are employed in household farming activities. The main occupation in rural area is farming, of which about 89% % are in rural area and 44% are in other urban areas. Apart from farming activities that involved growing crops, respondents also engaged in non- farm activities such small businesses (retail shops and grocery) and other activities such as masonry and carpentry. The results present a really Tanzanian rural area whereby more than 60% of the respondents engaged in farming activities (ECF, 2016).

Involvement of the dairy farmer in other activities is important due to the fact that the income generated from these activities can help in the management of dairy cattle when the production of milk has not yet started. The income can be spent on drugs when the animal falls sick, purchase of acaricides for spraying the animal to protect against tick and tick infestations, also to purchase concentrates when the animal is producing less milk and during pregnancy when the animal require nutritious feeds for growth of the fetus in the stomach and well development of the udder for milk production for close lactation.

The dairy farmer who is not engaged in other economic activities is likely to lose the dairy animal through death that might be caused by disease. If the animal is not producing milk there will be no fund to purchase drugs for treatment and for acaricides for spray to control against ticks. If the animal is dead then there will be no more milk production.

5.3 Influence of Socio-economic factors on Dairy cattle milk productivity

Ordinary least square regression model was used to determine the influence of independent variables (socio economic factors) on dependent variable (dairy cattle milk productivity). The R-square of 0.84 indicates strong fit of the model explaining of 84% of variation in dairy cattle milk yield productivity by independent variables included. The model is significant at $p=0.00$ with positive influence on dependent from independent variables. The model accepts alternative hypothesis that dairy cattle milk yield productivity is influenced by socio economic factors. The study findings are in agreement with the results reported by Kutlar, Ozcatalbas, Azkcaoz and Firat, 2010; Hailemichael, Gangwar, Mekuriaw and Tesfay, 2012; Janssens, Yisehak and Belay, 2012; Mamo, 2013, Hitihamu and Epasinghe, 2015, that smallholder dairy cattle production were below the maximum potential and were influenced by socio-economic factors. On the basis of these findings, it indicates that poor social economic factors lead to low dairy cattle milk productivity and it is easier for the small scale dairy cattle farmers to improve dairy cattle milk productivity if there is an improvement of socio economic factors especially knowledge of farmers on dairy husbandry, household proportion of labour force, herd size and experience which have shown significant effects.

5.3.1 Proportion of labour force in the household

Labour on dairy cattle farming shows significance influence on dairy cattle milk yield productivity. This indicates allocation and efficient utilisation of labour to the dairy farm activities might increase efficient in managing of farm activities which enhance dairy cattle milk productivity. Unlike Shinde findings (2011), who reported that dairy farmers were faced with challenges of labour problems. The current study found that labour was available from dairy farmers' households in which 68% of respondents had 1-2 labour force for dairy farming. Though during crop production labour was reported to be scarce, this corresponds to findings of Epeju (2010) who observed that labour problem was commonly experienced at peak times especially during crop production.

Dairy cattle milk productivity should as well improve living standard of the dairy farmers because labour productivity reported by UNDP (2015) have a labour saving effect leading to stationary or decreasing in labour demand.

Figure 5. 1: Household members sending milk to the Market (Food vendors) at Namtumbo town



Source: Field research, 2017

5.3.2 Knowledge of the farmer on dairy cattle husbandry

Knowledge on dairy farming to dairy farmers shows positive and significant influence on dairy cattle milk productivity. This indicates gaining knowledge on dairy husbandry to farmers might increase efficiency in management of dairy farms activities such as housing, feeding, watering, cleaning, milking, disease control and selling of milk. This is possible through training which expects to increase managerial skills of the farmers and therefore skills for increasing milk yield productivity. Unlike Sultan, Uddin and Peters (2016), who observed training significantly and negatively at (1%) affected milk yield, the current study found knowledge on dairy farming influenced positively on dairy cattle milk yield productivity. Among 100 respondents, 56% of respondents who attended training on dairy cattle farming/husbandry their dairy cattle had good performance in terms of milk yield productivity. The study findings are in agreement with the results reported by Yeamkong, Koonawootrittriron, Elzo and Suwanasopee (2010), who observed that additional training to farmers on improving the efficiency of milk production, management, cost-effective feeding and health care practices may support to increase productivity and profitability of their dairy farms.

Also, findings concur with Matthewman (1993) who stated that farmers with good husbandry knowledge will provide the best care and conditions so that the cow can produce well. Also, Djomo *et al.* (2012) stated that technical progress increases level of production that can be achieved with a given level of combination of inputs without affecting marginal rate of substitution.

Figure 5. 2: A dairy farmer demonstrating influence of socio economic factors on dairy cattle milk yield productivity by feeding concentrates at Minazini village



Source: Field research, 2017

Figure 5. 3: A dairy cattle with poor milk yield productivity and poor health due to the influence of socio economic factors in Namtumbo village



Source: Field research, 2017

5.3.3 Herd size

Herd size is found to have a significant influence on dairy cattle milk yield productivity; this indicates that the increasing herd size increase dairy cattle milk yield productivity. This is possible through making feed resources available, selection of cows which are best milk producers, herd composing largely with cows and good management practices in the farm. The study findings are in agreement with results reported by Ogunkoya (2014) who observed that large herd size enable dairy farmer to generate enough income from the sale of livestock to enable them to meet expenses such as the purchase of more breeding stock, feed and supplements, which would help increase and improve the productivity and overall performance of the livestock they keep. The findings also correspond to Sibuga *et al.* (2004), that large numbers of dairy cattle to smallholder farmers increase dairy produce, though with poor management reduce their productivity

5.3.4 Experience on dairy farming.

Experience on dairy farming shows significance influence on dairy cattle milk yield productivity. This indicates that gaining experience can enhance efficient management decision on dairy cattle management. This is possible through several ways such as learning by doing, receiving formal education and training Sultan *et al.* (2016). The study findings are in agreement with the results reported by Epeju (2010) who observed that farmers varied experience that enhanced food security and income from production coupled with local technical knowledge, hardworking and application with what was learnt at school. Years in dairy farming was therefore important in dairy cattle milk production.

5.4 Dairy cattle milk productivity

Dairy cattle milk productivity in the study area was found to be low in which majority (36 %) of respondents had their dairy cattle producing milk between 6 -10 litres per cow per day and 4% between 16-20 litres per cow per day with an average of 5.97 litres per cow per day. This indicates that socio economic factors had an influence on dairy cattle milk productivity. Unlike Njehu and Omore, (2014) who observed dairy cattle milk yield productivity of 23 litres in Handeni and 38 litres in

Lushoto per cow per day. The current study found 6-10 litres per cow per day with an average of 5.97 litres per cow per day.

The milk yield productivity in the study area contradicts also with Nga, *et al*, (2013) who observed an average 19.8 litres of milk per cow per day was produced by cross breed dairy cows in Vietnam. This shows that the milk productivity of the dairy cattle in the study area were low. The study findings indicate that dairy cattle milk productivity was found to correlate with socio economic factors indicating socio economic factors influenced dairy cattle milk yield productivity. The low dairy cattle milk production is the evidence that the dairy cows do not fully exhaust their productivity potential.

Figure 5. 4: Dairy farmer milking his dairy cattle



Source: Field research, 2017

5.4.1 Frequency of Milking a dairy cattle

The study findings reveal that, 39 % of respondents milked their cows twice per day, the 38 percent of respondents milked their cows once per day and 23 percent of respondents don't milk their cows (table 4.8). This shows that however majority (39%) were milking their dairy cattle twice the difference with those who were

milking once per day was not great. This implies that still other milk was not produced to benefit the dairy farmers. Shortage of milk market was found in the study area which has resulted into single milking and partial milking allowing the calves to get milk direct through sucking, the calves were also found in good health. Shortage of milk for market have forced farmers to lower labour force in activities such as feeding and health care. Decreased levels of management lead stress to the dairy cattle which in turn lower milk productivity.

Dairy farmers who didn't milk their dairy cattle were due to some other reasons: some of dairy farmers had dairy cattle which were too young to produce milk, others had pregnant dairy cattle for the first time and some dairy cattle had no dairy cattle as were dead due to different cases such as dystocia and other diseases.

Figure 5. 5: The calf suckling milk after partial milking in Namtumbo village



Source: Field research, 2017

5.5 Other factors found to affect dairy cattle milk productivity.

Data on other factors influencing dairy cattle milk productivity were collected from extension staffs, majority (39%) reported poor feeding and very few reported shortage of extension services (13%).

5.5.1 Poor feeding (PF)

Majority of the extension staffs reported that dairy farmers were not feeding well their dairy cattle that contributed to low milk productivity. Also, natural pastures in communal lands were utilised largely in feeding the dairy cattle, there were no improved pasture species established for feeding the dairy cattle. This also contributed to low milk production and some of dairy farmers failed supplement their dairy cattle with concentrates.

5.5.2 Diseases (DS)

Extension staffs reported that, some of dairy cattle were affected by worms and tick borne diseases. Some of the dairy cattle farmers didn't take care well their cattle especially in treating against worm infestation and controlling against ticks through spraying or dipping. Diseased cattle resulted into low milk productivity.

5.5.3 Lack of improved bulls (LB)

Some of the dairy cattle groups in the villages have no bulls which they had previously were dead and some were not able to service, so the animals that were coming into heat were not serviced, this has resulted in some of the animal not to produce milk.

5.5.4 Shortage of extension services (SES)

The results revealed that in some villages there was no village extension officer only ward extension officer was available to provide extension service to distant villages within the ward, which was rarely done. In some villages there were only village agricultural extension officer who could not provide livestock extension services. This affected milk productivity due to shortage of training to new dairy cattle farmers.

5.5.5 Type of breed (TB)

It was reported that some of the cross dairy cattle their milk productivity were low because they had more indigenous characteristics than dairy characteristics. The above mentioned other factors affecting dairy cattle milk productivity can be solved by introducing the use of artificial insemination (AI) and improving extension services coupled with facilitating working tools such as transport facilities so as to provide timely service.

5.6 Extension staff and infrastructure

5.6.1 Extension staff

The study found the district the livestock and fisheries department had livestock and fisheries has 18 extension staffs, among them 16 are Livestock extension staffs within which 3 were female and 13 were males and 2 fisheries staffs both of them were males.

5.6.2 Infrastructure

Namtumbo district council has 8 cattle dips, 1 livestock laboratory (not completed), 3 motorcycles, 2 slaughter slabs and 1 slaughter house (District Executive Director's office (Livestock and fisheries department) Namtumbo DC, 2017).

The study findings reveal the District had fewer extension staffs and infrastructures. Few extension staff and infrastructures imply that livestock extensions services to the livestock farmers were not well done in the study area this has contributed to low dairy cattle milk productivity to some of smallholder dairy farms.

Improvement of milk productivity is important as will result into more milk production which is important as other agricultural goods as raw materials necessary for processing in industries. Industries process raw materials and convert into other forms or products that can be packed and exported abroad, also their shelf life is increased that make long utilisation. As reported by Nanai *et al.* (2017a) that if agriculture, livestock and fisheries would produce more and quality goods will attract investors to exploit the opportunity by establishing industries.

Also URT (2016) reported that Tanzania is implementing a National Five Year Development Plan (FYDP) to improve livelihood of its people. The five year development plan 2016/2017- 2021 is focusing on promoting industrialization for economic transformation and human development whose drivers are technology and innovation, infrastructure, industry and trade in order to move from low income country to middle income country. In order to make the National Five Year Development Plan effective, agricultural and livestock productivity should be improved in order to supply raw materials required for processing in industries.

5.7 Milk market and its products

Most of the milk in the study area was sold as fresh and fermented milk. The individual dairy farmers were selling the milk directly to individual consumers, food vendors and restaurants. The price of milk varied from one area to the next ranging from 500-1000/= per litre. Milk market availability was also reported in the study area as one of the challenge facing the dairy farmers, which forced some of them to reduce frequency of milking to their dairy cows from twice per day to once per day especially milking only in the morning.

If the dairy farmers are facilitated with processing facilities for the time being, dairy cattle milk can be processed into different milk products such as butter, ghee, yoghurt, cheese, cream and butter oils that would increase shelf life and can be sold even at a higher price locally and abroad than selling only raw milk.

5.8 Profitability of dairy cattle milk production to small scale dairy farms.

Data on production cost and revenue were collected from respondents based on recall, as they were asked to give information on the amount of fund they spent per month on labour if there were to hire a labour to take care of the dairy cattle in their dairy cattle farms, amount of milk produced per cow per day, price of milk per litre, cost of dipping /spray against ticks per month, amount of concentrated (additional nutritious feed) used to supplement the dairy cattle and treatment cost of the dairy cattle against worm infestations and other diseases per month.

The study findings reveal that, the dairy cattle projects operated with profits of 9,781,593.36/= for 100 dairy cattle farms with an average of 97,815.93/= profit for one dairy cattle per month in Namtumbo District council (table 4.8). This shows that, the dairy cattle farms were operating with profit, The findings are in agreement with Mbatia (2010) who observed that farmers invest on land, cows, animal feeds and labour so that they can provide their families and other customers with milk, they must however earn profit from their activities if they are going to operate as a successful business. Unlike Schwalbach, Groenewald and Marfo (2001) who reported that farmers made losses and only few made small profits from cattle farming, in which 56% of farmers operated at loss, 27 % of dairy farmers made small profits and 17 % break even, the current study found profit that 74% operated at profit and 26% operated at loss. This indicates that dairy farmers would get more profit if there is high dairy cattle milk yield productivity through improvement of socio economic factors that influence dairy cattle milk yield productivity.

Labour wages was estimated to account for over 60 percent of all dairy farm cost incurred and impacted heavily on dairy farm profitability. This shows that if the household abled members as a family labour which is paid in kind work hard in the dairy farm to produce more milk from the dairy farms would reduce cost if there were to hire and earn more income and profits. The profit gained will enable to sustain dairy farmers in long term when the dairy cattle are not producing. This is possible if the income saved or invested on assets that are easily converted into cash when needed.

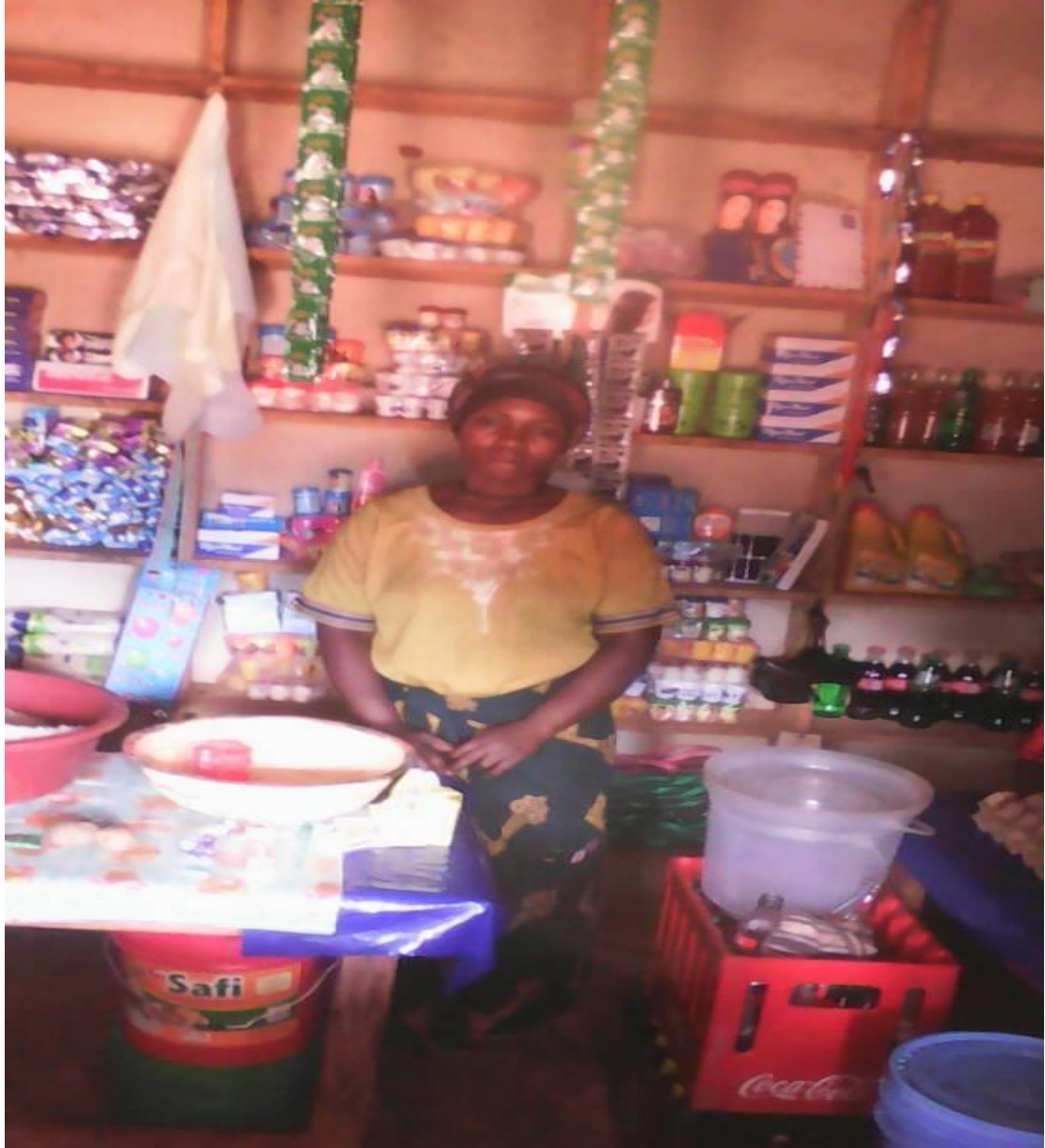
The study results showed that, the price per litres ranges from 500- 1000/= and milk market was problem in most villages. In order for many dairy farmers to realize more profit from their dairy farm activities the milk market should also be improved. Mngofi (2009) reported that improvement in milk marketing system is desirable for small dairy producers and traders and especially in low income countries. Most of the smallholders in rural area face seriously problems of milk marketing. The rural poor people can be helped to alleviate from poverty if there are functional markets that add value to their produce.

Profits generated from dairy farms through producing and selling of milk motivated dairy farmers and this has made them continue working on the project. Some of smallholder dairy farmers who managed to milk more and sell managed to roof their houses with iron sheets from grass, purchase assets such as motorcycles and others achieved to invest into other non-farm activities such as a retail domestic shops.

The study findings concurs with Mngofi (2009) findings in a study of contribution of dairy cattle to poverty reduction in Igunga District, that dairy farming apart from providing milk for home consumption households gained more profits that enabled them to purchase assets and structures that were not able to possess before.

The study findings confirm with those of Schwalbach, Groenewald and Marfo (2001) findings, who observed that despite the fact that 91% of the farmers milked their cow for home consumption, none of the farmers indicated as their main reason for farming. Cash related factors were cited by 91% of farmers as the main motivation for farming with cattle.

Figure 5. 6: Dairy farmer who has invested money collected from milk selling in a shop at Ngwindevillage



Source: Field research, 2017

Figure 5. 7: A dairy farmer at Litola village with his motorcycle and a house benefited by selling milk and one dairy cattle.



Source: Field research, 2017

Dairy cattle are crucial for rural poor people. As reported by Birthal and Ally (2005) cited by Ally (2007) that livestock being less capital intensive is an important choice for the rural poor people because of less requirements such as low investment and low operational cost.

Poverty is primarily initiated by low levels of assets holdings attached with low and uncertain returns. Land and livestock are ranked to be the major source of assets for the rural people for livelihood support in general and small and marginal households

(Ally, 2007). The growth of the dairy sector as part of the livestock and improvement in their milk productivity will contribute more to income generation and poverty reduction to rural households.

Improving socio economic factors to dairy farmers is important for improvement of dairy cattle milk productivity. It will lead to increased milk production to the smallholder farms that will enable smallholder farmer improve their life standard, alleviate poverty and hunger from milk consumption by profits generated from selling.

5.9 Factors influencing profitability in dairy cattle milk production

Ordinary least square regression model was used to determine the influence of independent variables (profit factors) on dependent variable (profit). The R-square of 0.612 indicates strong fit of the model explaining of 84% of variation in profit by independent variables included. The model is significant at $p=0.00$ with positive influence on dependent variable from independent variables. The model accepts alternative hypothesis that profit is influenced by the profit factors.

On the basis of these findings, it indicates that profit factors influence profitability in dairy cattle milk production these factors include concentrate and dipping/spraying costs which have shown significant effect.

5.9.1 Concentrate cost

Concentrate cost on dairy cattle farming shows significance influence on profitability. This indicates that farmer who managed to purchase frequently concentrate for feeding their dairy cattle for milk production had higher profit than farmers who didn't purchase concentrates for their dairy cattle due to the increased milk productivity. The study concurs with Ngongoni *et al.* (2006) with study on factor affecting milk production in the smallholder dairy sector who reported that famers who didn't feed the concentrate got lactation yield significantly reduced than those who practiced feeding concentrate and 54% of dairy farmers realized the importance of concentrate feeding to dairy animals. Major crops grown by the dairy farmers in the study area could be used an opportunity to formulate least -cost local

dairy concentrate which could be used all year around in feeding their dairy cattle there by increasing milk production and profit.

The study findings show that dipping/spraying cost had an influence on profitability in dairy cattle milk production. This indicates that farmers who incurred cost in dipping or spraying their dairy cattle had more profit than those who did it rarely or didn't do it all together. Dairy cattle that were dipped or sprayed with acaricides had a little chance of being attacked by the ticks which transmit different diseases hence reduce treatment cost. The study findings concurs with Ngongoni *et al.* (2006) who reported that diamide acaricides was applied routinely at weekly intervals during summer and fortnight during the dry season to control ticks, cattle travelled to the dip tank and few households controlled ticks on the farm by using knapsack sprayers.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter seeks to address the issues of conclusion and recommendations. The chapter is divided into three parts; Summary, conclusion and recommendations. Whereby the summary provides brief description of the whole dissertation, conclusion provides concluding remarks based on research findings and recommendations provide way forward based on the research findings and areas for further research.

6. 2 Summary

The general objective of the study was to assess the influence of socio economic factors on dairy cattle milk yield productivity, a case of dairy cattle projects in Namtumbo District council. The method of analysis was regression analysis where by multiple linear regressions model was used to assess the influence socio economic factors on dairy cattle milk productivity from smallholder dairy cattle farms in the district. The primary data were collected from 10 villages namely:- Rwinga, Namtumbo, Mgombasi, Litola, Kumbara, Ngwinde, Mandepwende, Mtumbatimaji, Minazini and Namabengo village.

The research findings revealed that there was socio economic factors influenced dairy cattle milk productivity. The research findings found that the problem of low dairy cattle milk productivity on smallholder dairy cattle farms exists in all 10 villages under the study. This indicates that the socio economic factors had an influence on dairy cattle milk yield productivity. It was found that knowledge of the farmer on dairy cattle husbandry, proportion of labour force in the household, herd size and experience influenced dairy cattle milk productivity. Farmers with little knowledge on dairy cattle husbandry, low proportion of labour force in their household, less herd sizes and low experience had low dairy cattle milk yield productivity in their farms. Other variables such as dependency ratio, amount of owned land used for pasture establishment, amount of credit spent on dairy cattle

milk production, education level of the farmer, amount of other income used for dairy cattle milk production did not influence dairy cattle milk productivity.

In examining the profitability of dairy cattle milk production, dairy cattle milk production was found to be a profitable intervention with an average profit of Tsh. 97,815.93/= per dairy cow per month in the study area.

The determination of factors influencing profit in dairy cattle milk production, it was found that concentrate and dipping/spraying costs influenced profit in the study area.

6.3 Conclusion

The research study has identified socio economic factors which influence dairy cattle milk productivity. The results suggest that there is strong and positive influence ($r^2 = 84$; $p < 0.05$) between socio economic factors and dairy cattle milk yield productivity from smallholder farms involved in the dairy cattle project in the District. From the findings of the study the following emerged as the main factors influencing the dairy cattle milk productivity: knowledge of the farmer on dairy cattle husbandry, proportion of labour force in the household, herd size and experience. Knowledge of the farmer on the dairy cattle husbandry appear to be influencing the dairy cattle milk productivity as knowledge of the farmer on dairy cattle husbandry increases significantly increase with milk yield productivity in their dairy cattle farms. Also, proportion of labour force in the household has a major impact in the dairy cattle milk yield productivity. The households with large labour force and used efficiently in the dairy cattle farms activities appeared to have positive impacts on dairy cattle milk yield productivity.

In addition, the herd size has a major impact on dairy cattle milk yield productivity from smallholder farms. The study finds that herd size influences dairy cattle milk yield productivity. Farmers with large herd sizes appeared to have high milk productivity than farmers with small herd sizes. As the number of cattle especially cow increases the in the herd, it increases probability of milk production and milk yield productivity from smallholder farms.

Moreover, experience also has major impact on dairy cattle milk yield productivity. The study findings show that experience influences dairy cattle milk yield productivity. The study suggests that farmers with enough experience have big chance of increasing milk yield productivity in their dairy cattle farms than farmers with less experience.

The research findings concur with Kutlar, Ozcatalbas, Azkcaoz and Firat (2010); Hailemichael, Gangwar, Mekuriaw and Tesfay (2012); Janssens, Yisehak and Belay (2012); Mamo (2013), and Hitihamu and Epasinghe (2015) who observed that smallholder dairy cattle milk production were below the maximum potential and were influenced by socio-economic factors.

Considering the profitability of dairy cattle milk production, research findings show that the dairy cattle milk production was profitable. An average profit of Tsh. 97,815.93/= per dairy cow per month was found in the study area in which 74% operated at profit and 26% operated at a loss. This contradicts with the study findings by Schwalbach *et al.*, (2001) who reported that farmers made losses and only few made small profits from cattle farming, in which 56 percent of farmers operated at loss, 27 percent of dairy farmers made small profits and 17 percent break even, hence accepting the alternative hypothesis.

On the basis of the study findings it appears that improvement of the socio economic factors in the study area and Tanzania as whole is significant as would greatly influence dairy cattle milk yield productivity thereby increasing more milk production, more milk production means more profits will be obtained where dairy cattle farmers would benefit by improving their living standard, alleviate from poverty, end hunger and also a country will reduce milk and milk products importation costs.

In determination of factors influencing profit in dairy cattle milk production, it was found that there was a strong and positive influence of factors on profit ($r^2 = 61.2\%$; $p < 0.05$). The factors emerged to influence profit in dairy cattle milk production were concentrate cost and dipping/spraying cost. This study finding concurs with the

Ngongoni *et al.* (2006) who reported that dipping and feeding concentrate increased milk production, the increased milk production leads to profit making. Also 54% of dairy farmers realized the importance of concentrate feeding to dairy animals in the study area.

6.4 Recommendations

The following recommendations are made in order to improve dairy cattle yield milk productivity:

It is recommended that the knowledge of the farmer on dairy cattle husbandry to be strengthened in the study area. This can be enhanced by extension officers who are equipped with necessary resources, which will enable them to increase coverage area in terms of number of farmers they reached. Timely training of farmers by extension officers will assist farmers to improve livestock activities important for increasing dairy cattle milk yield productivity and profitability.

Also, strengthening the proportion of labour force in the households has to be strengthened. Farmers with enough labour forces in households should supply timely required labour force to facilitate timely implementation of different livestock activities in their farms which will improve dairy cattle milk yield productivity through feeding, milking, watering, milk selling, cleaning and spraying or dipping.

In order to increase profitability from milk production dairy cattle farmers should be assisted to form cooperative unions, which will facilitate them to collect milk from members and sell in bulk to whole buyers, purchase bulk livestock inputs at a relatively cheap price and sell milk at better price so as to gain more profit.

Also, milk processing techniques and facilities to be introduced in the study area for value addition and shelf life increase. This will help to increase profitability in milk value chain and overcome market problems.

Farmers should be emphasized to dip or spray their dairy cattle with acaricides and to feed them with concentrate in order to maximize profit.

6.5 Policy implication

Based on the research findings, policies on training of farmers on dairy cattle husbandry and herd size should be strengthened. In order to address the problem of low dairy cattle milk yield productivity, the government can intervene in improving knowledge of the farmers by training them. Training dairy farmers on dairy husbandry can provide them with the tools and attitudes necessary to improve farm management. These trainings are often very valuable to make farmers aware of the new innovations and intensive techniques in the course of adoption and innovation. This can be done by strengthening extension services through employing extension officers at village levels facilitated with transport facilities. Also, increased herd size in villages to dairy farmers can be enhanced by the government through implementation of land use plan which enable legal availability of individual and communal land for animals kept in villages so as to make pasture availability to the dairy cattle and avoid conflict between livestock keepers and other land users as herd size increases so as to increase dairy cattle milk productivity.

Also, policies on livestock inputs should be strengthened; this can be done by the Government through subsidizing the livestock inputs such as acaricides and animal feed additives. This will help smallholder dairy farmers to increase profit that can help them to reduce poverty and improve their living standard.

6.6 Limitation of the study and areas for further study.

During data collection, the target was to collect 150 samples from 10 villages at a precision of 0.07, but due to poor attendance in two villages being 11 and 13 due to various reasons while other villages the attendance was above 15 respondents. The sample size was changed to 100 at a precision level of 0.1 from 150 at a precision level 0.7 so as minimize errors and bias among dairy cattle farmers in all ten villages. Poor attendance or non- response rate was due to the fact that, one village was divided into two villages so members from the other village didn't turn up though were in the same group, which resulted only 11 respondents from one village, in the other village only 13 respondents responded as some members had emergencies, some were outside the village for different reasons, other members were sick while

others members did not have dairy cattle and had a case to respond to village executive officer concerning illegal sale of their dairy cattle.

Other studies should be done on influence of milk collection centres and effects of labour distribution to other economic activities on dairy cattle milk productivity. Also, in this study, nine variables were used to collect data. These were knowledge of the farmer on dairy husbandry, proportion of labour force in the household, dependence ratio, amount of owned land, amount of credit spent on dairy cattle farming, experience, education level and herd size. But during study other variables were revealed such as diseases, shortage of extension services, lack of improved bulls, type of breed, poor feeding and shortage of milk market. For that reason, further studies are recommended on other variables. Similar study should also be done for dairy goat milk, egg and chicken productivity so as to provide solutions to the problems of low productivity.

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APPENDICES

Appendix I: Questionnaire for the dairy cattle farmers

Introduction

This questionnaire is designed by Mzumbe University student aiming at assessing socio economic factors influencing dairy cattle milk productivity of smallholder dairy farms. The information collected will only be used for studying purpose and will be confidential. The researcher will value your devoted time and inputs towards accomplishment of this study.

Instructions

1. Choose the correct answer
2. Fill in the blank

Personal information

1. Number of respondent.....
2. Location.....
3. Gender of respondent
(a) Male (b) Female ()
4. Age of the respondent in years
.....
5. What is your marital status?
a) Single b) Married c) Divorced d) Widow ()
6. What is your household size?
.....
7. What other economic activities are you doing to generate income apart from dairy cattle farming?
a) Farming
b) Employed ()
c) Casual labour
d) Small business
e) Other (Specify).....

Socio economic variables (factors) information

8. Level of education of respondent

.....

9. What income do you earn from other economic activities per year?

.....

10. What percentage /amount of income earned from daily activities used to support the dairy cattle project per year?

.....

11. What animal feed type do you supplement your dairy cattle?

a) Maize bran only b) Concentrates d) No supplement ()

12. What many dairy cattle do you own?

.....

13. How many dairy cows produce milk currently

.....

14. How often do you milk you cow per day

a) Not yet started b) Once b) Twice c) ()

15. How many litres of milk are produced per cow per day?

.....

16. What is your last time to be trained?

a) Last week b) c) last month d) Last year e) I don't know ()

17. Did you get training concerning dairy cattle husbandry?

a) Yes (b) No ()

18. How many household members do participate in dairy cattle project activities?

.....

19. How long since you joined the dairy cattle project?

.....

20. How many people are depending on you to support their basic needs daily?

.....

21. What total size of land do you own in the village?

.....

22. What size of land do you grow pasture for animal feeds?

.....

23. Are you a member of any of the following financial institution?

a) Bank c) SACCOs d) VICOBA e) other specify.....

a) Not a member ()

b)

24. What is the amount of loan you obtained from at last?

.....

25. What is the amount of loan was used to support dairy cattle project in order to increase milk production?

.....

26. What is the price of milk per litre do you sell?

.....

27. What amount of wages will you pay a casual labour per month if you were to employ in dairy farming activities?

.....

28. What amount of money do you spend per month per cow on the following;

a) Treatment Tshs

b) Concentrate or maize bran.....Tshs

c) Dipping/Spraying.....Tshs

29. What are your comments concerning the dairy cattle project productivity improvement?

.....

.....

Appendix II: Questionnaire for the extension Officers

Introduction

This questionnaire is designed by Mzumbe University student aiming at assessing socio economic factors influencing dairy cattle milk productivity from smallholder dairy farms. The information collected will only be used for studying purpose and will be confidential. The researcher will value your devoted time and inputs towards accomplishment of this study.

Instructions

1. Choose the correct answer
2. Fill in the blank

Personal information

3. Number of respondent.....
4. Location.....
5. Gender of respondent
(a) Male (b) Female ()
6. Age of the respondent in years
.....
7. What is your marital status?
b) Single b) Married c) Divorced d) Widow ()
8. Which factors affecting dairy cattle milk productivity in the district?
.....
.....
9. What should be done to improve dairy cattle milk productivity
.....
.....
10. How many livestock extension staff employed in the District level?
.....
11. How many livestock extension staffs are in the ward level?

-
12. How many livestock extension staff available in the village level
-
13. What is the overall dairy cattle productivity of milk in the District?
-
14. What efforts have been made to improve dairy cattle productivity in the district?
-
-
15. Mention livestock infrastructures and their condition present in district important for improving dairy milk cattle productivity.
-
-
16. Mention livestock infrastructures which are missing in district important for improving dairy milk cattle productivity.
-
-

Appendix III: Namtumbo dc, July monthly report, 2016.

UNITED REPUBLIC OF TANZANIA

**PRESIDENT'S OFFICE -REGIONAL ADMINISTRATION AND LOCAL
GOVERNMENT (PO-RALG)**

**AGRICULTURE SECTOR DEVELOPMENT PROGRAMME (ASDP)
DISTRICT MONTHLY REPORT (DR01)**

NAMTUMBO

IDENTIFICATION DETAILS

Month: July 2016

Name (contact Bakari
person) Mlanga

Address P.O. BOX 55 NAMTUMBO

E-mail

Mobile

Date of submission

Number of wards
submitted

ASDP Monitoring and Evaluation Thematic Working Group

P.O. Box 9192, Dar es Salaam

Tel and Fax: +255 22 286 4460

E-mail: doo@kilimo.go.tz

4. Mifugo iliyochinjwa

Aina ya mifugo	Idadi ya waliochinjwa kwa mwezi huu	Bei ya wastani kwa kg(Tsh)
Ng'ombe	120.2	6500.0
Kondoo	5.1	7500.0
Mbuzi	390.6	7000.0
Ngurue	433.3	5083.3
Kuku wa asili	1411.4	10833.3
Kuku wa kisasa	64.0	6500.0

6. Mazao yatokanayo na Mifugo

6.1 Maziwa

Aina ya mazao	Kiasi cha maziwa yaliyo zalishwa(Whole milk) kwa mwezi huu
Milk -Indigeneous Cattle (lita)	4935.6
Milk Dairy Cattle (lita)	39374.4
(Cheese)(kg)	-
(Butter)(kg)	-
(Ghee)(kg)	-

Appendix IV: Extension officers and infrastructures at Namtumbo district council

MKOA WA RUVUMA

HALMASHAURI YA WILAYA YA NAMTUMBO

IDARA YA KILIMO NA MIFUGO

December 2016

Takwimu Kisekta	Idadi ya miundombinu inayofanyakazi					Idadi ya yyombo yya usafiri vinavyofanyakazi				
Idadi ya watumishi	Maghal a	Majosh o	Mabwawa ya Samaki	Machinjio /Maabara	Skimu za Umwa giliaji	Magari	Pikipiki	Pampu za maji	Idadi ya mifugo	Idadi ya hekta zinazoli mwa
Kilimo =54	15	8			7	Mifugo=0	Mifugo=3	0	Ng'ombe =15,621(asili 12,325 kisasa 3296)	172
Mifugo=16				Kubwa =1 Ndogo=2		Kilimo=1	Kilimo=1 2		Mbuzi=45,695	
Uvuvi=2			Kuchimb wa= 193						Kondoo=2,867	
			Asili= 50						Nguruwe=5,104	
									Kuku=197,952	

Source: (District Executive Director's office (Agriculture and Livestock Department) Namtumbo DC, 2017)

Appendix V: Number of dairy cattle farmers in dairy cattle projects in Namtumbo DC

HALMASHAURI YA WILAYA YA NAMTUMBO

(Barua zote ziandikwe kwa Mkurugenzi Mtendaji (W))



Simu: Na. 025 - 2675008

Fax: Na. 025 - 2675008

Email:- dednamtumbo@ruvuma.go.tz

S. L. P. 55,

Namtumbo,

RUVUMA.

05/07/2016.

TAARIFA YA KOPA NG'OMBE LIPA NG'OMBE

Vijiji nufaika ni 29 na jumla ya wanufaika ni 477 kati ya hao wanaume ni 319 na wanawake 158. Mradi una jumla ya ng'ombe maziwa 827 ambapo majike ni 663 na madume 154.

Nawasilisha

Said Lwanda

Afisa Mifugo

Namtumbo