FACTORS INFLUENCING SUSTAINABILITY OF SMALL SCALE DAIRY FARMING; A CASE OF SMALL SCALE DAIRY FARMERS IN CHERANG'ANY SUB COUNTY, TRANS-NZOIA COUNTY, KENYA

BY

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Declaration

This research project is my original work and has not been presented for any award in any other university

Sign …… Date…….

BIDII KORO PHILEMON

REG. NO. L50/70045/2013

This research project has been submitted for examination with my approval as university supervisor.

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Dedication

This research project is dedicated to my Elder brother Justus Rotich for his continuous moral and financial support throughout my study, my mum and the only parent for the encouragement and prayers throughout my studies. Thank you all and God bless.

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Indeed I owe a number of people honor for the success of my coursework and project. First I honor my supervisors Dr. Khatete Dorice for support and guidance. My worthy lecturers Mr. Koringura, Mr. Sakaja, Mr. Ochieng, Mr. Cheben, Dr Anne Assey and Mr. Likuyani from the department of extra murals studies (Eldoret centre). I wish also to extend my gratitude to the esteem 2013-2015 masters class for the exemplary cooperation during the course work and the project. I wish also to thank the respondents who participated in the study and District livestock officer for her response, the University of Nairobi fraternity who played a big role in ensuring that I get adequate materials for the project.

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ABBREVIATIONS AND ACRONYMS

AFC Agricultural Finance corporation

KDB Kenya Dairy Board

KCC Kenya creameries cooperative

KDP Kenya Dairy Project

EADD East African Dairy Development

USAID United states Aid

SDCP Smallholder Dairy Commercialization Program

KARI Kenya Agricultural Research Institute

MoLD Ministry of Livestock Development

ILRI International Livestock Research Institute

ABSTRACT

Small scale dairy farming gained popularity among many communities in Kenya. Farmers can be able to utilize the available space and gain maximally. Milk can be directly sold to final consumers and milk processors. Milk is nutritious and good for one's health. Dairy farming is widely practiced across continents; America, Europe, Asia Australia and Africa. In first world economies, Dairy farming has been mechanized hence huge returns. Kenya and in Particular Cherang'any, is able to perform better and reach optimum utilization for maximum productivity. Research assistance and I will investigate factors influencing sustainability of small scale dairy farming in Cherang'any Trans-Nzoia County. The objectives of the study are; to examine how technology influences small scale dairy farming, to establish how access to finance influence small scale dairy farming, to find out how climatic condition influence small scale dairy farming and to find out how education levels of small scale dairy farmers influence dairy production. The theoretical framework for this study is population theory. This study targets 536 small scale dairy farmers in Cherang'any Sub-County using descriptive survey through questionnaire and observation method. The farmers will be selected using stratified sampling and random sampling while key respondent will be selected through purposive. Small scale dairy farmers will be drawn from Cherang'any and Kaplamai divisions. A sample of 30% will be sampled out for the study making 159 respondent and 3 key respondents. Research instrument will be tested for validity and reliability. Permission to conduct the study will be tabled to the Sub County Livestock and NACOSTI. Data collected will be analyzed using regression and correlation with the help of statistical package for social sciences (SPSS version 20). Findings will be presented using frequency distribution tables, mean, standard deviation and Correlation.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Dairy farming is an important agricultural sector and highly enriched with agro-ecological, political and social dimensions across countries, region and the vast continents. According to (Knechtges, 2011), approximately 900 million of worlds 3.3 billion people are poor and live in rural areas and majorly depends on agricultural activities for food and income according to (OECD, Global Trends in the Dairy Industry Outlook for the Baltics: Outlook for the Baltics, 2002). Dairy farming directly and indirectly utilize 80% land surface and it is projected to escalate to the tune of 30% of total value of the global agricultural production. Agriculture is the backbone of Kenyan economy and dairy production alone contribute 21% of the total 40% agricultural produce of the GDP and 3.5% of the total GDP according to (Knechtges, 2011). Dairy farming has geometric benefits ranging from food security, job creation, income generation and foreign exchange earnings and also source of protein to human diet. It also enhances dairy farmers, processors, traders and the entire participants of milk chain distribution.

In United States of America (USA), dairy farming is large scale and highly mechanized with milk marketing mostly done through cooperatives. Dairy product sales represented 42 percent of total commodity marketing by Agricultural Cooperatives in 2007 alone. Approximately 155 Dairy Cooperatives in USA is owned and managed by 49,675member-producers, or 84 percent of the nation‘s licensed dairy farms. The Dairy co-operatives deliver 152.5 billion pounds of milk, or 83 percent of all milk marketed (Ling, 2009).Thus in USA, cooperatives afford to pay dairy farmers promptly as a result of better organizational size

necessary for exercising countervailing power to effectively bargain. More than 51,000 U.S. dairy farms provide milk, cheese and yogurt to the United States and other countries. About 97 percent of all dairy farms are family owned (Moran, 2005). On dairy farms, the average herd size is 115 cows. In fact, 74 percent of dairy farms have fewer than 100 cows. Farms with more than 100 cows produce 85 percent of the milk (Dairyfarmingtoday.org) Productivity of US dairy farms has increased rapidly over the past 50 years: from 1961 to 2011, milk produced per cow increased 296%, according to US Department of Agriculture (USDA) Statistical Reporting Service (SRS; 1964) and USDA National Agricultural Statistics Service statistics. 14% increased dairy productivity is attributed to improved genetics, advanced technology, and better management practices, including advanced breeding innovations. Modern breeding technologies such as artificial insemination (AI), embryo transplants (ET), and sexed semen (SS) have been replacing conventional natural breeding for a number of years, estimate that US dairy farms using genetic selection and breeding programs such as ET and AI increased from 64.3% in 2000 to 81.5% in 2005. Breeding technology affects herd genetics and reproductive performance, influencing farm economics and productivity (A.M. Roussel, 2006) puts into perspective. Rouse suggested breeding technologies were the most significant factor contributing to farm livestock productivity since the 1940s.

The Danish dairy industry can be traced back into 18th century and consists of the international dairy group Foods and 30 smaller dairy companies, together processing 4.7 billion kg milk from a total of 61 production plants in Denmark according to (Knechtges, 2011). Cooperatively owned by Danish and Swedish milk producers, Foods is Europe's largest dairy group. The group processes more than 90 percent of the Danish and two thirds of the Swedish milk pool. It also runs dairy operations in a number of other countries, with UK placed as its

biggest business (Michels, 2010). The remaining 30 Danish dairies are evenly distributed between cooperatively and privately owned companies. The small dairies typically specialize in various product areas within cheese, butter and liquid milk production. A large part of their production is exported by specialized exporters. The value of all Danish dairy exports totals EUR 1.8 billion annually. The domestic market is, to a large extent, a market for domestic dairy production, although imported cheese and yoghurt now account for approx. 25 percent and 20 percent, respectively, of total domestic consumption. The market share of foreign milk remains moderate. Like the processing sector, the Danish milk producers have seen tremendous structural change, with production now taking place on a small number of large farms. In 2010, approx. 4,100 dairy farmers each had an average of 127 cows and a milk quota of 1,142 tones according to (Backlund, 2009). This places the Danish dairy farmers among the largest and most modern in Europe. More than half the cows live in new loose-housing systems. Exports of dairy products, in particular cheese, preserved milk products and butter, accounts for more than 20 percent of all Danish agricultural exports. The largest market for Danish dairy products is the other EU countries (Dairy Farmers of Britain: Fifth Report of Session 2009-10, Vol. 2: Oral and Written Evidence, Volume 2, 2010).

In South Africa six regions predominantly practice dairy farming. The areas are South cape, Central cape, Kwazulu natal, Western Cape, central eastern state and central Highveld and Free State. Dairy production has changed significantly as a result of technological advances especially in feeding forms, milking systems, biotechnology and housing. Dairy cows seemingly reducing as a result of decreasing dairy farms (Metcalfe, 2014). This is also happening in South Africa and can be better showcased by a significant decreased by 31% from 5347 to 3727 in 2001 and 2007 respectively. The number of dairy cows significantly dropped from 53200 to

515000 a decline of 3%. But the average number of dairy cows per herd doubled in the same time frame with milk production increasing from 3840 to 4590 kg per cow (A. Rosati, 2004). As a result of increasing return to scale on investment; housing and milking facilities, herd size normal tipple or double an expansion project to be rewarding. South Africa milk production sector are practice by commercial producers and small and medium scale farmers. While commercial producers avail their milk to processors, small and medium dairy farmers avail their milk to final consumers and perhaps surplus to the processors is supported by (Assessment, 1986). Besides purchasing milk for processing, commercial producers import concentrates and produce dairy products for primarily for exports, retailers and wholesalers.

Kenya is the leading milk producer in Eastern Africa and produces an estimated 4 to 5 billion litres of milk annually from a herd of about 4 million dairy cows much of this milk is produced by smallholder dairy farmers who account for 80% of the national milk production (Backlund, 2009). Small scale dairy production systems range from stall-fed cut-and-carry systems, supplemented with commercial concentrate, to free grazing on unimproved natural pastures in the more marginal areas. Upgraded (crossbred) dairy cow breeds are kept under the zero grazing system or under the semi-zero-grazing systems (Halberg, 2006). The production systems are influenced by the agro climatic characteristics of the area, land productivity potential and prevalence of animal diseases.

In Cherang'any Sub County, dairy farming is considered a reliable and stable source of income that can be managed by both small scale and large scale farmers. Majority of the dairy farmers in Cherang'any are yet to consider the practice as a business entity. Both farmers in small scale and large scale practices are not utilizing the potential in dairy farming to achieve maximum profits that can transform their lives (Knechtges, 2011) Dairy farmers faces diverse

challenges ranging from lack of proper management skills of rearing dairy cows, proper feeding procedures, poor infrastructure, high cost of dairy feed meals and lack of stable for their milk.

Many of the dairy farmers embrace paddocking rearing and a few have partial zero grazing which do not guarantee the dairy animal sufficient food to enable it produce to its full milk potential a maximum of 15 to 25 litres of milk per day (Backlund, 2009). The area has potential of leading in milk production but many challenges that faces the dairy farmers has led to poor milk production and is estimated to be one third of what is projected. The parastatal that was mandated to research on quality breeds failed to avail high productive and disease resistant. While the breeds present at ADC are expensive and the bureaucracy involved purchasing a cow or heifer is discouraging hence farmers opt to go for their locally bred animals (Moran, Business Management for Tropical Dairy Farmers, 2009).

1.2 Statement of a problem

Dairy farming is a crucial sector in Kenyan economy. Over the years Kenyan population has steadily increased in rural and urban setups. The latest estimates put Kenyan population at the mark of 42 million. High population provides a favorable market for milk and thus triggers corresponding milk production. However, there has been unsteady milk production in Cherang'any Sub County over the last 5 years (Padgham, 2006). Cherang'any predominantly practices mixed farming; maize farming and small scale dairy farming. As from 2012, maize prices have since dropped while milk price either drop or stagnate, making it interesting to find out the pattern with which they will adopt. It is on these frequent changing patterns on dairy production that the study sought to assess the factors influencing dairy production on small scale dairy farmer according to (Landsburg, 2013).

1.3 Purpose of the study

The purpose of the study was to assess factors influencing dairy farming of small scale farmers in Cherang'any Sub County, Trans-Nzoia County, Kenya**.**

1.4 Objectives

1 To examine the extent to which Technology influenced small scale dairy farming in Cherang'any Sub County

2 To establish how dairy funding influenced small scale dairy farming in Cherang'any Sub County

3 To find out how changing weather patterns influenced small scale dairy farming in Cherang'any Sub County

4 To investigate how farmer training levels influenced small scale dairy farming among small scale dairy farmers in Cherang'any Sub County

1.5 Research Questions

The study was guided by the following questions

1 How does Technology influence small scale dairy farming in Cherang'any Sub County?

2 How do dairy funding influence small scale farming in Cherang'any Sub County?

3 How do changing weather patterns influence small scale dairy farming in Cherang'any Sub County?

4 How levels of farmer training do influences dairy farming among the small scale dairy farmers in Cherang'any Sub County?

1.6 Significance of the study

Findings from the study were of importance to the government, small scale dairy farmers in Kenya, Dairy Board of Kenya, donors and other relevant stallholders. Findings from this research may be used as a benchmark for not only small scale dairy farming but also other projects within and without the Sub County. Project finding can be used for future references; forms basis of decision making. It may also be useful to donors, government and interested parties in provision of education, financial, insurance and technological support for better utility of the available resource (Byrne, 2002). The Research Assistants benefited by using recommendation as sources of their topics.

1.7 Delimitation of the Study

The study was carried out in Cherang'any Sub County (Creswell, 2013). The study covered small scale dairy farmers, a key respondent and research tools were questionnaires and interview schedule. The study focused on the factors influencing dairy farming sustainability on small scale farming in Cherang'any Sub County. The study was done between the month of April and June 2015 because during this period the region was expected to experience intense rainfall.

1.8 Limitation

Due to education level disparities and the general ignorance, some respondent declined to fill the questionnaire which led to more time allocation for explanation of importance of the study to them. This affected the researcher's budget as more time was needed to exhaust the questionnaire. The study was carried out on small scale dairy farmers in Cherang'any Sub County. Research Assistants notified the respondents that information given was kept confidential and was used for the purposes of the study (Landsburg, 2013).

1.9 Assumptions of the study

The study assumed that: Sustainability of Small scale dairy farming was dependant variable of the study. All the respondents were knowledgeable enough to understand what is required of them on the factor influencing dairy production among small scale dairy farmers (Byrne, 2002).

1.10 Definition of significant terms

Factor is a constituent or element that brings about certain effects or results, or indicates a specific multiple, number, or quantity.

Dairy farming is a class of agriculture for long-term production of milk, which is processed (either on the farm or at a dairy plant, either of which may be called a dairy) for eventual sale of a dairy product.

Small scale it means limited or average and means in this study, a farmer practices dairy farming with a small number of dairy cows

Technology is the collection of techniques, methods or processes used in the production of milk. Technology is embedded in machines, computers, devices and factories, which can be operated by individuals without detailed knowledge of the workings of such things.

Social demographic factors these are social factors of the dairy farmers like age, marital status, sex, Education level, and experience in dairy farming that in one way or the other influence dairy productivity

Sustainability of small scale dairy farming means the ability of the small scale dairy project to run itself after the realization of the project.

Dairy funding is the initial capital needed for the purposes of project realization

Farmer Training means the skills and knowledge necessary to initiate and manage small scale dairy farming

1.11 Organization of the study

The study included five chapters:

Chapter one: composed of background of the study, statement of the study, research objectives, and significance of the study, delimitations and limitation. Chapter two: dealt with theoretical reviews. Past studies gives rich knowledge for better approach of a study in hand. Chapter three: gave insights on what research tool the researcher used, study area, target population, sample size, research instrument to be used, validity and reliability of research instruments, data collection procedures, definitions of variables and ethical issues while conducting the study. Chapter four; gives results of the data analyzed while chapter five records summary, conclusions and recommendations

CHAPTER TWO

LITERATURE REVIEW

2.2 Introduction

This chapter reviews related literature on factors influencing sustainable small scale dairy farming in as written by other scholars. The theoretical and conceptual frameworks also presents research gaps.

2.21 Technological influences on small scale dairy farming

Dairy operations today are characterized by narrower profit margins than in the past largely because of reduced governmental involvement in regulating agricultural commodity prices. According to (Robinson, 2012), small changes in production or efficiency can have a major impact on profitability. The resulting competition growth has intensified the drive for efficiency resulting in increased emphasis on business and financial management. Furthermore, the decision making landscape for a dairy manager has changed dramatically with increased emphasis on consumer protection, continuous quality assurance, natural foods, pathogen-free food, reduction of the use of medical treatments, and increased concern for the care of animals (Robinson, 2012).

Artificial Insemination (AI) is the second-most common practice of breeding livestock--well; it's the only alternative to breeding livestock next to natural breeding using a male over females. Artificial insemination (AI) is one of the most effective tools available to cattle producers to improve productivity and profitability of their cattle operation. Artificial insemination has been commercially available for more than 65 years and utilized very effectively in the dairy industry. However, it is underutilized in the U.S. beef herds. As a point of comparison, about 66 percent of the nation's dairy cows are bred AI, and the use of AI by

commercial swine producers is currently 70-75 percent. AI is, however, much more common in dairy production than in beef production, though AI is gaining ground in beef breeding herds due to the increased access and marketing of superior and favorable proven sires (Books, 2010).

Knowing how to AI cattle are important in order to achieve a high success rate in cattle breeding herds where owning a herd bull is The quantity of milk (yield) produced in a year by an animal varies enormously according to breed, feed and management practices (Macaskill, 2010). The world average of 2,300 kg/year Per cow is somewhat meaningless because it is influenced heavily by the large numbers of poor-yielding animals in less developed countries across the globe. In many developed dairying countries, yields are typically 4,000–5,000 kg/head and exceptionally reach 6,000–8,000kg/head particular intensively managed Enterprises. In such systems, cows will be selected on the basis of yield and the calving. The world milk production after stagnating in 2009 rebounded in 2010 and is expected to grow initially in excess of 2% annually for the next three years, causing prices to decline. As prices adjust downward, the growth in milk production after 2013 is expected to be less vigorous (Books, 2010).

Fresh raw milk is cooled to 40C to extend its shelf-life (freshness). At this temperature, the activity of enzymes, the growth of microorganisms and metabolic processes are all slowed down. As a result, prolonged holding of chilled milk is bound to cause significant deteriorative alterations in keeping quality of milk. In addition, cooling causes a considerable dissociation of b-casein, calcium and phosphate ions and proteases from the casein micelles.

Chemical and biochemical processes are considerably slowed down by cooling. However, milk, which has been stored, sometime has a bitter off-flavor. Enzymes and microorganisms can cause chemical changes which are accompanied by a lower pH value and

change in nitrogen-containing compounds. Psychrophilic microorganisms cause proteolysis of casein and, together with enzymes, also that of albumin. Protein breakdown products (polypeptides) are formed. Certain bacteria are responsible for the hydrolysis of fats causing rancid flavor development. Several enzymes such as oxidizer, catalase and reductase are active for a long time, even at 0° C. Hence, if the time between milk reception and processing is 2 to 3 days, the storage temperature should be kept between 2° C to 5° C for minimum effect on keeping quality of milk Cherang'any dairies, Brookside purchased milk from famers at a fair price (Backlund, 2009).

Milk cooling plant eliminate souring/curdling of milk because of cooling takes at the collection centre, adulteration of milk and spillage from cans can be eliminated during transport, transportation cost of milk can be brought down by regulating transportation to the main dairy either on alternative days or once in a day, saving of initial investment on purchase of cans and subsequent maintenance cost (Repairs, cleaning etc.) of those cans. Also improved quality of milk can be supplied to the main dairy plant for quality products processing hence ready for both domestic and export market (Knechtges, 2011).

Extension services, which provide support for the dairy farmers geared towards improving management, feeding, fertility and veterinary care is crucial to sustainable small scale dairy farming. Many of these extension service providers offer artificial Insemination services that aim to further improving milk yields with pedigree dairy cattle. Genetics, artificial insemination services are expected to grow in the future, as the government of India continues to develop protocols for imported genetics products (A.M. Roussel, 2006).

2.22 Influence of Dairy Funding on small scale dairy farming

The Kenyan government over the past decade has recognized the challenges facing the dairy industry. With the support from the private sector and donor agencies, various interventions have been spearheaded with the intention of analyzing the factors constraining the competitiveness of smallholder dairy farmers and policies and institutions affecting the dairy sub-sector, among others. According to (Clark, 1998) (Assessment, 1986)these interventions include: the Smallholder Dairy Project jointly implemented by the Ministry of Livestock Development (MoLD), the Kenya Agricultural Research Institute (KARI) and the International Livestock Research Institute (ILRI), with primary funding from the UK Department. IFAD funded Smallholder Dairy Commercialization Program me (SDCP) which was implemented by the Ministry of Livestock Development; East African Dairy Development (EADD) Program funded by the Bill and Melinda Gates Foundation and being implemented by the Heifer Project International, Techno Serve and ILRI; Heifer International dairy project in parts of the Rift Valley and Central Province through gifts of income-producing animals and training; and, the Kenya Dairy Project (KDP) funded by private donors and implemented by Techno serve in Nyala in Nyandarua North, Sabatia Dairy Farmers Cooperative in Eldama Ravine, Ndumberi Dairy Farmers in Kiambu and Muki Dairy in North Kinangop (Backlund, 2009).

The government of Kenya has in addition since 2003 put in place several other measures to revive the dairy by encouraging development partners and private sector to mobilize more resources to the industry; monitoring of dairy imports; and improved coordination and collaborative ventures among stakeholders that created synergies and better use of resources. These interventions resulted to strengthened producer organizations which were able to collectively market dairy produce and access extension services, among others things. Consequently, production and marketing of dairy produce increased with the annual milk

production rising from 2.8 billion litres in 2002 to 4 billion litres in 2009 and intakes by processors rising from 143.5 million litres in 2002 to 407 million in 2009, representing a 180% increase (Kenya Dairy Board website, accessed in June 2010). The review of import and export procedures for dairy produce as a legislative measure on the other hand led to diminished imports and a sharp rise in exports. The quantity of milk and milk products exported rose from 0.1 million Kg in 2001 to 10.9 million Kg in 2008, but due to, export figures dropped to 5 million Kg in 2009. Imports on the other hand declined from 5.2 million Kg in 2001 to 3.4 million Kg in the same period (Kenya Dairy Board website, accessed in June 2010). Disturbances in early 2008 arising from the post election violence however disrupted dairying activities in most parts of the Rift Valley (which is a major milk producing area) leading to a drop in milk production and marketed volume in the affected areas (Assessment, 1986).

Moreover, the country faced a severe drought in 2009 causing scarcity of animal feed and water which led to a further drop in milk production. Due to this shortage, the local dairy processing plants were unable to sustain the previously acquired export markets. On the contrary, with the onset of the rains in late 2009 (October/November), there was an upsurge in milk production leading to increased milk intakes by the formal sector. This sudden increase in production overstretched the handling capacities of the major milk processors. Daily intakes by processors rose sharply from an average of 0.8 million litres in May 2009 to 1.7 million litres by January 2010 (Kenya Dairy Board website, June 2010). Consequently, the government of Kenya proposed various short, medium and long term interventions to deal with increased milk production in future. The short term interventions included availing a grant of Ksh 300 million to the Kenya Dairy Board (KDB) to buy the excess processed milk from the processors. The medium term interventions included financial support to the New KCC to refurbish and

commission a UHT plant in Eldoret and a condensed milk plant in Naivasha, as well as procure, install and commission an additional milk drier (Alexandra Lange, 2012). In the long term, the government plans to incorporate milk powder into the National Food Strategic Reserve to 9 improve uptake of excess milk which can then be offloaded into the market during times of scarcity; expand dairy markets away from the traditional markets; enhance quality production of milk and milk products; upscale the existing school milk program; and create a Dairy Development Fund to provide resources for necessary interventions in the dairy industry In Kenya, there are both formal and informal credit sectors, but there is a large interest rate difference (Books, 2010).

The formal financial sector refers to the financial systems that operate under direct supervision by the Central Bank. These are made up of commercial banks, certain specialized government banks, and non-bank financial institutions, such as investment houses, insurance companies, financing companies and security markets. The informal sector includes friends, relatives, credit co operatives, rotating savings and credit associations and an array of landlords, millers, traders and other agents who use financial dealings as an important financial subsidiary (Nordic Ministerad, Fuhrrer, & Gregory, 2014). The formal sector mainly deals with large scale enterprises and well-off clientele which can satisfy their stringent loan conditions, while the informal sector provides savings and credit facilities for small farmers in rural areas and for lower income households and small scale enterprises in urban areas (Dairy Farmers of Britain: Fifth Report of Session 2009-10, Vol. 2: Oral and Written Evidence, Volume 2, 2010).

Credit access is not only affected by interest rate but by all characteristics of credit. This study attempts to find out how all credit factors in totality affect smallholder dairy farmers access to credit. Before market liberalization in Kenya, formal agricultural credit was provided at

subsidized rates through the Agricultural Finance Corporation (AFC). However, this parastatal experienced difficulties in recovering loan advances and had to stop lending at subsidized rates. Even then AFC lending rates have remained lower than commercial rates and are more stable. Although banks are legally required to lend between 17% and 20% of their loan portfolio to the agriculture sector, the local banking system has been conservative in lending to agriculture. (Backlund, 2009).

Despite the segmentations, it is not well established how the smallholder farmers make their choice of the credit source and the factors that influence their choice decision. This study focus was on the factors that influence smallholder dairy farmers' choice of agricultural credit sources, based on farmer's characteristics and the agricultural credit attributes. The choice is thus assumed to be based on a set of attributes. According to (Kardasian, 2012), credit sources were reclassified into five distinct lending models based n guidelines described. Various rural financial services in Kenya are classified into five models, namely: Community owned rural finance, Donor led rural finance, and Government led rural finance, Managed SACCO and Private commercial banks (Kardasian, 2012).

In Kenya , in order for an individual to score a loan, collateral are essential and deemed secure while it can be sold in case of default or continuous disrespect of repayment agreement. Commercial banks require that a loaned be having land and property tittles, lock book, infrastructure and books of account. Small scale dairy farmers in Cherang'any too face such challenges. While it is possible for small holder dairy farmer to access loan, the package is significantly small making it harder to experience substantial profit margin that can be ploughed back or reinvested. In essence, such restrictions meant to weed out poor small dairy holders and accommodate the well off farmers (Alexandra Lange, 2012).

2.23 Changing weather condition influences sustainability of small scale dairy farming

(Kardasian, 2012)Climate change, however, is expected to negatively impact the industry in the future. Climatic events such as rising temperatures and atmospheric carbon dioxide concentrations will change the prices of dairy farms' inputs, including feed, fuel, and electricity. Higher temperatures additionally cause heat stress for dairy cows, leading to a reduction in milk yields. While climate change may negatively affect dairy farms, it also helps dairy farmers plan how to mitigate by calculating impacts specific to their farms, allowing them to understand the impacts of climate change and plan for the future (A.M. Roussel, 2006). Feed comprises almost 50% of a dairy farmer's budget. While climate change is expected to decrease the yield of corn, causing corn prices to increase, alfalfa yields are expected to show a moderate improvement (Backlund, 2009). As a result, the price of alfalfa was modeled as a slight drop in price. Additionally, climate change is expected to increase fuel and electricity costs.. (Gregory J. Peter, 2014)

The effect of climate and the environment on animals is complex. For example environments which is similar air temperatures and humidity but differ in wind speed will have different effects on the animal in terms of its ability to maintain body temperature. Measurement of this variable and /or the formulation of an index, tell us nothing about the state of the animal. For this reason, the proffered strategy is to measure the state of the animal, its body temperature, respiration rate and production, and relate this to the conditions that prevail. Measurement of the environment al variable to predict what the likely effects might be on an animal, without prior knowledge of how a particular genotype responds to such environments, can be very misleading. The animal is the best integrator of all the climate and environment variables and it is through direct measurement on the animal that the effect of the environment can be most accurately judged (Assessment, 1986).

There a number of a number of in the environment which must be overcome if an animal is to reproduce and be sufficient and highly productive. Major environmental constraints to high productivity in the tropics are ambient temperature and humidity, annual and seasonal availability of feeds resources, internal and external parasites and a variety of bacterial and viral infections (Backlund, 2009). The effect of climate can be minimized ether through the use of resistant genotypes or through managerial intervention to the animal's environment. In most cases a combination of these two basic strategies used of these constraints, the most difficult to combat are those associated with high ambient temperature and humidity encountered in most tropical areas. This is because of the genetic necessary when attempts are made to combine high milk production potential with high heat (Backlund, 2009).

2.24 Farmers Training Influences sustainability of Small Scale Dairy Farming

Studies have shown that farmer technology trait, farm trait, economic, characteristics and institutional factors are common and determines farmers decision to either adopt are abandon new agricultural technology (Macaskill, 2010). Education increase propels information flow and exposes a wide view of knowledge to farmer's thus promoting adoption of better technologies. United States for instance uses trained extension officers to provide various services to farmers. Services ranges from advisory services transfer of technology and human capacity building.

In Nigeria for instance, accessing agriculture services from the government is huge problem. Related technical practices that small scale dairy farmers lack are the type of feed essential for dairy cows, breeding, parasites control, serving and calving, milking and packaging.

In Kenya, Dairy farmers have platforms where education can be accessed. Agricultural shows, Agricultural development cooperation, Field days are just platforms where dairy farmers can interact, ask questions and receive incites from fellow dairy farmer on particular a show case

on his/her dairy breed. In such in reactive sessions, extension officers are able to educate and disseminate information on parasite prevention, first aid kit, breeding and serving dairy cattle. Farmers are too linked up with agents who willfully commit to find market farmers milk (Metcalfe, 2014).

2.25 Theoretical Framework

Theory of population

This study was guided by population theory. Malthus was an English clergyman who spent much time about economic problems. According to (Books, 2010) unlike most classical economists, Malthus saw the possibility that depression could exist and argued strongly. The essential was presented in an essay and was recorded that population grows geometrically while food supply is arithmetic. His work went through many editions but never again was sustainability revised as far as the selection here is concern (Books, 2010).

2.1 Conceptual Framework

Independent variables Dependant variable

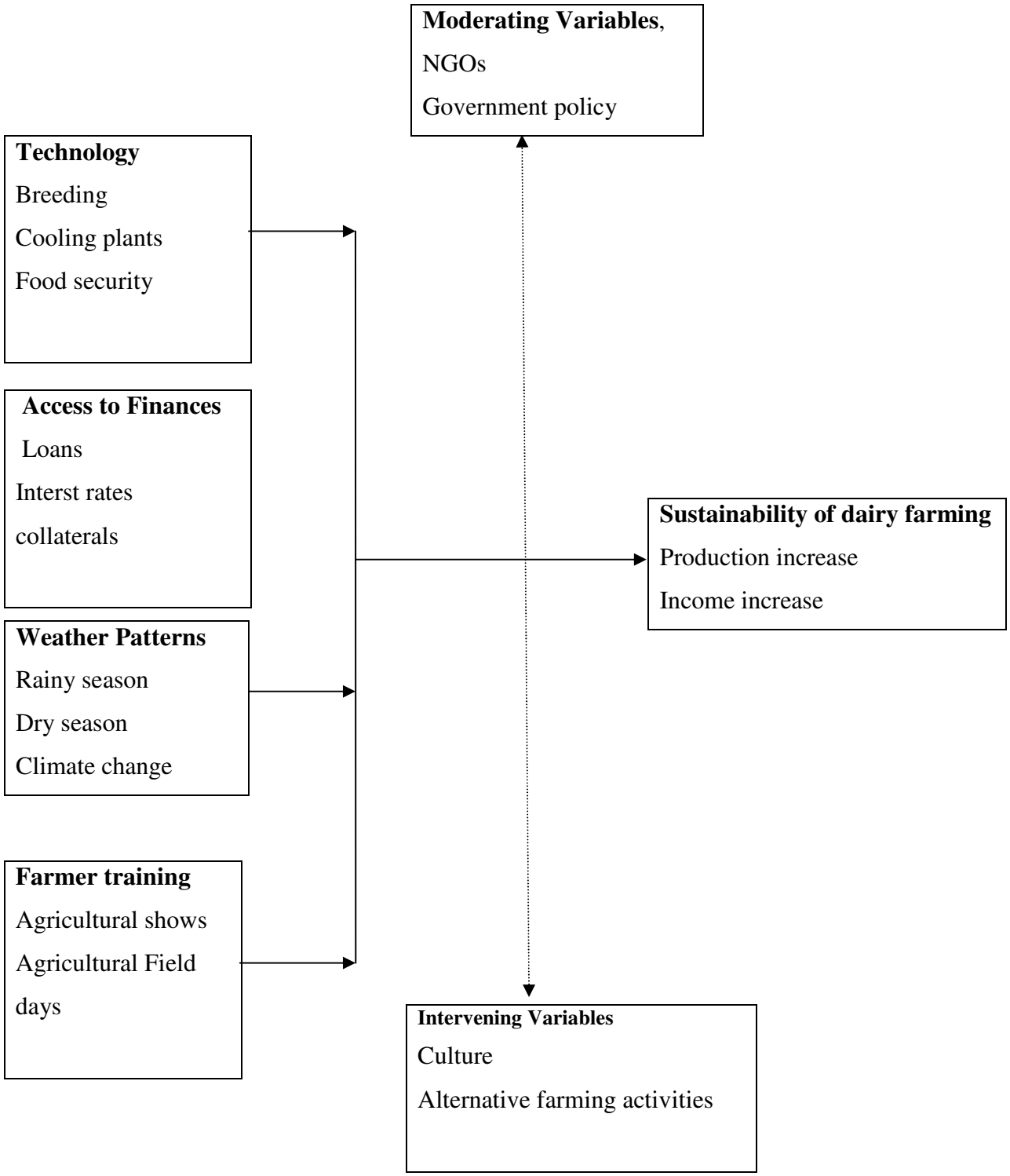

Figure 2.1 Conceptual Framework

The above conceptual framework expounds key factors that influence sustainability of the small scale dairy farming. In order to achieve the full potential of small scale farming, the (Backlund, 2009)above factors play a pivotal role and need to be looked at. Up to date technology adoption, enough and ease to fund, Climate and climatic changes and education levels of small scale farmers are the key independent variables that influence sustainable dairy farming in Cherang'any Sub County. Intervening variables in this case that influenced small scale dairy farming were culture and alternate farming activities while the moderating variables were NGOs and government policies in relations to small scale dairy farming. This study capitalized on independent variables and focused its influence positively or negatively on dependant variable: sustainable small scale dairy farming (Assessment, 1986).

CHAPTER THREE

RESEACH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter detailed the methods of data collection, analysis and presentation used in the study. It focused on Research design, Target population, Sampling procedure, Methods of data collection, Validity of the instruments used, Reliability of the research findings and data analysis techniques used in the study.

3.2 Research Design

The study used descriptive research design. The descriptive research design was appropriate to the study because it allowed collection of in depth information from respondents while using research instrument as interview schedule and questionnaires. This provided detailed information on Small Scale Dairy farming in Cherang'any Sub County and how to improve the enterprise. Descriptive surveys were useful in preliminary and exploratory studies in the sense that it allowed in depth information gathering, presentation and direct quenching of a clarification (Wilks, 2011).

3.3 Target population

The target population for this study was 480 small scale dairy farmers from Cherang'any division and Kaplamai division (Liu, 2008). The Key informant was the District Livestock officer while the participating respondents formed unit of analysis of the study.

Table 3.1 Target population

Target respondents	**Number**
Division	**NO. of small scale dairy farmers & officials**
Kaplamai	269
Cherang'any	210
DLO	1
Total	480

3.4 Sampling Procedure

The study sampled 144 small scale dairy farmers and a key informant for the survey research using a probability stratified sampling method and purposive sampling accordingly (Belle, 2011). Small scale dairy farmers were divided into two strata based on the division they belonged. Random sampling was used to come up with the sample size. The sample frame was based on the advice of Kombo, Tromp, and Somekh the proponents of rule of thumb where the sample size in descriptive research should be more than30% of the target population. The Key informant was selected using purposive sampling (Gregory J. Peter, 2014).

Table 3.2 Sample Frame

Target Population	**Number**	**Sample size**	**Sampling Procedure**
Cherang'any Division	269	80	Stratified random sampling
Kaplamai Division	210	63	Stratified random sampling
DLO	1	1	Purposive
Total	**480**	**144**	

3.5 Data collection Methods

The Data collected was quantitative and qualitative and was collected through questionnaires and scheduled interview. Both secondary and primary data was used for secondary sourcing. Useful material from library, journals, internet, government's document, projects records and internet was used. However, data from the field formed the major portion of data collected (Macaskill, 2010) Questionnaires were used for both Small scale dairy farmers and the key informant because it collected in-depth information (C. Eugene Conrad, 1973).

3.51 Piloting

The Pilot study was conducted in Moiben division to test whether the questionnaire was well understood by the respondents and if it offered the best data. The Pilot study used test-retest method to check the reliability, clarity, relevance, language used and suitability of the questions on the instrument designed (Clark, 1998).

3.52 Validity

Validity entails the soundness of the inferences based on scores and whether the instrument measure what is supposed to measure. Validity test was measured using content vanity method. Research instruments were forwarded to the Lecturers in the school of continuing and Distance education to check on whether the items in the research instrument served the intended purpose (Clark, 1998).

3.53 Reliability

Reliability refers to the ability of a test to consistently yield the same results when measurement is repeated on the same informant under the same condition. Reliability indicates the stability and consistently with which the data collection instrument measures the concept under study. Reliability of the questionnaire was determined through test-retest method. Mini study in the area on 5 small scale dairy farmers was conducted. After a week the mini study was

repeated and findings drawn using Cranach alpha correlation coefficient calculated using SPSS package. The reliability coefficient was >0.6, thus the instrument was reliable (Clark, 1998).

3.6 Data Collection Procedure

The initial step involved getting a permit from National Commission for Science and Technology and Innovation (NACOSTI) (Buchanan, 2004). This was done two weeks before the actual study. The study comprised of a scheduled interview and structured questionnaires was administered to 144 respondents. The research assistant administered the questioners on a one on one technique in order to reduce non-response rate (Landsburg, 2013).

3.7 Data Analysis and Presentation

Correlation was used in this study to analyze data. Correlation analysis is a statistical process for estimating the relationship between two variables or more. Many techniques were used to model and analyze several variables, when the focus is on the relationship between a dependant and one or more independent variable 'of high values of one with the values of the other from +1 to -1. Values close to +1 indicate a high-degree of positive correlation, and values close to -1 indicate a high degree of negative correlation. Values close to zero indicate poor correlation of either kind, and 0 indicates no correlation at all. While correlation is useful in discover variables, it does not prove or disprove any cause-and-effect (Michael Berthold, 2003).

3.8 Operational definition of variables

In order to achieve the studies objectives, the researcher investigated factors influencing sustainability of small scale dairy farmers in Cherang'any Sub County; objectives of the study being: Influence of technology, dairy funding, and change in weather patterns and farmers level of training on dairy farming. Specific questions were asked for every objective which enabled sequential gathering of information (Assessment, 1986).

3.9 Ethical Consideration

Ethical issues are important in any research and largely address the principle of morality of the study. With the aim of maintaining privacy and dignity of every participating individual, the respondents agreed to comply with research principles. Respondents were briefed on the aims of the study, benefits, potential hazards and methods. They were requested to personally or commercially provide information about themselves (Richard Cash, 2009). He or she was at liberty to accept or decline participating in the study. Every participating research unit was notified with consent form and no inducement was given to influence their acceptance. The respondent's identities were coded and kept confidential (Richard Cash, 2009). No final draft or any communication on specific individual information or identity was revealed during and after the conclusion of the study unless by consent of participating individual (Kimmel, 2009)

3.3 Operational Definition of Variables

Objective	Indicators	Measurement scale	Tools of analysis
To examine influence of technology and human capacity on small scale dairy farming	No of farmers with technical expertise I dairy and levels of technical how	Ordinal Nominal	Frequency distribution tables, mean, Standard deviation and correlation
To establish influence of Dairy funding influence small scale dairy farming	No of farmers with loans Financial education, collateral, loans, informal borrowing and interest rates	Ordinal Nominal	Frequency distribution table mean, Standard deviation and correlation s
To find out how Changing weather pattern influence small scale dairy farming	Dryness Wetness Global warming	Ordinal Nominal	Frequency distribution tables mean, Standard deviation and correlation
To find out how Farmer training influence their dairy farming	No. of small scale dairy farmers who have participated in dairy workshops, field days, agricultural shows and seminars	Ordinal Nominal	Frequency distribution tables mean, Standard deviation and correlation

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, INTERPRESTATION AND DISCUSSION

This Chapter presents the results of the study on factors influencing sustainability of small scale dairy farming in Cherang'any sub county, Kenya. The data for this study was collected from agricultural small scale farmers from Cherang'any and Kaplamai Divisions and District Livestock Officer in the sub county.

4.1 Response rate

Table 4.1 indicate the response rate for the study that involved small scale dairy farmers from the two divisions and a key respondent

Table 4.1 response rate

Respondents	Sampled	Response	Percent
Cherang'any	80	68	85.00
Kaplamai	63	46	73.02
DLO	1	1	100
Total	144	115	

Observation from table 4.1 shows that the highest response to the questionnaire came from small scale famers from Kaplamai with (73.02%) followed by Cherang'any (85%).Key respondent responded to the interview.

Table 4.2 Small Scale dairy Farmers Background

	Category	Frequency	Percent
Age	20-30	9	7.8
	31-40	44	38.3
	41-50	31	27.0
	51-60	23	20.0
	61- Above	8	7.0
Education	Primary	53	46.1
	Secondary	34	29.6
	Tertiary	23	20.0
	University	5	4.3
Gender	Male	70	60.9
	Female	45	39.1
	Total	**115**	**100.0**

The study sought to know the age brackets of the farmers who participate in small scale dairy projects. Table 4.2 shows that 9 (7.8%) are between 20-30 years, 44 (38.3%) are between 31-40 years. 31(27%), 23(20%), 8(7%) were 41-50, 51-6, and 61 above respectively.

Educational level of respondents.

The study sought to understand what levels of education involve in small scale dairy farming project. The respondents were asked to indicate the highest level of academics they attained. The researcher categorized levels of education into; primary, secondary, tertiary and university. From the responses in table 4.2 shows that 53(46.1%), 34(29.6%), 23(20%), 5(4.3%) attained primary, secondary, Tertiary and university levels of education respectively.

The researcher also sought to understand how gender is represented in small scale dairy farming project and from the responses in table 4.2, 70(60.9%) were male and 45(39.1%) were female.

4.1.2 Respondent on the tenure/span practicing small scale dairy farming

In this section, the researcher looks at the demographic of small scale dairy farmers through the span (years) in which they have been practicing the project. The farms were asked to give the period of engagement in dairy farming. Their respondents are presented in table 4.3

Table 4.3 Farmers tenure in engagement in small scale dairy farming

Tenure	Frequency	Percent
0-1	10	8.7
2-5	27	23.5
6-10	32	27.8
11-15	40	34.8
16- Above	6	5.2
Total	115	100.0

Results shows 10(8.7%) of the respondent said they have practiced small scale dairy farming for a period between 0-1 year. 27(23.5%), 32(27.8%), 40(34.8%0 and 6(5.2%) said they have been practicing the project for between 2-5, 6-10, and 16 years and above respectively. The researcher further asked respondents on the level of the output daily. The results of the analysis are in Table 4.4

Table 4.4 sustainability of small scale dairy farming in Cherang'any sub county

Output	Frequency	Percent
1-5	5	4.3
5-10	38	33.0
10-15	33	28.7
15-20	18	15.7
20- Above	21	18.3
Total	115	100.0

The results shows 5(4.3%), 38(33%), 33(28.7%), 18(15.7%), and 21(18.3%) produce milk between 1-5, 6-10, 11-15, 16-20, 21-above lit res of milk daily. The researcher sought to know portion of land dedicated for small scale dairy farming and the results tabulated in Table 4.5

Table 4.5 Farmers size of land dedicated to small scale dairy farming

Portion	Frequency	Percent
1 acre- Below	31	27.0
1.1-2	42	36.5
2.1-3	15	13.0
3.1-5	5	4.3
5.1- Above	22	19.1
Total	115	100.0

The results shows that 31(27%) said they have dedicated 1 and below acres of land for the project, 42(36.5%) dedicated between 1.1 and 2 acres of land, 15(13%) said 2.1 and 3 acres

are under the project, 5(4.3%) confirm 3.1 and 5 acres of land under the project and 22(19.1%) affirmed dedication of 5.1 and above acres of land to have been allocated for the project.

4.2 Farmers Technological usage and sustainability of small scale dairy farming in Cherang'any Sub County.

Technical know-how in dairy farming is crucial as this can be translated into the productions. Basic skill on Nutrition, breeding, milk handling and farming practice are essential in realization of dairy farming and therefore the study sought to know whether the use of artificial insemination, presents of milk cooling plant, availability of extension officers and animal feed influence sustainability of project. With the use of likert scale, farmers were asked whether the indicators of technology influence sustainability of their dairy enterprise. The computed descriptive statistics are illustrated in Table 4.6

Table 4.6 Descriptive statistics on Technology and its influence on sustainability of small dairy farming

Technological influence on milk production	N	Mean	Std. Deviation
Inaccessibility to artificial insemination influence breeding hence milk production	115	4.4522	.93886
Presence of cooling plants reduces milk from going bad boosting the project	115	4.2609	.68935
Lack of extension officers affects milk production	115	3.8522	1.03656
Food technology helps ensure constant supply of food	115	3.5826	1.23532
Valid N (listwise)	**115**		

Results shows that farmers agree (MN=4.45 and SD=0.94) that inaccessibility to artificial insemination influence milk production among small scale famers. Farmers attribute to poor breeding and inbreeding as major inhibitor to adequate milk production. Furthermore, most farmers agree that presents of milk cooling plant helps farmers to invest more and produce more as milk will not be go bad before reaching the market. Farmers too agree (MN=3.85 and SD=1.69) and (MN=3.58 and SD=1.24) that lack of extension officers and lack of nutrition know how influence milk productions among the small scale farmers. The study deducts that the relevant the NGOs and government have done little to boost milk farming but Cherang'any have benefited from private investors who by and large saw comparative advantage and put up cooling plant and provide market for their milk.

Karl Pearson product (2-tailed) moment correlation was computed and result presented in Table 4.7

Table 4.7 Correlation on farmers dairy technology and sustainability of small scale dairy farming

		Farmers Technological know-how	Sustainability of small scale dairy farming
Farmers Technological know-how	Pearson Correlation	1	.092
	Sig. (2-tailed)		.329
	N	115	115
Sustainability of small scale dairy farming	Pearson Correlation	.092	1
	Sig. (2-tailed)	.329	
	N	115	115

The results shows that there exist a positive relationship (r=0.092 and p=0.329) between the farmers technological know-how and sustainability of small scale dairy farming in Cherang'any sub county. This is to mean that in as much as the majority of the farmers have basic education on breeding, presence of cooling plant, food technology and extension officers, there is die need for continuous provision for technical services and programmers in order to attain sustainability.

4.3 Dairy Funding influence Sustainability of small scale dairy farming

The second objective is was to investigate how Financial education, Collaterals, interest rates and Informal organization influence Sustainability of small scale dairy farming in Cherang'any Sub County . Financial institutions amended their policies on loan qualification severally to arrest frequent defaulters and minimize losses. Financial institutions went ahead and request a potential borrower to showcase previous dairy records, bank statement, and title deed and log books as collateral. It was important to understand how small scale farmer got start-up capital since interest rates in the financial institutions are high and unaffordable for small holder dairy farmer and understand if informal groups had a hand in their success. With the use of likert scale, famers were asked to indicate whether insufficient dairy funding, expensive loans, collaterals and informal organization influenced sustainability of their project. The results were analysed and tabulated in Table 4.8

Table 4.8 Descriptive Statistics on dairy funding influencing sustainability small scale dairy farming

	N	Mean	Std. Deviation
Insufficient dairy funding resulted to low education to farmers hence low milk production	115	3.8435	1.12851
Collateral s needed by financial institutions from a borrower inhibit loan borrowing hence low milk production	115	3.7130	1.08228
High cost of capital in financial institution inhibit small scale dairy investment hence low milk production	115	3.6348	1.17227
Most small scale dairy farmer borrow from informal groups to boost milk output	115	2.4696	1.29318
Valid N (listwise)	115		

Results shows that respondents agreed (MN=3.8 and SD=1.1) that insufficient dairy funding has an adverse effect on sustainability of their small scale dairy projects. From statistic respondent agreed (MN=3.7 and SD=1.1) that collateral required by banks inhibit borrowing hence low input which resulted to low milk production. Most respondent also agreed(MN=3.6 and SD=1.2) that high cost of capital shy away small scale famers from borrowing loan as interest rates are way their means. However, majority disagreed (MN=24 and SD=1.3) that small scale farmers borrow from informal groups in the villages. Therefore implies that most farmers in Cherang'any resorts to raise initial capital and working capital by selling off their assets and

savings as oppose to taking a loan banks. The study went further to ascertain whether dairy funding influence sustainability of the project and the results tabulated in table 4.9

Table 4.9 Correlation on dairy funding influence on sustainability of small scale dairy farming

		Small Scale Dairy funding	Sustainability of small scale dairy
Small Scale Dairy Funding	Pearson Correlation	1	-.205*
	Sig. (2-tailed)		.028
	N	115	115
Sustainability of Small Scale Dairy farming	Pearson Correlation	-.205*	1
	Sig. (2-tailed)	.028	
	N	115	115

*. Correlation is significant at the 0.05 level (2-tailed).

The statistics show that there exist a negative (r=-0.205 and p=0.028) between dairy funding and sustainability of small scale farming in Cherang'any Sub county. This means that reduction of interest rates, reduction of collateral needed, will ease financial accessibility hence boosting dairy investment which will in turn improve milk production in Cherang'any Sub County.

4.3 Weather changing patterns influence sustainability of small scale dairy farming in Cherang'any Sub county.

Global warming has been the talk over the world and this is as a result of excessive emission to the atmosphere. The excessive green gases into the atmosphere form a blanket layer

hindering rays from sun from escaping into the space hence raising earth temperature. Temperature rise result to drought and famine, floods and unpredicted rain pattern. In this regard, it was important to study how weather influenced changing weather patterns influence sustainability of small scale dairy farming in Cherang'any Sub County.

Using likert scale, farmers were asked to respond to questions with the responds strongly agree (5), agree (4), unsure (3), Disagree (2), Strongly Disagree (1).The results of the analysis are presented in table 4.10

Table 4.10 Descriptive statistics on changing weather patterns on sustainability of small scale dairy farming

Responses	N	Mean	Std. Deviation
Inadequate rainfall and prolonged drought hamper milk production	115	4.5739	.74998
Unpredicted weather conditions inhibit marketing hence milk production	115	3.1130	1.39400
Warm temperature affect sustainability of milk production	115	3.6174	1.03942
Continuous wetness affect sustainability of milk production by small scale dairy farmers	115	3.9043	1.04272
Valid N (listwise)	115		

From the results majority of the respondents strongly agreed (MN=4.57and SD=0.75) that inadequate rainfall and drought affect sustainability of small scale farming. Most of the famers depend of rain fed grazing field for their dairy cows. Some of the respondents were unsure (MN=3.11and SD= 1.39) about whether unpredicted weather condition affect

sustainability of small scale dairy farming. Some of the small scale famer piped water into their farms and other practices zero grazing.

A few respondents agreed (MN=3.62 and SD=1.04) that warm temperatures influence sustainability of small scale dairy farming. Farmer's puts that regardless of changing of weather patterns, Temperature poses no threat and dairy cow produces milk regardless. Some respondents agreed (MN=3.9 and SD=1.04) that continuous wetness ensures grass thrives and thus help a farmer feed dairy cow hence sustainability of the small scale dairy farming.

To confirm the overall influence of weather changing pattern influence sustainability of small scale dairy farming in Cherang'any Sub County, a correlation analysis was computed and results tabulated in table 4.11

Table 4.11 Correlations on influence of Changing weather patterns on sustainability of small scale dairy farming

		Changing weather patterns	Sustainability of small scale dairy farming
Changing weather patterns	Pearson Correlation	1	.045
	Sig. (2-tailed)		.633
	N	115	115
Sustainability of small scale dairy farming	Pearson Correlation	.045	1
	Sig. (2-tailed)	.633	
	N	115	115

There exist a positive influence(r=.45 and p=.633) between changing weather patterns and sustainability of small scale dairy farming in Cherang'any Sub county. This shows that changes in weather pattern affect growth and availability of fodder feeds for dairy animal and

also water for drinking. Farmers and stakeholders need to dig boreholes, tap gravitational rivers for the beneficial of the dairy farmers. The use of silage and fast growing fodder feeds.

4.5 Famers training influence sustainability of the small scale dairy farming in Cherang'any sub county

Training remains crucial while practicing dairy farming. Basis training helps farmers to sensitive and keeps on check changes in their dairy cows and attends with speed therefore improving production of milk from their farms. Using likert scale(strongly agree, agree, unsure, disagree and strongly disagree) the farmers were asked whether lack of basic skill, insufficient education on food security, nutrition and knowledge on where to source funds influence sustainability of small scale dairy farming . Computed descriptive statistics are illustrated in table 4.12

Table 4.12 Descriptive Statistics on Framer training influence on sustainability of small scale dairy farming

	N	Mean	Std. Deviation
Lack of basic skill on breeding affect milk production	115	4.4087	.63378
Insufficient education on food security hamper milk production	115	4.2261	.80634
Low level of education on nutrition affect milk production among small scale dairy farmers	115	3.9652	.86785
Limited knowledge on dairy funding constraint Milk production	115	3.6696	1.06558
Valid N (listwise)	115	4.0674	0.84338

Overall statistics reveal that majority of the respondents agree (MN=4.0674 and SD=0.8434) that dairy funding is important for sustainability of small scale dairy funding. For instance most of the respondent agreed (MN=4.409 and SD=0.6338) that lack of basic dairy skills hamper sustainability of small scale dairy farming, respondent agreed (MN=4.226 and SD=0.806), (MN=3.965 and SD=0.8063), (MN=3.67 and SD=1.0656) that insufficient education food security, low level of dairy nutrition, and limited dairy funding knowledge respectively influence sustainability of small scale dairy farming.

To confirm the above findings, Karl Pearson correlation scores was computed dairy funding and sustainability of small scale dairy funding and the results tabulated in table 4.13

Table4.13 Correlations on influence of Farmer training on sustainability of small scale dairy farming

		Farmer Training	Sustainability of small scale dairy farming
Farmer Training	Pearson Correlation	1	.045
	Sig. (2-tailed)		.632
	N	115	115
Sustainability of small scale dairy farming	Pearson Correlation	.045	1
	Sig. (2-tailed)	.632	
	N	115	115

It is evident that there exist a positive influence (r=0.045 and p=0.632) between farmer training and sustainability of small scale dairy farming. This means that continuous training on food security, fund sourcing, nutrition value and breeding enables sustainability of small scale dairy farming.

Table 4.14 Matrix Correlations

		Technology	Dairy funding	Changing weather pattern	Farmer training	Sustainability of small scale dairy farming
Technology	Pearson Correlation	1	-.110	.132	.336**	.092
	Sig. (2-tailed)		.240	.160	.000	.329
	N	115	115	115	115	115
Dairy funding	Pearson Correlation	-.110	1	-.011	.096	-.205*
	Sig. (2-tailed)	.240		.903	.309	.028
	N	115	115	115	115	115
Changing weather pattern	Pearson Correlation	.132	-.011	1	.093	.045
	Sig. (2-tailed)	.160	.903		.324	.633
	N	115	115	115	115	115
Farmer training	Pearson Correlation	.336**	.096	.093	1	.045
	Sig. (2-tailed)	.000	.309	.324		.632
	N	115	115	115	115	115
Sustainability of small scale dairy farming	Pearson Correlation	.092	-.205*	.045	.045	1
	Sig. (2-tailed)	.329	.028	.633	.632	
	N	115	115	115	115	115

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Results show that Technology, Farmer training and changing weather pattern factors has positive effect on sustainability of small scale dairy farming while dairy funding factor has a negative effect on sustainability of small scale dairy farming in Cherang'any Sub County.

CHAPTER FIVE

SUMMARY OF FINDING, CONCULUTION AND RECOMMENDATIONS

Chapter five describes the summary, conclusions, suggestions and recommendations that enable further research on the factors influencing sustainability small scale dairy farming projects I Cherang'any Sub County.

5.1 Summary of the findings

The Research sought to understand the influence of technology, dairy funding, weather and farmer training factors on the sustainability of small scale dairy farming in Cherang'any Sub County. Background information showed that most of the famers practices are men as opposed to female Most of the farmers dedicate 1-2 acres of land for dairy farming. Regarding the tenure, most farmers have practiced small scale farming fall between 11-15 years. Results show that majority of the small scale dairy farmers lies between ages 31-40 years. Information was collected using administered questionnaires on 114 small scale dairy farmers from Cherang'any and Kaplamai Divisions and an interview to District livestock officer Data collected was analyzed and presented in the previous chapter.

From the background information, the study found out that most famers attained primary education and have basic education on dairy farming and with the assistance of research assistant they were able to understand fill the questionnaires.

In respect to the first objective of the study, famers have knowledge of the advanced technology but cannot afford to purchase but instead adopted simple technology ($r=0.092$ and $p=0.326$) in practicing their farming activities. The weak relationship suggest that there has to improve on technology

The second object of the study, research found out that Dairy funding has a negative effect(r= -0.205 and p=0.028) for instance a respondent that insufficient dairy funding affect the sustainability of small scale dairy farming. Farmers sort to either raise initial capital by selling own assets and fro savings.

On the third objective, the study found a strong positive influence (r=0.45 and P=0.633) between Changing weather patterns on sustainability of small scale dairy farming in Cherang'any Sub county. It was observed that unpredicted weather, prolonged drought and famine influence sustainability of the small scale dairy farming in Cherang'any Sub County.

Finally, the study found that Farmer training had a strong positive(r=0.45 and p=0.362) influence on the sustainability of the small scale dairy farming. Lack of skills on breeding, insufficient education on dairy food security, insufficient information on dairy nutrition and limited funding sources influenced sustainability of small scale dairy farming.

5.2 Conclusions

The study concluded that the sustainability of small dairy farming is at stake in the sub county. This is because of Expensive technological devices, ever changing weather patterns, inadequate dairy funding and scanty farmer training on dairy farming. Portions allocated for dairy faring were found to be between 1 and 2 acres of land. With such challenges milk production might be hampered even further if measures are inadequately addressed.

5.3 Recommendations

(i) The National government, Trans-Nzoia county government and the Nongovernmental organizations need to join hands and avail modern milk cooling plants and distributed them in Divisions so that milk are refrigerated and hence preventing from going bad.

(ii) Trans-Nzoia county government need to liase with central government and non-governmental organization in finding ways to provide small scale farmers with affordable loans and reduce collaterals required before accessing loan.

(iii) Provision of frequent trainings; seminars, workshops, field days and agricultural shows and dairy manuals so as attain a sustainable small scale dairy farming.

(iv) Digging out boreholes, taping gravitational waters from Cherang'any hills and Dams therefore a measure to mitigate effects of weather changes.

(v) County government of Trans-Nzoia needs to liaise with insurance firms and agree on a better dairy policy against droughts and famine.

5.3 Suggestions and for further research

(i) Influence of support services on small scale dairy farming in Cherang'any Sub County

(ii) Influence of economic factors on the sustainability of small scale dairy farming in Cherang'any Sub County.

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APPENDICES

APPENDIX 1 TRANSMITTAL LETTER

Bidii K. Philemon,

P.O box 47

Kapcherop

Dear Respondents,

I Am Bidii Koro Philemon a master's student in the Department of Extra-mural Studies at the University of Nairobi, take this opportunity to thank the respondents who participated in the study on "factors influencing sustainability of small scale dairy farming in Cherang'any Sub County" and to the lecturers and supervisors who did what they can to see this project a success. I thank you for taking part in this study.

Yours sincerely,

Bidii K. Philemon.

APPENDIX II QUESTIONNAIRE SMALLL SCALE DAIRY FARMERS

Kindly respond to the following items in the questionnaire

SECTION A: Demographic

1 Gender

Male [ ] Female [ ]

2 What is your age bracket?

20-30 [ ], 31-40 [ ]

41-50 [ ], 51-above [ ]

3. What is your highest level of education?

Primary [ ] Secondary [ ] Tertiary [ ] University [ ]

4. How long have you practiced small scale dairy farming?

0-1 [ ] 2-5 [ ]

6-10 [ ] 11- Above [ ]

5. How many litres of milk do you get each day?

1-5 [ ] 5-10 [ ]

10-15 [ ] 15-20 [ ]

20-Above [ ]

SECTION B: SPECIFIC RESEACH QUESTIONS

6 What portion of land dedicated for dairy farming

Below 1 acre [ ] 2-3 acres [ ] 5 acres and above [ ]

1-2 acre [ ] 4-5 acres [ ]

7 What has been the production so far from your dairy cows in the last one year

Significantly increased [ ] partially increased [ ] remained the same [ ] partially decreased [ ]

Significantly decreased [ ]

Section C: Technological influence on dairy farming sustainability

Using strongly agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD), Neutral (N)

8 **Give your views about causes of how milk production in respect to technology**

	SA	A	N	D	SD
Lack of enough livestock officers influence dairy faming					
Presence of milk cooling plants affect dairy farming					
Lack of Extension officers (vertinary) affects dairy production					
Lack of automated milking system affect dairy farming					

Section D: Dairy funding influence sustainability of dairy farming

9. Give your views about causes of milk production in respect to dairy funding.

	SA	A	N	D	SD
Due to insufficient dairy funding, there is low dairy education on farmers					
Collaterals needed by financial institutions inhibit access to funds hence low output					
Interest rates in commercial banks are high and unaffordable to small scale dairy famer					
Most farmers borrow finances from informal groups					

SECTION E: Weather changing patterns influence sustainability of dairy farming

10. Give your views about causes of milk production in respect to climatic condition

	SA	A	N	D	SD
Inadequate rainfall and prolonged drought affect small scale dairy farming					
Unpredicted weather conditions affect small scale dairy output					
Climatic changes affect sustainability of small scale dairy production					
Continuous wetness affect sustainability of the small					

SECTION F: Farmers Training and its influence on dairy farming

11. Give your views about causes of milk production in respect to farmers' educational level

	SA	A	N	D	SD
Lack of basic skills on dairy farming affects dairy output					
Lack of specific and relevant skill hamper dairy production of small scale dairy farming					
Low level of education of farmers affect dairy production among small scale farmers					
Limited knowledge of funding sources constraint milk production by small scale famers					

The End Thanks

Interview Schedule for key informants

1. What can you comment about farmers participation in dairy farming to this area?
2. What can you say about dairy farming in Cherang'any sub county?
3. Do you support training opportunities like seminars or barazas to individual farmers or groups or best methods of dairy farming?
4. Is dairy farming in this area sustainable? extenti
5. What is your opinion on the influence technology,dairy funding weather changes and farmer training on the sustainability of small scale dairy farming ?
6. Does technology sustainability of small scale dairy farming in this region?
7. What is the influence of dairy funding on sustainability of small scale dairy farming
8. Which challenges to the following stakeholders face regarding development and sustainability of dairy in future (Personal, society or governmental)

Personal

……

Governmental

……

Farmers

……

NGO's and other stakeholders

……

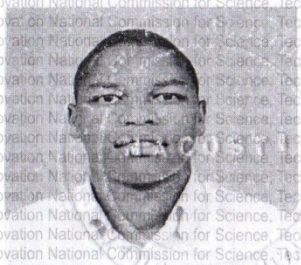
APPENDIX III: WORK PLAN (TIME FRAME)

ITEM	MARCH	APRIL	MAY	JUNE	JULY
Proposal					
Data collection					
Data analysis and interpretation					
Project submission					

Proposal writing will commence in March followed by data collection in the month of April and May. Data analysis and project submission will be done in the month of June and July accordingly.

THIS IS TO CERTIFY THAT:
MR. BIDII PHILEMON KORO
of UNIVERSITY OF NAIROBI, 47-30204
KAPCHEROP,has been permitted to
conduct research in *Transnzoia County*

Permit No : NACOSTI/P/15/1713/6597
Date Of Issue : 9th July,2015
Fee Recieved :Ksh 1,000



on the topic: *FACTORS INFLUENCING SUSTAINABILITY OF SMALL SCALE DAIRY FARMING A CASE OF SMALL SCALE DAIRY FARMERS IN CHERANGANY SB COUNTY TRANS NZOIA COUNTY*

for the period ending:
6th November,2015

.....
Applicant's Signature

.....
for Director General
National Commission for Science, Technology & Innovation