FACTORS AFFECTING THE PERFORMANCE OF SMALL HOLDER DAIRYFARMERS IN CENTRAL DIVISION IN KITUI DISTRICT OF EASTERN PROVINCE: KENYA

BY

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DECLARATION

I hereby declare that this work is a result of my own effort and has never been submitted for any award in any other university of higher learning

Signed:.....

ENOW GULIA ALIO

Date:.....18/10/08.....

APPROVAL

This work has been done under my supervision as the university supervisor, and submitted with my approval

Signed:  .....

Dr. Alex Ijjo

Date: 18-10-2008.....

DEDICATION

I dedicate this work to my wife Halima Dahir, and my children who untiringly supported me during my time of study and missed me the most during period of my research

May the Almighty Allah Bless them all

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ABSTRACT

The study set out to establish the factors affecting the performance of smallholder dairy farmers of Central division in Kitui district. Milk production in Kitui dropped significantly in the last few years. This has led people to seek supplies from neighbouring places. The decline in milk production has also contributed to increased poverty among smallholder farmers in the division. There has been clear need to identify those factors which significantly influence milk production in general and those that caused the decline in Kitui in particular. This study identifies the factors affecting the performance of smallholder dairy farmers and examines how output and productivity would be boosted.

The research was conducted through a survey of Central division, using qualitative and quantitative methods. A sample size of 50 respondents was drawn from the four locations in the division. Primary data were collected using questionnaires and interviews. The sampling technique used was random sampling whereby each household had equal chances of being selected. A Cobb- Douglas production function approach was used to investigate factors that influence milk production among smallholders in the division.

The results of this study show that both farm and farmer characteristics had a significant influence on milk production in the district. The findings further show that managerial factors affected milk production. The study, therefore, recommends that the government, research institutions, non- governmental organizations in the division as well as extension officers ought to train farmers on how to efficiently utilize available resources for optimal milk production.

LIST OF ABBREVIATIONS

AI	Artificial Insemination
ECF	East Coast Fever
KDB	Kenya Dairy Board
SDF	Small holder Dairy Farmers
KCC	Kenya Cooperative Creameries
KEBS	Kenya Bureau of Standards
LPS	Lacto Peroxide System
MOALDM	Ministry of Agriculture Livestock Development and Marketing
KDDP	Kenya Dairy Development Project
SDP	Smallholder Dairy Project
GOK	Government of Kenya
SME	Small and Medium scale Enterprises

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CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter looks at the background to the study, problem statement, objectives of the study, research questions, hypotheses, significance of the study and the conceptual framework.

1.1 Background to the study

Kenya predominantly depends on agriculture as the main source of National Income. The sector accounts for about 25% of the gross domestic product (GDP) directly, and indirectly another 30% through linkages with manufacturing, distribution and other services related to economic activities (SDP 2001). In addition, the sector accounts for almost 80% of National employment. Contribution of the sector is about 60% of the total export earnings and of the government revenues (GOK, 1995). Dairy farming is an important component of livestock sub- sector and indeed of the National Economy.

The development of the modern dairy industry in Kenya dates back to the beginning of the 19th century when exotic dairy bulls were imported into the country with aim of upgrading the indigenous cattle through cross breeding.

The first commercial dairy by European settlers in Kenya was established between 1901 and 1920. The industry can be said to have taken off by beginning of the 1920s culminating in the formation of Kenya Co-operative Creameries Limited (KCC) in 1925. Before 1925, dairy was in the hands of the European settlers who were typically large-scale farmers who controlled production and marketing of both milk and milk product, breeding services and therefore the supply of the dairy breeding stock was also in their hands.

After independence, in 1963 dairy farming in Kenya was transformed into a predominantly smallholder activity, in terms of both milk production and volume of sales following Government resettlement schemes. Smallholder farmers are now the major milk producers in the country. They contribute over 75% of the total milk production in Kenya today. The dairy herd in the country has grown from 0.8 Million herd in 1960 to over 3 Million in 1998 despite continued sub- division of land, frequent drought and major disease outbreaks. (GOK 1998).

There can be no sustainable development, food security or poverty eradication agenda in Kenya without focusing on the needs of the smallholder dairy farmers, women and youth in the rural areas (Anjichi, 2004). Small and medium scale enterprises (SMEs) are very heterogeneous groups. They include a wide variety of firms. Smallholder dairy farmers are in this category of enterprises because they are small in operation and employ fewer numbers of workers (Anjichi, 2004).

The small – scale farmers may be poor, but are dynamic, innovative and growth oriented. In some countries SME owners and workers are perceived to be dominated by members of particular ethnic groups such as the native Pribumi in Indonesia or indigenous groups in Bolivia (Halberg, 1999). Low quality breeding stocks, high cost of animal health and disease control services, lack of artificial insemination services are also constraints hindering increased milk production. Poor quality and costly feed supplements and lack of organized and reliable market and over- reliance on rains are causes of uneven milk supply throughout the year. The study aims at establishing the problems with a view to recommending necessary intervention measures.

Impact assessment studies have been done on SMEs in Kenya. Farmers need loans to purchase machinery, water development, seasonal crop production, livestock and fisheries development, horticulture and floriculture crop production. It is needed too for payment of hired labour (Aleke Dondo, 2000). There are a number of benefits gained through dairy farming. Nutritional benefits through milk consumption plays an important role in child development. Milk consumption significantly enhances children's physical and mental development leading to long – term benefits. The success of dairy has translated directly into employments creation and income not only on the dairy farms but also among those who market milk and processing. This is important in the context of economic recovery strategy through job creation.

Dairy is a business activity, which generates income for the farmers through both marketing and sale of dairy animals.

1.2. Problem Statement

A smallholder dairy sector continues to play an important role in the development and growth of Kenya's economy. In particular, the government aims at increasing milk production so as to meet the increasing national demand resulting from human population growth. In addition to increasing milk demand, population growth continues to put pressure on land, increasing the need for intensification of the resulting small holding in line with achieving National food self-sufficiency. All policies of agricultural sub- sectors aim at increasing productivity within the context of the country's comparative advantage in various farm products.

The achievement of these goals require that polices be geared towards enabling individual producing units, in this case farm household, to be self sufficient in food. There is need for

macroeconomic policies to address the factors that hinder the sector's growth to improve productivity at farm level. In a liberalized economy, which puts substantial emphasis on market oriented farming, policies must facilitate efficient and competitive farming systems which will be self sustaining. This enables small holders farmers participate in the market fairly without the danger of exposing their vulnerable households to income insecurity. Milk is an important source of nutrition and plays a crucial role in child physical and mental development (ILRI 2004).

In Kenya, milk yield of the smallholder dairy farmers keeps fluctuating, per cow per day caused by unknown causes. (Hussein *et al;* 1994).

This research seeks to identify the factors affecting the performance of small holders dairy farmer in central division in Kitui district of Eastern province in Kenya.

1.3. Research Objectives

General Objective

The general objective of the study was to identify the factors affecting the performance of small holders dairy farmers in Kitui district of eastern province in Kenya.

Specific Objectives

(1) To examine the trend in production of milk by dairy farmers in central division of Kitui.

(2) To identify the managerial and farm factors that influence milk production in central division of Kitui.

(3) To asses the constraits faced by dairy farmers in milk production.

(4) To explore ways and means for improving the yields in dairy farming in smallholders in central division in Kitui.

1.4 Research Questions

(1)What is trend in production of milk by dairy farmers in central division of Kitui?.

(2)What are the managerial and farm factors that influence milk production in central division of Kitui?.

(3)What are the constraints faced by dairy farmers in milk production?.

(4)What are ways and means for improving the yields in dairy farming in smallholders in central division in Kitui?.

1.5 Hypotheses

H_0: Managerial and farm factors do not significantly influence milk production in Central division.

1.6 Significance of the study

There are a number of benefits gained through farming. Nutritional benefits through milk consumption, significantly enhances children's physical and mental development leading to long- term benefits.

The success of dairy farming has translated directly into employment creation and income not only on the dairy farms but also those who process and market milk. This is important in the context of economic recovery through job creation.

It is my hope that the study contributes to the smallholder dairy farms in understanding the factors that hinder their economic growth. The study will have value for the researchers and policy makers, planners and development agencies especially those in dairy sub- sector, in understanding better the factors that will affects the farmers economic activities. It will give an insight about the problems. A study and documentation data on how to address the obstacles in the sector would be put in place.

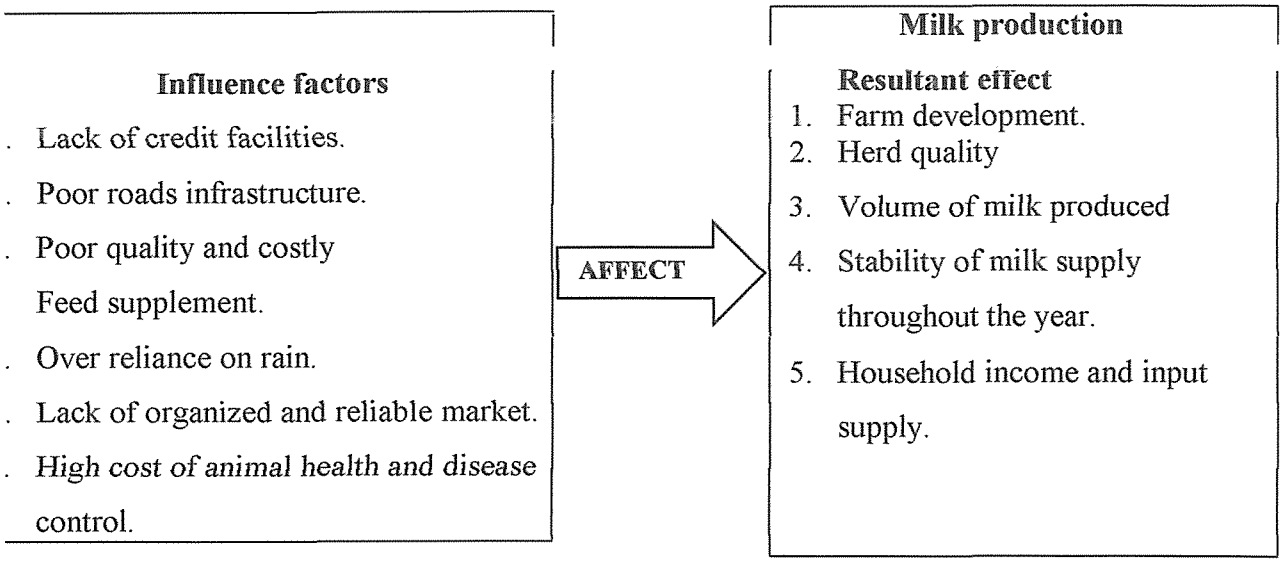
1.7 Conceptual Framework

Lack of credit facilities would lead to less funds for purchase of replacement stock, building of farm structures such as cattle sheds and spray race. Poor roads make it difficult for milk to get to the market in time. It makes transportation of milk and farm inputs costly. Due to poor roads, vehicles are damaged and fuel consumption is very high which makes the prices of farm inputs high to cover costs incurred.

Poor quality of feeds affects milk production and even animal health due to lack of sufficient nutrients.

The over – reliance on rain affects supply of milk throughout the year. Rainy season is characterized by plenty of milk supply and less supply of milk follows during the dry seasons. Lack of organized and reliable markets lead to poor marketing facility of farm produce. It is through this marketing agent that farmers get farm inputs on credit. Lack of reliable market implies that farm produce poorly fetch market.

Figure 1.1 Factors that influence milk production



Source: Enow, 2008

1.8 Theory to the Research

The Cobb- Douglas model was used for this study: In economics the Cobb Douglas functional form of production function is widely used to represent the relationship of output to input. For production, the function is

$$Y=AL^{\alpha}K^{\beta}.$$

Where

Y=Total production (the monetary value of all the goods produced in a year.

L= labour input.

K= Capital input.

A, α and β are the output elasticity of labour and capital, respectively. These values are constant determined by available technology.

The Cobb-Douglas function form can also be estimated as a linear relationship using the following expression

$$Log_e(Y) = a_o + \sum a_i log_e(l_i)$$

Where

Y= Output

l_i=Input

A_i=Model coefficients.

The model has been widely used in analysis of farm efficiency due to its ability to handle a large number of interrelated variables.

The function has the advantage of ease of interpretation and computational simplicity.

Kipkoech, (2002) used Cobb-Douglas production function to study an economic evaluation of groundnut production technologies in Western Kenya. Labour inputs, fertilizer use and farm power had significant influence on groundnut yield. Education level was found to be insignificant factor. The researcher concluded that, groundnut farmers in Western Kenya were found to be inefficient in resource use.

For the purpose of this study, this model of Cobb-Douglas was used because it has more variables:

$$Y = A.X_1^{\beta_1}.X_2^{\beta_2}.X_3^{\beta_3}.X_4^{\beta_4}.X_5^{\beta_5}.X_6^{\beta_6}.e^{\alpha_1 D_1 + \alpha_2 D_2 + U}$$

Where:

Y = Milk production in litres per day

X_1 = Age of the dairy farmer in years.

X_2 = Education of the dairy farmer in years

X_3 = Years of experience by the farmer in dairy.

X_4 = Labour employed at the dairy production in man- hours per day.

X_5 = Amount of dairy meal consumed by dairy animals per day.

X_6 = Farm size owned by the farmers in acres.

X_7 = Dummy for animal diseases (1 if diseases are serious; 0 otherwise).

X_8 = Dummy for price of raw milk at farm level (1 if very low; 0 otherwise).

β_i = Coefficients for continuous variables.

α_i = Coefficients for dummy variables.

U = The error term.

The estimated log – linearized form of the above function is:

$$\text{In } Y = \text{In } A + \beta_1 \text{ In } X_1 + \beta_2 \text{ In } X_2 + \beta_3 \text{ In } X_3 + \beta_4 \text{ In } X_4 + \beta_5 \text{ In } X_5 + \beta_6 \text{ In } X_6 + \alpha_1 D_1 + \alpha_2 D_2 + U$$

CHAPTER TWO

LITERATURE REVIEW

A SURVEY OF DAIRY SECTOR IN KENYA

2.0 Introduction

This chapter reviews various studies on agricultural production. Milk production literatures have been mainly considered in this chapter.

2.1. Milk Production Studies

The dairy sector in Kenya was liberalized in 1992 ending the monopoly of KCC in milk processing and marketing and ushering in the private sector to play greater role. Milk marketing channels have been diversifying with the entrance of numerous private milk processors which increased informal milk marketing which now play the dominant role. It is estimated that over 80% of the milk in Kenya is sold through the informal marketing channels (Orre *et al*, 1998) and that private processors account for over 90% of the milk that is processed (KDB, 1999).

Raw milk is by nature a highly perishable product and has to be preserved before being processed or consumed. Prior to liberalization of the dairy sector, most farmers delivered their milk to collection center where it was bulked and chilled before transportation to processing factories. The collapse of KCC factories paralyzed many cooling centers operations because there was no immediate alternative buyer for their milk (Bebe *et al*,2003).

The collapse of the cooling centers has occasioned severe difficulties in milk marketing to farms in inaccessible area where private milk marketing agents (both formal and informal) are faced by

poor infrastructure. Often milk collected from poor infrastructure cannot reach the processing plant within the recommended time of two- three hours culminating in spoilage. In many of the inaccessible areas, afternoon milk is not collected because doing so is unprofitable to the private market involved. In some of these areas cows are milked as early as soon and subsequent milking is done 16-18 hours later. The use of the udder storage for milk negatively impacts on milk production. Further more plenty of milk goes to waste in dairy farms especially during the flush rainy season.

Even when milk marketing due to poor infrastructure in Kenya is not well documented, there is reason to believe that it undermines realization of a significant amount of potential in diary production. Estimated figures suggested that if evening milk was collected, intake by milk processors would increase by 40- 50% (Dairy Master Plan, 1991). Farmers in Kitui dwell in areas with poor roads, lack of electricity. This occasions losses of milk through waste, spoilage and efficiency. Some milk market agents in such remote areas use harmful chemical agent in milk to preserve it. While cooling is still the preferred method to bulk raw milk preservation, an alternative method of preservation using lactoperoxidase system (LPS) has been developed for use by small – scale farmer groups in poor milk market access region. The use of LPS has been approved by both the FAO/ WHO expert committee on food additives and the codex alimentary commission. (Bebe *at al*; 2003).

There are 52 licensed milk processors in the country with a total capacity of 2.9 Million litres a day. But only 34 of these are active and they are currently processing about 800,000litres a day. Milk production could rise from the current annual production of 3.2 billion litres to 5 billion litres by 2013 (Dairy Board daily nation 14th Sep 2005). Low quality-breeding stocks, high cost

of animal health and disease control services, lack of artificial insemination services are the main constraints hindering increased milk production. Poor quality and costly feed supplements and lack of organized and reliable market and over – reliance on rains are causes of uneven milk supply throughout the year (Daily Nation Sep 14,2005).

Gitau *et al.* (1994) and Mulei *et al.* (1995) established that the main underlying factors limiting calf survival and performance in small holders farms include: poor housing and management, inadequate feed and feeding, poor disease control strategies. Loss of calves due to disease is acknowledged as one of the cited setbacks to calf rearing by smallholder resource poor farmers. Methods of rearing dairy calves in Kitui vary from farm to farm and from region to region. Most progressive dairy farmers had to a large extent adopted the modern type of rearing systems. The majority of smallholder resource- poor farmers have, however continued to follow traditional methods. In these methods calves are commonly grazed or tethered on natural tropical pastures throughout the year without protein supplementation.

Consequently, due to inadequate feed and disease transmission, heavy calf loses has been reported under this type of management (Pyne 1990; Gitau *et al.* 1994 and De Jong, 1960 particularly with research findings by Juang (1982) in parts of Nigeria, which revealed that over 29% of losses in calves occur during the first 30 days post Partum. Lech *et al.* 1968 in two separate surveys in Britain reported between 64% 75% occurring in the first month. Diseases such as gastro intestinal (due to Colibacillosis, Salmonelosis, Coccidiosis and Helminthiasis), Tick borne diseases such as (East Cost Fever, Babesiosis, Anaplasmosis and heart water).

Gastro intestinal parasites (Cooperia, Spp; Bonostomum Phebotomum and others), and Pneumonia is the most prevalent. They are reported to be major killers of cattle particularly calves, in most parts of Kenya (Kariuki, 1974; Schiborn Van Veen, 1980; Jagun 1982; Ongare *et al*; 1995 Radostit and blood, 1985; Moll *et al.*, 1996; Nyagiti *et al.*, 1987, Tedkdek and Ogunusi, 1987, Mulei and Rege, 1989, Maingi and Ithtinji 1992, Gitau *et al* 1994, Negesae, 1994, Latiff *et al*, 1995; Timely *et al* 1995; Nyagiti *et al* 1996). The problem is worsened by the smallholder farmers compared to Large Scale farmers with more animals (Scheiera and Ibrahim, 1986) the Average Mortality of 35% (Gitau *et al.*, 1994) represents a major economic loss to the smallholders' resource poor farmers.

With over 3 million improved dairy cattle, Kenya has by far the largest dairy herd in Africa. Research by smallholder dairy project and partners has shown clearly that the official national milk production estimates of 3.2 billion litres may be significantly understated due to a greater increase in dairy cattle numbers than officially recognized resulting in a strong recent growth rate in milk production of some 7% per year (Gitau *et al.* 1994).

Tied to the successful increase in milk production is the fact that Kenyan milk consumption at some 80 – 100 litres / person/ year is among the highest of any developing country in the world. When expressed as consumption in relation to annual gross domestic product per person, only Mongolia and Mauritania surpass Kenyan milk consumption per unit of income (Bebe, 2003). This success story is particularly important because it has taken place among rural smallholder farmhouse holds, which produce most of the milk in Kenya.

Employment creation and income is not just by smallholder dairy farms but also among those who market much of the milk. This is important in the context of Economic Recovery Strategy's emphasis on increasing employment. The sector employs many Kenyans both in the farms and in processing plants and milk bars helping in National development (SDP, 2004).

There is direct employment for both men and women in the estimated 800.000 smallholder families in Kenya, for whom dairy farming is primary activity, many of these farms also employ full- time laborers to assist with the dairy enterprise creating some 360,000 additional full- time jobs, some from among the poorest members of the community. Many also employ short- term laborers. Milk is an important source of nutrition and given the high level of milk consumption in Kenya, milk can play a crucial role in child development. Research shows that milk consumption significantly enhances children's physical and mental development, leading long term and intergeneration benefits, unlike in most other poor countries, even poor house holds in Kenya (both urban and rural) buy and consume milk mostly in tea. Households that keep dairy cattle have better access to milk and are able to more easily capture these benefits (Gitau *et al.* 1994).

While drinking raw milk would present a threat to public health, research has shown that, the vast majority of Kenyan consumers who purchase raw milk boil it both for preservation and in preparation of tea. While slightly reducing the nutritional value, boiling destroys harmful micro-organisms, rendering it safe for consumption. However cultural preferences that encourage consumption of raw milk, whether fresh or fermented, should be discouraged including, the practice of using left- over raw milk from the previous days sales (SDP, 2004).

There is significant employment through milk marketing and related activities, both in formal processed and formal raw milk sectors. The informal market represents well over 80 percent of all milk marketed in Kenya. Of this half is sold directly from farmers to consumers, with small-scale traders, including milk bars, mobile traders and raw milk sales from co- operatives accounting for the rest. Recent research has shown that there are over 29.000 Kenyan jobs supported by formal and informal milk marketing, average wages levels higher than the official nation minimum wage. Over 70% of these jobs are in the informal raw milk marketing. These non- farm jobs are important dairy – related opportunities for rural and urban poor (SDP, 1998; KDB, 1998).

2.2. Constraints facing the development of Kenyan smallholder dairy farming.

In spite of the success to date of smallholder dairy in Kenya, important constraints remain an obstacle to its continued development, which need to be addressed by policy markers, Researchers, planners and development agencies.

Production and marketing in the dairy sub sector are affected by a wider range of policy areas including policies and regulations on feed animal health, breeding services, milk collection, processing and marketing.

This has produced a very complex and sometimes contradictory policy environment. Lack of policy implementation results in a clear difference between written policy and action on the ground. Key public institutions in the sector are poorly functioning and under resourced for their stated functions. Keys bodies that influence policy do not have full representation from stakeholders, particularly smallholder farmers, consumers and milk market players.

Poor quality rural access roads pose a threat to incomes from dairy, causing unreliable milk collection, lower farm – gate milk prices and reduced access to inputs supplies and services. Upgrading poor roads to good murram roads would reduce transport costs on those roads and raise prices paid to farmers (TWMSR, 1997).

Raw milk markets pose a potential threat to public health. However those risks are relatively low because of the practice in Kenya of boiling milk, and can be reduced further through training in proper handling of milk. The universal practice of boiling milk, whether pasteurized or not, reduces health risks significantly as milk borne, potentially disease causing microorganisms are destroyed by boiling. Current policies allows, licensing of those with fixed premises but not mobile traders, with KDB emphasizing that this is for trade ability and inspection. Research has shown that raw milk quality differed little between licensed and unlicensed traders and retailers, indicating that licensing polices are not addressing the real issue of raw milk quality and public health. Some of the poorest quality milk was found among large-scale traders, some of whom have licenses, who transport milk long distances from rural to urban towns. However KDB has now developed a checklist of milk handling procedures from small traders, aimed at ensuring that only traders who meet set criteria are licensed.

Small – scale traders have largely been operating without access to training and support in milk handling. Pilot testing has shown that when such traders receive training in milk handling, testing and the use of appropriate containers, milk quality improves significantly. (TWMSR, 2000).

Farmers get loan facilities from A.F.C (Agriculture Finance Co- operation). This is an institution set up to give financial support to farmers. In the last ten years, A.F.C has been mismanaged and run down failing in its mandate to give financial support to needy dairy farmers. In instead

financed the politically connected large – scale farmers who are otherwise financially stable. Owing to lack of support from both the government, A.F.C and the collapse of K.C.C. resulted in poor milk market and the dairy farming became unviable. (TWMSR, 2004).

Most farmers were unable to service their loans. Currently there is a good political will for the farmers from the government and A.F.C provides loans to needy farmers and provide pack- up extension service so that the farmers can be able to service their loans. Most dairy farmers dwell in areas with poor road infrastructures and with no electricity. These situation occasions loses of milk through wastage, spoilage and inefficiency.

Most marketing co-operatives have collapsed and milk marketing is a problem for the farmers. Lack of electricity in the rural set up and poor roads have made it difficult for the farmers to access market for their perishable milk and their products. Farmers cannot easily access farm inputs due to poor infrastructures, which has increased input prices including dairy meal beyond farmers purchasing abilities. Lack of electricity makes it difficult for cooling process to be done. Consequently evening milk either goes to waste and the farmer stops milking thus using the udder as a storage facility, exposing the animal to the dangers of intra- mammary diseases (mastitis) and reducing the life span of the udder.

Poor quality rural access roads pose a threat to income from dairy causing unreliable milk collection lowering farm gate milk prices and reduce access to input suppliers and services.

In every financial year the government gives some money to the ministry of livestock for both administrative and extension services. The money is usually not enough to make a meaningful

contribution towards providing extension services to the farmer. This lack of support discourages the farmer from seeing dairy enterprises as a profitable venture drawing a set back on the dairy industry. Dairy industry is a delicate business venture, which requires attention from the stakeholders if there has to be a meaningful gain from the enterprise. A dairy cow costs locally between Kshs 60,000 – 150,000 and one single tick is able to kill the animal through tick borne disease. A farmer who has taken loan from A.F.C to buy the animal and surrendered his land title as collateral, if the animal dies the farmer will certainly not venture back into the industry again.

There is prevalence of notifiable diseases in the country and control measurers have not been put in place. Areas bordering international boundaries are the main inlets of these diseases due to frequent livestock movement across the border. Kenya – Uganda, Kenya – Somalia, Kenya-Tanzania, Kenya – Ethiopia and Kenya – Sudan border points are the major source of these diseases. These diseases are killers and have the effect of affecting milk, meat, hides and skin products quality and consequently negatively falling below international marketing standards. (TWMSR,2005).

The predominant exotic breeds kept in smallholder dairy system are cross breed and upgrades of Holstein- Friesian and Aryshire. Farmers prefer Holstein – Friesian and Aryshire in highland area with better market access and feed availability, because they produce higher milk yield, have higher growth rate, higher fertility, bigger body size and preferred coat colour. Smallholder dairy farmers use more natural service (built) than A.I.). Moreover use of A.I services have declined over time. The risk of inbreeding is real on smallholder farms regardless of whether natural or artificial services are used. This is due to a variety of factors including the use of the

same bulls/ semen over long periods of time, poor record keeping, misinformation and uncontrolled mating practices.

Kenyan small holder dairy farming is seen success story in Sub Saharan Africa but the sustainability of the sector is threatened by inadequate supply of appropriate replacement stock on farm as well as poor organization and supply of breeding services. Smallholders need better information on the most suitable cattle breeds' genotype to keep under the different production systems and objective. Choices of breed/ genotype should be left to the farmer. Smallholders do not raise enough replacement stock within their herds and source them from outside. The primary sources of such stock are other smallholder farms or from brokers and rarely from large – scale farms. The genetic quality of such animals is often uncertain (SDP, 2001).

Indications are that inbreeding levels are likely to be high whether A.I or bull services are used especially in the absence of pedigree records. Therefore, farmer should be encouraged to keep records and use them for routine management decision – making. The delivery of A.I services is disorganized and dialogue between the public and the sectors should be encouraged to stream line the supply breeding services. Policies on training, licensing, supervision and reporting of insemination seeds should be reviewed to make them realistic and for the sector to be more responsive to farmers' needs. A.I services operate particularly in the high potential areas. Inseminators travel around set routes where there are crushes for serving the animals.

For any meaningful economic activities to take place there has to be safe and conducive work environment, activities like milking, feeding, transportation of milk, watering of animals may be hindered resulting in negative response in both production and marketing of the product. The

area of study is conflict prone resulting in serious risky, insecurity situation leading to cattle rustling, killing of farmers and torching their houses. This condition result in loss of animals by the farmers and hence there will be serious reduction in livestock population including dairy.

HIV/ AIDS scourge is a problem, which has taken root in Kenyan communities, more so in the rural areas where there is little knowledge about the disease. It has affected dairy farming by causing the sell of animals for either treating the sick farmer or for burial costs. There is therefore a need for the government to crate awareness within the rural communities to arrest the spread of the disease. Key factors in economic recovery in Kenya, as elsewhere are employment and incomes for the poor, broad strategies are outlined in the current economic recovery strategy for employment and wealth creation and the recently launched strategy for revitalizing Agriculture. Small holder dairy production and milk marketing already contribute to the goals of these strategy, generating jobs, raising incomes and improving the health of the poor. Enhancing this sector and broadening its benefits thus has enormous potential to help drive Kenyan's economic recovery during this new era of policy redirection and public commitment (TMSR,1997).

A consortium of partners working in this area comes together to help promote smallholder dairy in Kenya and provide information to help guide the policy debate and implementation. This brief highlights key information, findings and policy implications. Most findings reported in this brief have come from the smallholder dairy project (SDP) a research and development project collaboratively implemented by the ministry of livestock and Fisheries Development. Kenya Agricultural Research Institute and funded by the UK Department for international, development (DFID, Gitau *et al.*, 1994, Temely *et al.*, 1995).

2.3 Production Efficiency in Dairy Sector.

Efficiency is the degree to which producers achieve the greatest possible output given available resources and techniques (Wolgin, 1973). In developing economics, efficiency is considered a quite important factor of productivity growth. This is because resources are meager and opportunity for developing and adopting better technologies are dwindling. According to Ali and Chaudhry (1990), productivity can be raised by improving efficiency without increasing resource base or developing new technologies. Muriithi (1990) states that improved allocation of resources can boost agricultural production without developing new technologies. According to Mercy (1991), efficiency is important for developing countries that are endowed with low productive resources. Poor adoption and implementation of agricultural policies are responsible for the decline in growth of agricultural production (GOK, 2000). The commonly assumed goal of farm manager is economic efficiency for profit maximization (Doll and Orazen, 1978).

According to Ali and Chaudhry (1990), technical efficiency is the ability of firm to achieve maximum possible output with available resource. It is actually the ratio of farmer's actual output to the technically maximum feasible output at a given level of resources. Upton (1979) argues that technical efficiency is the relationship of output achieved to the quantities of inputs used. Allocative efficiency concentrates on correcting disequilibrium that might appear in the utilization with the existing factors of production at the given techniques and methods of organization.

Heady and Dillon (1961), state that within the limit of statistical reliability, the ratio of marginal value product to their factor opportunity cost provides a measure of efficiency of resource use on

average. Maximum efficiency in resource use occurs when the revenue from using one additional unit is equal to the cost of that additional unit allocative efficiency is the ability to establish an optimal allocation of a given resource according to Ali and Chaudhry (1990). It can be said to be the ratio of technical maximum possible out put at the farmer's level of resource to the out put obtainable at the level of the resources.

Linear programming and production functions have the ability to handle large variables in analyzing farm resource use efficiency. Linear programming approach in particular has the ability to handle multiple goals and complex resource allocations in more comprehensive and realistic manner (Getachew, 1980). The limitation of this approach is that, it requires huge quantities of data. This restricts its application among the smallholders since minimal records are kept.

Irea (1979) recognized that linear programming approach faces the following weaknesses.

(1) Lack of sufficient detailed input- output data.

(2) Difficulty of constructing a linear programming model with relevant relationships and alternatives.

In this study, production function would be used to identify the factors that influence milk production as well as investigating the allocative efficiency among the smallholder dairy farmers.

2.4. Efficiency studies in Agricultural production.

Kiproech (2002) used Cobb- Douglas production function to study an economic evaluation of groundnut production technologies in Western Kenya. Labour inputs, fertilizer use and farm power had significant influence on groundnut yield. Education level was found to be an

insignificant factor. The researcher concluded that, groundnut farmers in Western Kenya were found to be inefficient in resources use.

In Meru district, Murrithi (1990) used Cobb- Douglas production function to study the efficiency of resource use for smallholder dairy production with the objective of determining productive resource allocation to increase milk yield. In this study, labour, farm – growing forages and operating capital was found to be insignificant at 1% level in influencing milk yield.

Ateka (2002) used Cobb- Douglas production function to study an economic evaluation of efficiency and size economics in smallholder dairy production for Nyamira district. Capital, land size, managerial ability and concentrate feed were found to be significant influences to milk production. Using a Cobb- Douglas production function, Nyabuta (1999) studied efficiency of resource use in artisanal fishing in Lake Victoria. The research found that expenditure on fishing labour and working capital significantly influenced " Omena" output and managerial ability did not influence the output. Hired labour was found to be a significant allocative efficiency factor. Resources were found to be used beyond economic level and hence inefficient.

The study was done by comparing computed marginal value products and corresponding input prices. In Machakos and Meru districts, Matovu (1979) used Cobb – Douglas production function to study the efficiency of resource utilization in small- scale farming of maize and cotton. The results showed that efficiency was attained in the use of some resources and not others in the two enterprises. Marginal productivity of resources used in production of both maize and cotton were found to be low.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.0 Introduction

This chapter discusses the design procedures and methodology which was adopted in collecting and analysis of data, Sources of data, which is used in the research, have been mentioned alongside the sample frame from where the data has been collected.

Production function has been widely used in analysis of farm efficiency due to its ability to handle a large number of inter related variables. According to Beattie and Taylor (1985), production function is a quantitative or mathematical description of various technical production possibilities faced by firm. In this study, results of production function analysis will be useful as a basis for assessing whether small – scale farmers are using too much or too little to their productive resources and also will establish whether reallocation of resources will be profitable.

The researcher selects a production function that is computationally manageable for estimation, testing and easy to manipulate (Upon, 1979; Heady and Dillon, 1961). However, no single algebraic form can be used to characterize agriculture production in all situations. Some of the main algebraic forms include: Linear, quadratic, transcendental and Cobb- Douglas production functions (Heady and Dillon, 1961).

The study used Cobb- Douglas production function due to the following advantages of the function:

(1) Mathematical property of logarithmic transformation.

(2) Ease of interpretation.

(3) Computational simplicity.

3.1 Research Design.

This research used descriptive random sampling method to come up with the respondents in this research. The respondents included people above 18 years in central division of Kitui district who head the different house holds which participated in this research.

3.2 Target Population.

50 respondents participated in this research, were chosen at random from the different house hold heads in central division in Kitui district out of a total population of 55,423 people in the whole district.

3.3 Research Instruments

Methods used for data collection/ Research instruments

The research use open- ended and close- ended (research made) questionnaires, observation, and oral interviews methods to examine the factors that affect the performance of smallholder dairy farmers in central division in Kitui district.

Personal interviews was carried out by the researcher as a follow up of the questionnaires so that the interviewee to be aided in the areas of difficult and seek an in depth discussion and explanation on matters missed on the questionnaires.

Observation is focused on the practical aspect of the normal tasks carried out in the organization by the staff. The advantage of this method was that it enabled the confidentiality of information and better recommendations based on personal observation.

3.4 Data collection procedures

The researcher took an introduction letter from Kampala International University School of Postgraduate Studies to the District officer in charge of central division of Kitui-Kenya for permission to consult the dairy farmers on the factors affecting the performance of smallholder dairy farmers in the division.

Upon approval questionnaires were prepared and pre- tested before administering it to the chosen respondents to see how effective the questions were in collecting information needed from the respondents. After which the data was collected, processed, statistically treated, interpreted the results, arranged the data in order and finally summarized the data.

3.5 Analysis of data

Once the data has been collected, it was analyzed by the researcher both qualitatively and quantitatively using Statistical package for Sciences (SPSS) and Excel was also used to do various computations in this study.

3.6 Limitations of the study

The researcher faced the following limitations in the process of this research:

Some of the respondents were not willing to share with some of the information, which they thought was confidential, but the researcher shall promise to keep the information got with great confidentiality.

Language barrier caused a problem, where some of the respondents are likely not express them well and some times misunderstand the questions so the researcher shall to help the respondents to interpret the questions.

Limited literature on the topic of study in the university library and other libraries around made study to be only restricted to use a few literature materials the researcher managed to access.

3.7 The Resource Efficiency

(1) Elasticity of production with respect to the resource X_i used is:

$$\beta_i = \frac{\partial Y}{\partial X_i} * \frac{X_i}{Y}$$

(2) Marginal physical product with respect to resource X_i used is:

$$MPP_i = \frac{\partial Y}{\partial X_i} = \beta_i * \frac{Y}{X_i}$$

$$\text{Profit } \pi = P_Y Y - \sum (P_{Xi} X_i) - F$$

Where π = Profit

P_{Xi} = Market Price or Opportunity Cost of input X_i

X_i = Amount of ith factor

F= Fixed cost if any.

P_Y = Unit price of output.

Y= Amount of physical output

For maximization

$$\frac{\partial \pi}{\partial X_i} = P_Y \frac{\partial Y}{\partial X_i} - P_{Xi} = 0$$

$$\frac{\partial Y}{\partial X_i} = \frac{P_{Xi}}{P_Y}$$

$$MPP_i = \frac{P_{Xi}}{P_Y}$$

$MVP_{Xi} = P_{Xi}$

For efficient allocation of resources, marginal value product is supposed to be a unit. In order to test the efficiency of resource use, the null hypothesis was set as below.

For significance test, the t- values was calculated as follows:

$$t = \frac{MVPX_i - Px_i}{S.E\ (MVPX_i)}$$

Where = MVP_{Xi} = Estimated marginal value product of input X_i

Px_i = Price of input X_i

S.E. (MVP_{Xi}) = Standard error of the sample regression coefficient associated with input X_i.

Accepting H_0 would mean farmers are inefficient in using that resources (X_i).

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION

4.0 Introduction.

This chapter addresses the analysis of data that was collected and relevant interpretation of respective variables considered for study. The discussion involved explores exhaustively the farm and farmer factors that influence milk production.

4.1. Response Rate.

The response rate was 100%

4.2 Analysis of Production Functions

Animal diseases.

From the data obtained in a survey of Central division, animal diseases according to this study were found to shift milk production curve to downwards by 0.005 units on analysis. This is an indication that dairy animals produce milk adequately when in good health condition just according to the maintained hypothesis. The dummy variable was however found not to be significant at 5% in explaining the milk production factors in the division as shown in table 4.1. This concurs with TWMSR, (2005), who asserts the constraints faced in dairy farming include notifiable diseases in the country and control measurers have not been put in place in border areas.

Prices of milk at farm gate.

Good milk prices according to this sample were found to be insignificant at 5% level in explaining milk production trend among the smallholders by analyzing the survey data obtained using SPSS computer package. However, the increase in price of milk was found to shift

production curve upwards by 0.086 units as shown in table 4.1. This is an indication that if prices are good most farmers in the division would strive to increase their milk production mainly to maximize their profits.

Infrastructures condition.

Infrastructures were also found to be significant variable in explaining milk production factors in Central division. Poor roads were found to be discouragement to most farmers interviewed. An improvement of roads was found to shift milk production curve upwards by 0.110 units as shown in table 4.1. This could be explained by the fact that good roads would reduce cost of transportation of milk to the market as well as farm inputs. This contributes to an increase in profits realized by milk sales, hence an incentive to increase production further.

This concurs with Bebe, *et al*,(2003)who says that the collapse of the cooling centers has caused severe difficulties in milk marketing to farms in inaccessible area where private milk marketing agents (both formal and informal) are faced by poor infrastructure. Often milk collected from poor infrastructure cannot reach the processing plant within the recommended time of two- three hours culminating in spoilage and in many of the inaccessible areas, afternoon milk is not collected because doing so is unprofitable to the private market involved.

Table 4.1: Analysis of Production Function.

Variable	Coefficient	S.E	t- Value
Age of head	-061	.070	-.907
Education of head	.169	.057	-2.520*
Experience of head	.029	.046	.442
Dairy meal used	.250	.067	3.611**
Farm size	-096	.067	-1.370

Diseases	-.005	.028	-.079
Milk price	.086	.031	1.281
Infrastructure	.178	.036	1.491*
Constant	1.985	.345	5.747

Source: Primary data, 2008

- *and ** are significance at 5% and 1% levels respectively.
- Variables are defined in the text.

The study established that the elasticity of considered variables for smallholder dairy farmers in central division studies was 0.483. since this value is below one, it is hence an indication that the milk production in this district is at diminishing returns to scale.

This is in agreement with TWMSR, (2005), who asserts the constraints faced in dairy farming include notifiable diseases in the country and control measurers have not been put in place in border areas.

4.3. Marginal Physical Product (MPP)

Marginal physical product is the change in output resulting from a unit change in variable input.

$$MPP_i = \frac{\partial Y}{\partial X_i} = \beta_i * \frac{Y}{X_i}$$

Where β_i is the production elasticity associated with resource X_i while other factors are held constant. A resource marginal productivity depends on the quality of the resource that is used and on the level of other resources with which it is combined in the production process. Heady and Dillon (1969) states that estimate with widest applicability are those derived at mean point

level. Geometric mean (GM) has been employed by many researchers for estimates of average output and average value of input in estimating marginal productivity.

Heady and Dillon (1969) argues that the most reliable and useful estimate of marginal productivity is obtained by taking X_i at its Geometric mean. In this study, GM was employed to estimate marginal productivity of used resources. Multiplying all the n items in the set and then taking the nth root of the product as shown below obtain GM of any set of numbers.

$GM = (X_1 * X_2 * \ldots * X_n)^{1/n}$

The logarithm of GM of X_i is equivalent to the arithmetic mean of InX_i. So, the GM becomes:

$$X_i = \frac{\sum_{i=1}^{n} InX_i}{n}$$

Table 4.2 gives values of X as compound using the formula above.

4.4. Marginal Value Product (MVP)

Marginal value product is the value of output resulting from unit change in the level of resource X_i. It is obtained by multiplying the MPP_{Xi} by price of the output that in this study is milk in litres. The average price of litres of milk is taken to be Kshs 6.00. This is a very low price to the dairy farmers in which they can not get a value for their milk.

4.5 Interpretation of MPP and MVP

Results of the study show that as age of respondents increases, milk production reduces by 0.0842 litres. However, the variable was not significant at 5% level in explaining the poor milk production in Central division. The relationship according to this sample is in agreement with the maintained hypothesis that at old age most farmers would not be innovative and hence are reluctant to adopt necessary technologies.

Education of households head.

An increase in education by a year for household head was found to increase milk production in the farm by 0.00277 litres. This was a significant factor affecting milk production at 5% level. This is an implication that education helps a farmer to make more informed decision on animal husbandry. By being able to appreciate and consequently adopt new diary production technologies, the dairy farmer is capable of adopting farm inputs necessary to increase milk production. This is in agreement with Khaldi (1975),who used Cobb – Douglas production function to study education ad allocative efficiency for USA agriculture. Similarly, Sahot (1968) states that education enhances allocative efficiency in crop production in India.

Experience of the household head

Experience of the household head in dairy production to positively influence milk production in the division according to the sampled farmers. A unit increase in year of experience was found to increase milk production by 0.2246 litres. This could be associated to the fact that the more a farmer is exposed to challenges in the sub sector the more he would be ready to face them in future. Experienced farmers are capable of knowing how to tackle problems more diligently than new entrants in the production as shown by the sample.

The use of dairy meal.

Dairy meal was found to be significant variable at 1% level in explaining the problems facing milk production among dairy farmers in Central division. Since dairy meal is an essential feed supplement in milk production, poor feeding of the dairy animals would obviously lead to an increase in milk production. this study found that a unit increase in dairy meal supplement would lead to an increase in milk production in Central by 0.1107

The size of farm.

Farm size was found to be insignificant at 5% level of significance is as a factor influencing production of milk in central division. This study found that a unit increase in size of farm by an acre would lead to an increase in milk production by 0.0062.

This may be explained by the fact that an increase in farm size would enable dairy farmers to grow sufficient grass to feed their animals. Since more food for the dairy animals would translate to an increase in milk production, an increase in land size in Central division was found to agree with the maintained hypothesis.

Table 4.2 Computation of MPP and MVP

Variables	Output (X)	MPP (litres)	Price / litre	MVP (Kshs.)
Milk production	1.9032	-	-	-
Age of head	3.8196	-0.0842	6	-0.50524
Education of head	1.9960	0.0277	6	0.16591
Experience of head	2.1189	0.2246	6	1.34731
Dairy meal used	1.6510	0.1107	6	0.66396
Farm size	1.5305	0.0062	6	0.03731

Source: Primary data, 2008

Figures 4.1 and 4.2 illustrate the proportions of MPP and MVP realized from unit increases of various continuous variables analyzed for study of factors affecting milk production in Central division in Kitui district.

According to figure 4.1, experience was found to increase milk production by the greatest amount while age reduced milk production according to the data sampled.

As shown in figure 4.1, the data collected in central division indicated that a unit increase in age of dairy farmers above the mean was found to reduce milk production by 0.084 litres. The reduction of MPP by 0.084 litres was consequently found to reduce MVP by Kshs 0.51. This is because dairy farmers who are aged are less innovative and as age advance their concentration on optimal production gets impaired.

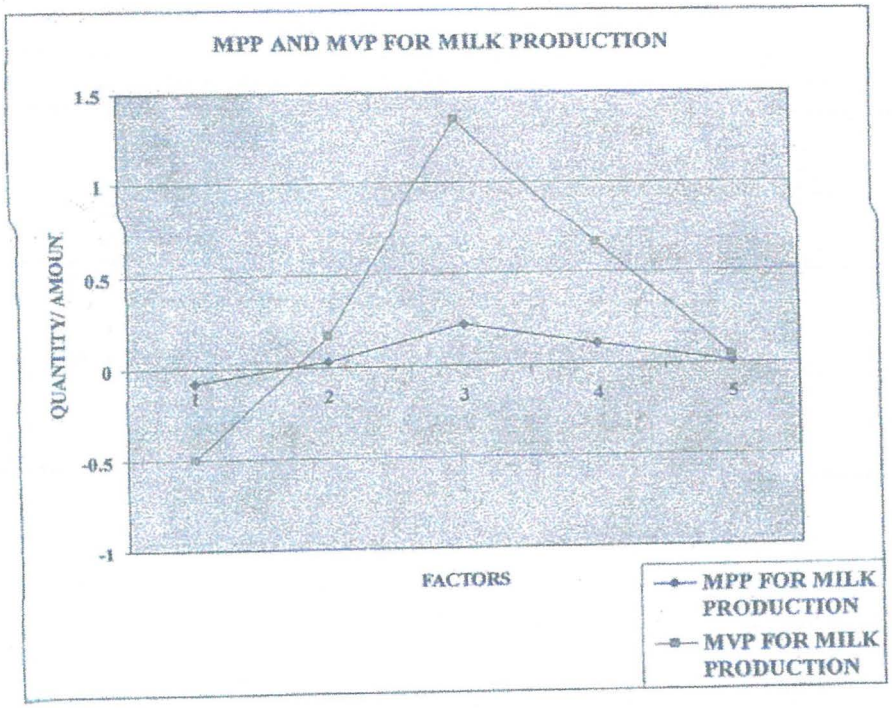
A unit increase of education years of household head according to the sampled dairy farmers in Central division by one unit was found to increase MPP by 0.028 litres. The increase in MPP by the said quantity translated to an increase in MVP of milk production by Kshs 0.17 as shown in figure 4.1. This could be explained by the fact that increased milk output would lead to more returns to the dairy farmer.

Experience in years was found to be directly related to milk production. a unit increase in years of experience was found to increase MPP by 0.22 litres in central division. The increase in milk production implied an increase in MVP by Kshs 1.35 as figure 4.1 shows. This may be explained by the fact that experience in dairy production leads the farmers to be more informed about available technologies and their ability to invest wisely in order to realize optimal output.

The study of central division showed that unit increase in diary meal supplement use by farmers to feed their animals lead to an increase of MPP by 0.11 litres. As shown in figure 4.1, the increase in MPP leads to an increase in MVP by Kshs 0.66. This may be explained by the fact that better feeding of dairy animals directly translates to an increase in milk production and hence in returns.

From the analysis of survey data from central division, it was established an increase in farm size among the smallholder dairy farmers lead to an increase in MPP by 0.006 litres. As figure 4.1 below shows, the increase in MPP leads to an increase in MVP by Kshs 0.037.

Fig 4.1 MPP and MVP for +Milk Production



Primary data, 2008

4.6. The efficiency of resource utilization in milk production.

In determining the efficiency of resource utilization, a test for allocative efficiency was undertaken in this study. This involved comparing Marginal Value product of resources with their respective prices. This approach is similar to what Ateka (2002), Nyabuta (2001) and Matovu (1979) used in their respective studies. The resource utilization

Efficiency is attained when MVP is equal to Marginal Factor Cost (MFC). This is confirmed by the basic economic theory that states that, returns from employing last units of an input should be equal to its cost.

In making a comparison between the estimated MVP and the resource price, t- statistics was estimated as below:

$$t = \frac{MVP_{Xi} - P_{Xi}}{S.E\,(MVP_{Xi})}$$

The test for efficiency of resource utilization was done for inputs with significant regression coefficients.

4.7 Average Allocative Efficiency in Milk Production.

Table 4.3: Computed t- Value for Testing Efficiency of Resource Use.

Resource	MVP (Kshs)	Price/ litre	t- value
Milk production	0.50524	6	78.2966
Age of head	0.16691	6	102.352
Experience of head	1.34731	6	101.145
Dairy meal used	0.66396	6	99.4621
Farm size	0.03731	6	90.1090

Source: Author's Data, 2008

*** 1% significance level.

According to table 4.3 obtained from an analysis of the sample of central division surveyed, marginal value product (MVP) as a result of a unit increase in age of household held is Kshs 0.50524. a unit increase in education years of the household was found to increase MVP by Kshs 0.16591. An MVP increase of Kshs 1.34731 was realized from a unit increase in years of experience of the household head according to the data sampled. From the sample surveyed, a unit increase utilization of dairy meal use was found to increase MVP by Kshs 0.66396. The study of factors affecting milk production

In the division found that an increase in size of farm by one unit would raise MVP by Kshs 0.03731.

In determining the average allocative efficiency in milk production, the price per shilling spent on dairy production was assumed to be the gain forgone in terms of interest rate the dairy farmer would have earned had he saved the money in an interest earning account. The interest rate is pegged at 12%. This is agreement with Heady and Dillon (1969) who states that, for computational purposes, heterogeneous forms of inputs that have no common physical units should be generated and measured in value terms.

According to the findings of this study, age of household heads, education of the household heads, experience of household heads in dairy production, dairy meal use as supplement in the dairy farms and farm size marginal value products were found to be different from the milk price.

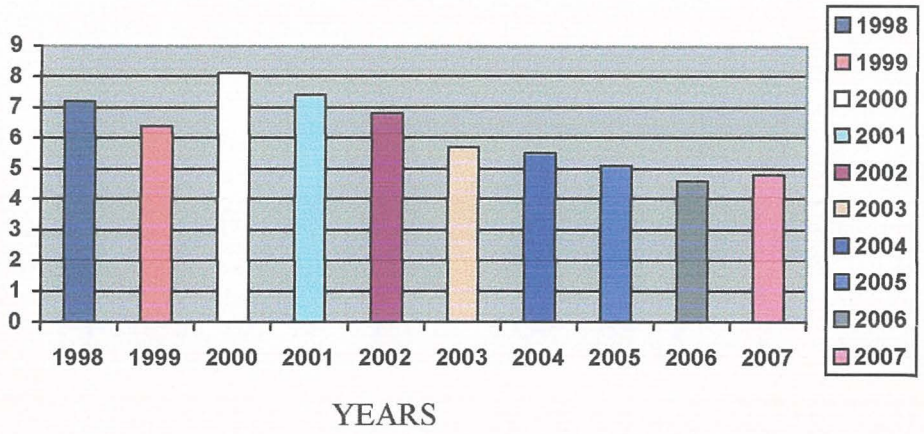
TRENDS IN DAIRY MILK PRODUCTION IN KITUI

TABLE 4.4

YEARS	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
AMOUNT MILK IN TONS X103	7.2	6.4	8.1	7.4	6.8	5.7	5.5	5.1	4.6	4.8

(Source : District Livestock Production Office- Kitui, 2007)

Fig 4.2 Graphical representation of trends of Milk production in Kitui



There has been a gradual decrease in milk production over the last 8 years.

4.8 Factors affecting dairy production

The factors which caused the decline in production includes; poor road infrastructures, poor quality and costly animal feeds, over reliance on rains, lack of organized and reliable market, animal diseases among others.

This concurs with Orre *et al*, (1998) who asserts that since the dairy sector was liberalized in 1992 ending the monopoly of KCC in milk processing and marketing and ushering in the private sector to play greater role, milk marketing channels have been diversifying with the entrance of numerous private milk processors which increased informal milk marketing which now play the dominant role and he asserted that it is estimated that over 80% of the milk in Kenya is sold through the informal marketing channels because of poor marketing channels.

Like wise, TWMSR, (2005), who asserts the constraints faced in dairy farming include notifiable diseases in the country and control measurers have not been put in place in border areas.

CHAPTER FIVE

SUMMARY OF THE FINDINGS, CONCLUSION, RECOMMENDATIONS AND AREAS OF FUTURE RESEARCH

5.0 Introduction

This chapter entails the findings and conclusion of this study basing on analyses of sampled data for central division a recommendation is also made basing on the conclusion asserted.

5.1 Summary of the findings

Trend in production of milk by dairy farmers in central division of Kitui

There has been a gradual decrease in milk production over the last 8 years due to long droughts and an NGO that used to assist the farmers came to an end.

Managerial and farm factors that influence milk production in central division of Kitui

The factors that have influence milk production in central division of Kitui are animal diseases. Prices of the milk, infrastructure conditions, level of education of household, experience of house hold head in dairy farming, the use of dairy meal and the acreage size of the dairy farm.

Constraints faced by dairy farmers in milk production

Constraints faced by dairy farmers in milk production in central division of Kitui are poor road infrastructure, unreliable rains, and poor market for dairy products, cattle diseases and high cost of animal feed.

How to improving the yields in dairy farming in smallholders in central division in Kitui

Yields in dairy farming in smallholders in central division in Kitui can be improved by

having a good road infrastructure to transport dairy products, creating market for dairy products, provision of veterinary services to farmers, training of farmers to know how to best practice dairy farming, and

5.2 Conclusion

The factor which affect the performance of small holder dairy farmers in central division in Kitui are age of household head, education of the household head, dairy meal used, and the size of land owned and experience of the household head in dairy farming were found to be inefficiently allocated in milk production in Central division and poor allocation of resources was hence the reason as to why farmers were not optimally producing milk in the division.

5.3 Recommendations

Based on the findings the research recommends the following:

There is a need for the government to ensure that roads are repaired and maintained in the area. Good roads would lower cost of transporting farm inputs as well as delivery of milk to the market and hence increase profit realized by dairy farmers.

Extension officers, Non- governmental organizations in the area as well as research institutions have a role to play in improving the milk production in the division. Farmers need to be trained on how to efficiently utilize the available resources. The study found that poor resources allocation was a constraint in milk production for this division, farmers need exposure to the most efficient methods to adopt in order to realize optimal output.

5.4 Areas of future research

Research can be done in the role of the cooperative societies on dairy farming in Central Division in Kitui District in Kenya.

Further research can also be done in how to help farmers improve their dairy farming.

REFERENCES

Ali, M. and Chaudhry, M.A (1990). *Interregional Farm Efficiency in Pakistan's Punjab: Afrontier Production Function Study. Journal of Agricultural Economics.* 41(1): 65- 74.

Ateka, J.M (2002). *An Economic Evaluation of Efficiency and Size Economics in Smallholder Dairy Production in Nyamira District.* M.phil. Thesis, Moi University.

Babe B.O (2003). *Herd dynamics of smallholder dairy in Kenya Highlands.* Ph. D. thesis, Wageningen University, Wageningen, The Netherlands.

Beattie, B.R and Taylor, C.R (1985). *The Economics of Production.* John Wiley and Sons, New York.

Babe B.O, Udo H.M.J, Rowlands G.J and Thorpe W. (2003). *A smallholder dairy system in the Kenyan highlands Breed preferences and breeding practices.* Livestock production science 82 (2-3) 117 – 127.

Bebe B.O. Udo H.M.J Thorpe W. (2002). *Development of Smallholder dairy systems in the Kenya highlands.* Outlook on Agriculture 31 (2) 113-120.

Bebe B.O. Udo H.M.J, Row lands G.J, and Throne W, (2003). *Stakeholders' dairy systems in the Kenyan Highlands: cattle population dynamics under increasing intensification.* Livestock production Science 82 (2-3): 211 – 221.

Dairy policy Forum (DPF 2004).*Policy to support smallholder dairy for sustainable employment and income in Kenya.* (ILRI 2004) smallholder adaption of dairy technologies.

Doll, P.J. and Orazem, F. (1978). *Production Economics:* Theory with Application. Grid Inc; Columbus, Ohio.

Gatachew, A. (1980*). Resource Allocation for Small- Scale Farmers of the Star Grass Zone in Embu district, Kenya.* MSc. Thesis, University of Nairobi.

Gitau et al 1994, Scherira and Ibrahim (1995) Schihorn van veen (1980*). Economic loss through calf mortality.*

GOK (Government of Kenya) Annual Report 1998. Government printers.

Government of Kenya (2002). *National development plan 2002- 2008. Effective management for sustainable Economic growth and poverty reduction.* Government printers, Nairobi, Kenya.

Heady, E.O. and Dillon, L.J. (1961) Agricultural Production Function. Iowa State University Press, Ames, Iowa.

Hussein, S.S, Byerlee, D, and Heisy P.W. (1994*). Impact of farmers' knowledge and adoption of technology.* Evidence from Pakistan. Agricultural. Vol. 10 pp 39-47.

Irea, S. (1979). *A linear Programming Approach to the Optimal Allocation of Resources and Combination of Crop enterprises in the Perkerra Irrigation Scheme*, Kenya. MSc. Thesis, University of Nairobi.

KDDP/ SAD (Kenya Dairy Development Programm/ small holder dairy project) (2004). *The breeding fact, for farmers and extension staff study*: KDDP/SAD, Nairobi, Kenya.

KDDP/SAD (Kenya dairy development program/ small holder dairy project) (2005). *Data and statistics from the KDDP breeding assessment study:* KDDP/ SAD, Nairobi, Kenya.

Livestock Census (Daily Nation Sept. 14 2005). Government Printers, Kenya.

Matovu, D.M. (1979). *Efficiency of Resource Utilization in Small- Scale farming*: A case Study of maize and cotton production in Machakos and Meru Districts. MSc. Thesis, University of Nairobi.

Mukhebi A. (2004). *Reaching the poor in rural Kenya with market information*. Proceedings of workshop on markets to raise income of poor farmers in Africa 5th – 8th April Nairobi, Kenya.

Murrithi, M. (1990). *Efficiency of Resource use in smallholder Milk production.* A case study of Meru central dairy farmers. MSc. Thsis, University of Nairobi.

Nyabuta, O.J. (1999). *Efficiency of resource use in Artisanal Fishing in Lake Victoria, Kenya.* MSc. Thesis, Moi University.

Khadi, N. (1975). *Educational and Allocative Efficiency in USA Agriculture. American Journal of Agricultural Economics.* 57 (4): 650- 657.

Kipkoech, A.K (2002). *An Economic Evaluation of Groundnut production Technologies in Western Kenya.* MSc. Thsis, Moi University.

Kothari, C.R. (1990). *Research Methodology: Methods and techniques.* Second Edition. Wisley Eastern, New Delhi.

Sahota, G.S. (1968). *Efficiency of resource allocation in India agriculture. American Journal of Agricultural economics.* 50 (3): 684- 764.

SDP (Small holders dairy project) (2001). *Competitiveness of smallholder dairy enterprise in Kenya. Policy Brief 3.5p, Nairobi, Kenya.*

K.D.D.P (Kitui District Development Plan 1997-2001)

SDP (small holders dairy project) (2001*). LPS – Practical alternative for reducing post harvest milk losses.*

Upto, M. (1979) Farm Management in Africa. Oxford University Press, Great Britain.

Wolgin, J.M.(1973*). Farm response to price change in Small- holder Agriculture in Kenya.* Unpublished PhD. Thesis, Yale University

APPENDIX

QUESTIONNAIRE FOR IDENTIFYING THE FACTORS CONSTRAINING MILK PRODUCTION AMONG SMALLHOLDERS IN CENTRAL DIVISION, KITUI DISTRICT IN EASTERN PROVINCE. KENYA.

RESEARCH QUESTIONAIRE

Introduction

This research is purely for academic purpose. The researcher, Mr. Enow Gulia Alio is an MBA student at Kampala International University, Uganda. Your co- operation in answering the questions will be highly appreciated. All information given shall be confidentially handled.

Yours sincerely,

Enow Gulia Alio.

1.0 Farmer's Characteristics.

Name of the household head .....

Sex of farmer ..... (1 if female; 0 otherwise)

Age of the farmer ..... (years)

Education of the husband ..... (years)

Education of the wife if not the household head..... (years)

The period farmer has been in dairy production ..... (years)

Number of children .....

Number of girls .....

Number of boys .....

Division .....

Location .....

Sub- location.....

Occupation of the farmer .....

Occupation of the wife .....

2.0 Land ownership and labour status

Do you have title deed for your farm? ..... (1 if yes; 0 otherwise).

What is the size of your land? ..... (acres)

What is the size of the land rented? ..... (acres)

What is the rental rate per acre in the division? ..... (Kshs/ acre)

What is the source of labour for your farm? ..... (1 if family labor; 0 otherwise)

3.0 Income characteristics.

What is your off- farm income? ..... (Kshs./ month)

What is your farm income? ..... (Kshs./ month)

Which source of income do you consider more reliable? ..... (1 if farm income; (otherwise).

4.0 The Dairy Farm Characteristics

Please fill the following table:

Breed of dairy animal	Number of animals	Total amount of milk produced

How much milk do you produce per day? ..... (litres/day)

What is the farm- gate price of raw milk in the division? ..... (Kshs/litre)

How much time is devoted to attend the dairy animals? ..... (man-hours/day)

What is the labour cost in the region? ..... (Kshs./hour)

What is the market rate of interest at present? ..... (percentage)

Which diseases threaten dairy production in your farm?

1. .....

2. .....

3. .....

4. .....

How serious is your dairy production threatened by diseases? ..... (1 if very serious; 0 otherwise).

How much dairy meal is consumed in your farm? ..... (Kg/day)

What is the price of dairy meal? ..... (Kshs/Kg)

What are your sources of technical information?

(1) .....

(2) .....

(3) .....

(4) .....

How often are you advised by Veterinary officers in the division? ..... (1 if very often; 0 otherwise).

What are your major sources of income for use in the dairy production?

(1) .....

(2) .....

(3) .....

(4) .....

Have you benefited from loans for your enterprise? ..... (1 if yes; 0 otherwise).

How do you consider the dairy production enterprise? ..... (1 if very rewarding; 0 otherwise).

Are you going to continue with dairy farming given the current state of market? ..... (1 if yes; 0 otherwise).

What are the major challenges you have faced in dairy production since you started farming?

(1) .....

(2) .....

(3) .....

(4) .....

(5) .....

(6) .....

(7) .....

What do you want done for you to improve your dairy farming?

.....

.....

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.....

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Names of the Researcher / Assistant.....

Signature .....