DETERMINANTS OF SUSTAINABILITY OF DONOR FUNDED DAIRY PROJECTS: A CASE OF MALAVA SUB- COUNTY, KENYA

BY

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DECLARATION

This research project report is my original work and has not been presented for the award of any degree in any other university.

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I dedicate this research project report to my wife Balbina, children Eugene, Alvin and Michele, who have been my greatest inspiration in this endeavor.

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LIST OF ABBREVIATIONS AND ACRONYMS

ADB	-	Asian Development Bank
A.I	-	Artificial Insemination
CBO	-	Community Based Organization
CDD	-	Community Driven Development
CDF	-	Constituency Development Fund
CIG	-	Common Interest Group
DMI	-	Dry Matter Intake
E.T	-	Embryo transfer
E.U	-	European Union
EADDP	-	East Africa Dairy Development Programme
ETA	-	Expatriate Technical Assistance
FBO	-	Faith Based Organization
GAP	-	Generally Accepted Accounting Principles
HIV/ADS	-	Human Immune Virus/ Acquired Deficiency Syndrome
IEG	-	Independent Evaluation Group
IFAD	-	International Fund for Agricultural Development
IFRS	-	International Financial Reporting Standards
LDP	-	Livestock Development Programme
LMAT	-	Lead Mobile Advisory Team Member
MAT	-	Mobile Advisory Team Member
NGOS	-	Non Governmental Organization
NACOSTI	-	National Commission for science and Technology and Innovations
OECD	-	Overseas Economic Commission and Development agency
PMAT	-	Team member from mobile advisory pool
SPSS	-	Statistical package for Social Science
SS	-	Sexed Semen
UN	-	United Nations
USDA	-	US Department of Agriculture
WKCDD & FMP	-	Western Kenya Community Driven Development & Flood Mitigation Project

ABSTRACT

Development partners as a way of reducing poverty in many parts of the world have envisaged dairying as a means to improving on the nutritional status and income generation from poor families. This has led to the implementation of lots of developmental projects in favour of dairying in the poor parts of the world by donors. Dairy farming is highly enriched with agro-ecological, political and cultural dimensions across countries, region and the vast continents. Dairy production trends and systems in many countries are influenced alot by policies put in place besides, climatic,technological and cultural factors. Policies interventions such as A.I, promotion of the marketing and consumption of milk and dairy products, provision of appropriate veterinary and extension services, milk import policies and institutional support to the dairy sector. Yet despite such major advancement in technology and favourable policies, most dairy projects still fail upon project termination. It is reported that failure rate of projects including dairy is 50% in Sub- Saharan Africa. Farmers in South Africa have increased their production significantly as a result change in policy on technology especially on feeding regimes, biotechnology, milking systems and housing. Kenyan dairy sector though considered the most advanced and a leading milk producer in Eastern and Central Africa produces an estimated 4 to 5 billion litres of milk annually from a total herd population of about 4 million dairy cows yet the success rate for donor funded dairy projects is barely 40%. Despite this problem, no study has been done to establish the cause of the termination of these donor funded projects especially on withdrawal of donor support on dairy projects a case of Malava sub-county,Kenya. This poses a gap that this study sought to fill through an investigation of the determinants of sustainability of the donor funded dairy projects, a case Malava sub-county, Kenya. The objectives of the study were: to determine how climate influence sustainability of donor funded dairy projects,to assess the extent to which technology influence sustainability of donor funded dairy projects, to evaluate the extent to which culture determines sustainability of donor funded dairy projects, and to establish the extent to which extension services determine, sustainability of donor funded dairy projects and a case of Malava sub-county, Kenya. The study adopted a descriptive research design. Stratified and purposive sampling techniques was used to come up with a representative sample size from 1,800 farmers. A mini study was conducted on 35 farmers out of the research target area. A return rate of 258 giving an 80% was reported. Data was analyzed using descriptive statistics with aid of SPSS in generation of results that was presented in form of percentages and cross-tabulation with Pearson chi-square for association indexes. The study established that; climate changes, landscape and terrain respectively srongly determined donor funded dairy projects. as revealed with p-values revealing a very strong significance in relationship within the first theme; within the second theme, rate of technology adoption and technologies available for adoption strongly determined sustainability of donor funded dairy projects revealing also significant p-values in this study. Within culture, results revealed that there was a significant relationship between the two variables level of association with alternative farming practices and gender roles posting high respectively. On extension services, a significant association was determined on level of farmer satisfation with extension services and types of services offered by extension officers respectively. On government policies on donor funded projects there was a relationship between policies by the government on donor funded projects and sustainability of donor funded dairy projects therefore revealing a strong association index. The study therefore recommends that the county government to develop strong policies on dairy development, enhance dairy trainings, set up a climate resilience training centre on climate change and to subsidize on issues of technologies like A.I, pests and disease control among others Lastly institutional implementation and subsequent monitoring and evaluation procedures set up .

CHAPTER ONE

INTRODUCTION

1. 1 Background of the Study

Poverty continues to nag at the millions of poor people in many communities in the third world countries. These countries depend entirely on developed countries for its community development projects. United states of America, Canada, United kingdom, just to mention a few have played a major role directly or indirectly through their funded NGOs in sponsoring community projects in parts of Asia, Latin America and Africa. Their main areas of concern have been in Health, Education, tourism ,Agriculture and Environment sectors.

In Kenya, most Agricultural projects which have got the donor support have been mainly in the dairy sub sector through local, crosses and even highly improved dairy cows. Dairying has remained an integral part of many communities from the pastoralists in the arid and semi arid areas to high potential central highlands in kenya because of milk, manure and even communities keep animals for dowry which a cultural function (FAO, 2006;IFCN Sector model 2006).

The dairy industry has grown exponentially in the last half a century as a result of technological advancement in the dairy sector. United States Department of Agriculture, (1964) reports that productivity of US dairy farms increased rapidly by 296%. Similarly, Fifth Session report, (2009) state that Danish dairy industry which is rated among the largest in the world have been reported to export more than 20% of all Danish agricultural export as a result of rapid growth.

India with a dairy herd of 16.5% of the total population of the world dairy animals produces 8.4% of the world milk production which is about 98.3 million litres per day and also the largest consumer of milk in theworld. However, there are challenges to dairy in India, mostly in form of rapid urbanization, low interest of the younger generation in dairy farming, increasing real estate price that leads to loss of farm lands and higher cost of production compared to US even though labour is cheaper, hence some dairy regions come under pressure. The US dairy industry which produces 14.6% of the world milk out put has been growing at a very good pace as a result of policies of the US government which nurture and protect cooperative marketing. Saudi Arabia boasts of being the highest average milk producer with an output of 10.133 litres per cow while Germany with all its technological

advancement ranks number 15 with an average milk yield of 6.877 litres per animal (FAO, 2012).

In China with a total dairy product output of only 4% of the world production has dairy cattle farms which are pyramid shaped: At the base are small farm households that own 1–5 dairy cows while at the top are the large operations with more than 1 000 dairy cows. According to the Dairy Association of China, there were approximately 1.37 million dairy cattle farms in 2002. Of them, 1.14 million (or approximately 83 percent) owned 1–5 cows. By 2006, the total number of dairy cattle farms and farm households nearly reached 1.6 million, up 15 percent compared with the data for 2002. The economic reforms that began in the 1970s laid trhe foundation for rapid development of the dairy industry

In Australia, the government and the industry has really recognized dairy sector development which was constrained by old policies(Harris, 2008). Consequently an industry reform plan was proposed with the objectives of ensuring competitiveness in international markets, avoiding a WTO challenge to the legality of policies. A clear result of these policy reversals was an increase in the scale of productivity of the Australian dairy farms and more competitive , export oriented industry.

Africa which is a net importer of milk has had its production increasing at 2.1% per annum while the consumption gap has equally been increasing at 7.8% per annum between the year 1990 and 2004(FAO, 2006;IFCN Sector model 2006). Production is understandably low in Africa because majority of dairy farmers have low educational background and require additional technical knowledge in order to improve dairy production (Tambi, 1991; Kyomo, 1993; Okwenye, 1995; Urassa and Raphael 2004).

As a result of this, dairy production trends and systems in many countries are today influenced by policies of dairy project funding agencies. These policy interventions include; genetic improvement of animals, promotion of the marketing and consumption of milk and dairy products, provision of appropriate veterinary and extension services, provision of credit and farm inputs, milk import policies and institutional support to the dairy sector (Ahmed and Ehui 2000; Per and Marc 2002 Missing). Yet despite such major advancement in technology and favourable policies, most dairy projects still fail upon project termination. Meltzer commission (2000) for instance, reports that failure rate of projects is 50% in Sub- Saharan Africa. Dairying has been envisaged as a means to improve on the nutritional status and income generation from poor African families. This has led to the implementation of lots of developmental projects in favour of dairying.

Nigeria being the largest producer of cow milk in west Africa and third in Africa, is still a net importer of the product in order to meet the up with the 1.45 billion litres estimated national milk requirement(2016, Foraminifera market reseach limited website). Local production of milk is less than 1% of the total annual demand making the toatal milk consumption in Nigeria less than 10 litres per head whereas the global average is about 40 litres per head. In other parts of Africa its reported to be 28 litres per head. In order to promote the industry, this country has attempted to ban imported powdered milk,reduce custom charges on imported dairy inputs,introduction of Agricultural insurance schemes, and enhanced extension services amongst others. (FAO, 2006;IFCN Sector model 2008).

South Africa despite the challenges of dairy project failure rates, farmers in increased their production significantly as a result of change in policy on technology especially on feeding regimes, biotechnology, milking systems and housing (ESADA, 2006). Kenyan dairy sector which is considered the most advanced and a leading milk producer in Eastern and Central Africa produces an estimated 4 to 5 billion litres of milk annually from a total herd population of about 4 million dairy cows yet the success rate for donor funded dairy projects is barely 40% (Kenya Dairy Board, 2000). The low success rate of these dairy projects have been attributed to agro-climatic characteristics of the area, land productivity potential and prevalence of animal diseases (MoLD, 2013).

Kenya dairy industry has grown of with a dairy cow population of 3.5 million exotic breeds, 9.3 million indigenous animals, 1 Million camels and 13.9 million goats produces about 3 billion litres of milk annually with exotic dairy cows producing more than 70% of the total national milk output. Bulk of the feed is from natural forage, cultivated fodder, crop by-products and concentrates (FAO. 2011.Dairy development in kenya, by H.G Muriuki. Rome) Dairy's main role is its contribution to the livelihoods of the many people throughout its value chain including its nutrition.

Smallholder dairy farmers of about 1 million in kenya dominate the industry at the production level, 30 licensed milk processors. Others include producers, mini dairies, cottage industries and cooling plants, farmers organizations which handle about 20% of the total milk(Muriuki, 2003), informal traders,distributors, retailers input suppliers,veterinery service providers extension and advisory service providers.

Major challenges reported in the dairy industry in kenya include the following; small size of the dairy enterprises which cannot take advantage of economies of scale, lack of

adequate production skills,lack of influence in market, policy and legislation decisions for many industry players, inadequate access to breeding/ A.I service, due to costs and poor infrastructure, high consumption of un-processed milk, inadequate enforcement of regulations on livestock movement hence cattle diseases, lack of quality upto date information on the dairy and unpredictable dairy policy policy and legal environment among others.

Cattle population in kakamega county comprises 68% local and 32% exotic cross breeds of the total 381,970. Total households in the county is about 355,679 which means at least at a household level, there must be a dairy cow. (County Director of Livestock, 2015). Dairy is a source of food, providing milk and meat to the population throughout the year and therefore important in ensuring food security and can be considered as an inflation proof and productive investment in the county apart from a social and economic security. A dairy cow is one of the assets if owned by the poor families can be crucial in maintaining household survival in times of crisis as the milk, the meat and even the cows manure can be sold to contribute to the income of the farmer (County Director of Livestock Production, 2015).

Malava Sub County has a population of 205,166 persons (40,635 house holds) and a dairy herd of about 22,024, 35 dairy goats out of about 330,000 livestock units. (Kenya National beareu of statistics, 2013), boasts of dairy farming as a reliable and stable source of rural income to a majority of the sub county population. Malava sub-county with 15% of the total Kakamega county dairy herd produces about 24% of the total annual county milk production which is about 103,112 tonnes thus reflecting an annual production of 1 tonne per cow anually in the sub-county. (County Director of Livestock,2015).

Despite all these numbers, majority of dairy farmers in this sub-county cannot be considered to practice dairy farming as a business due to the low milk out put. In the sub county, dairying has been an integral farming used with crop farming because of milk, increased crop yield as a result of manure and has been used as an entry enterprise by many partners in poverty eradication in the county at large. Low milk production makes dairy farming in the sub county unsustainable and this records a project failure rate that is higher than the national average of 40%, due to Climate, technology, socio-cultural, extension services and Governmen policies.

1.2 Statement of the problem

There has been huge numbers of dollars going down the drain for many years in the third world countries with little impact. Poverty continues to nag at the millions of poor people in these communities. Third world countries depend entirely on developed countries for its community development projects. United States of America, Canada, United Kingdom, Germany, Italy, France have played the main stream role of sponsoring community based projects in part of South America Asia and Africa, but the poor performance of projects and the disappointment of project stakeholders and beneficiaries seem to have become the rule and not the exception in contemporary reality. The project failure rate at the World Bank was over 50% in Africa until 2000 (World bank, 2001 Commission). The World Bank's private arm, the International Finance Corporation has discovered that only half of its African projects succeed. In an independent rating, the Independent Evaluation Group (IEG) claimed that 39% of World Bank projects were unsuccessful in 2010 (Chauvet et al., 2010).

Kenya has not been left behind and the problems mentioned above are part of our donor funded projects. Lately, there is an increased interest from donors to start or revive most projects within western Kenya. Their main areas of concern are Agriculture, education sector, health (HIV/AIDs and malaria) and tourism sectors. In Malava sub-county, 21 cattle dips were revived through constituency development fund and only 10% are operational after 8 years, Send a cow an NGO supporting poor communities supported 5 groups with 16 dairy goats in 2009 and curently the number of goats have reduced to 25% after 8 years in the funded groups. LDP introduced 9 dairy cows and 2 bulls 15 years ago to a few groups that cannot be currently traced.

WKCDD & FMP supported 16 Dairy CIGs and introduced 396 and 38 dairy cows and goats respectively but the number has only increased by 1.01% annually for that period (County WKCDD&FMP report 2015). Out of 2 dairy cooperative societies revived in 2007 by DANIDA, none is fully operational (County livestock production report 2014). WKCDD&FMP in collaboration with the county government has made deliberate efforts to introduce 2 milk chilling plants at Tombo and Kimangeti with capacities of 984kg and 1,500 kg respectively in the sub-county to strategically assist in milk marketing for the dairy farmers, but still not fully utilized. Despite this problem, minimal studies has been done to establish the cause of the failure of these donor funded projects especially on withdrawal of donor support. This poses a gap that this study sought to fill through an investigation of the

determinants of sustainability of donor funded dairy projects; a case of Malava sub-county, Kenya.

1.3 Purpose of the study

The purpose of the study was to evaluate the determinants of sustainability of donor funded dairy projects, a case of Malava sub-county, Kenya.

1.4 Objectives of the Study

This study was guided by the following objectives

1. To determine the extent to which climate influences sustainability of donor funded dairy projects, a case of Malava sub county, Kenya.
2. To assess the extent to which technology determines sustainability of donor funded dairy projects, a case of Malava sub county, Kenya.
3. To evaluate the extent to which culture determines sustainability of donor funded dairy projects, a case of Malava sub-county Kenya.
4. To establish the extent to which extension services determine sustainability of donor funded dairy projects, a case of Malava sub-county, Kenya.

1.5 Research Questions

The research questions which were adopted for the purpose of this study were:

1. To what extent does climate influence sustainability of donor funded dairy projects, a case of Malava sub-county, Kenya?
2. To what extent does technology influence sustainability of donor funded dairy projects, a case of Malava sub-county, Kenya?
3. To what extent does culture influence sustainability of donor funded dairy projects, a case of Malava sub-county, Kenya?
4. How does extension services determine sustainability of donor funded dairy projects, a case of Malava sub-county, Kenya?

1.6 Significance of the study

The study sought to understand the determinants of sustainability of the donor funded dairy projects in Malava, Kenya. Findings from the study was expected to be of much importance to the donors in the dairy industry, within and outside the government,

beneficiaries and other relevant stakeholders including theCounty government of Kakamega. Findings from the research may be used as a benchmark for not only dairy projects but also other projects within the sub county. The researcher also expected that project finding would be used for future references; forms basis for decision making, financial and technological support for better utility of the available resource (Byrne, 2002). Economic planners are expected to use this knowledge to come up with sound policies that can improve the dairy sub sector so as to assist the dairy farmers and the rest of kenyans in achieving vision 2030. To academic scholars it is hoped that this study may add new knowledge on the extent to which dairy projects are sustained.

1.7 Delimitations of the study

The study was Limited to dairy farmers in Malava Sub-County, Kenya. (Creswell, 2013). The study covered dairy funded groups, major players like, department of livestock production and other stakeholders who were systematically selected. Key respondent and research tools that were used are questionnaires and interview schedule. The study focused on determinants of sustainability of donor funded dairy projects, a case of Malava sub-county, Kenya. The study was carried out between the months of March and June 2016 a period the region was expected to experience intense rainfall, a changing weather condition from a dry spell. The study considered the following independent variables namely; Climatic factors which in this study meant varying weather patterns, rainfall regimes and temperature flactuations, Technological factors which in this study meant the adoption of the technical means used to improve on dairy production like A.I, feeds compounding,disease control and Zero grazing to mention but a few. Cultural factors in the study meant, alternative farming practices, gender, culture, level of education among others and government policies included number and level of Influence of thepolicies. Intervening variable in the study was extension services that meant number of trainings attended and skills and Knowledge acquired whereas the dependent variable was sustainability of the donor funded dairy projects which meant increase of milk production and income from milk sales.

1.8 Limitations of the study

Main limitation in this study was time and cost, as the researcher would have wished to have more time and reach out to all elements in the study, education level disparities and general ignorance, some respondent declined to fill the questionnaire which led to more time allocation for purpose of 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 dairy funded farmers in Malava sub-county. Research Assistants notified the respondents that information given was kept confidential and was only used for the purposes of the study (Landsburg, 2013).

The researcher overcame the limitations by selecting research assistants from the area where study was carried out, setting time frames for conducting interviews. This shortened the time for data collection since they were familiar with the terrain, culture, local language and even the groups that provided the data. Research assistants were of minimum of form iv level of education, able to understand the contents of the questionnaire and would even translate in the local language.

1.9 Basic Assumptions of the study

The study assumed that sustainability of donor funded dairy projects is a dependent variable of the study, respondents were honest and knowledgeable enough to understand what was required of them on the determinants of sustainability of donor funded dairy projects. The study also assumed that the sample size selected was a representative of the whole population, the questionnaire gave the intended results and the questions asked were answered honestly by the respondents.

1.10 Definitions of Significant Terms as used in the study

The project in the study refers to donor funded dairy projects in Malava sub-county, Kenya

Climate determinants refers to those factors related to rainfall, drought and climate change.

Determinant refers to a constituent or element that brings about certain effects or results, or indicates a specific multiple, number, or quantity.

Donor funded dairy projects refers to all dairy related projects supported through financiers like WKCDD/FMP,CDF,LDP,Countygovernment amongst others in Malava Sub county, Kakamega

Government Policy refers to the basic principles by which the project is guided in order to achieve sustainability.

Technology determinants refers to those related to 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.

Cultural determinants are social factors of the dairy farmers like alternative farming practices, gender, marital status, sex, education level, and experience in dairy farming that in one way or the other influence dairy productivity.

Sustainability of donor funded dairy projects refers to the ability of the donor funded dairy project to run itself after the realization of the project.

1.11 Organization of the Study

Chapter one composed of background of the study, statement of the problem, purpose of the study, research questions, research objectives, significance of the study, delimitation ,limitation of the study assumptions of the study and definitions of signicant terms. Chapter two dealt with theoretical reviews of past studies that gave rich knowledge for better approach of a study in hand. Chapter three composed of research design, gave insights of what research tools the researcher used, study area, target population, sample size, research instrument that were used, validity and reliability of the reseach instruments, data collection procedures, definition of variables and ethical issues while conducting the study. Chapter four gave results of the data, analyzed and presented in frequency tables and percentages, while chapter five gave records of summary,conclussions and recommendations in the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter discussed the literature related to the determinants of sustainability of donor funded dairy projects in Malava sub-county, Kenya: This section explored theoretical and empirical literature on determinants of sustainability of donor funded dairy projects in Malava sub-county, Kenya. The purpose of this section was to establish the foundation for the study that identified a framework within which primary data was contextualized and interpreted. By exploring existing experiences from other parts of the world and from Africa, literature review was used to strengthen the findings of the study. Empirical studies on determinants of sustainability of donor funded dairy projects in Malava sub-county, Kenya, particularly Climatic factors, Technological factors, cultural factors and lastly, Government policies. It explored theoretical framework and conceptual framework to identify the concepts and variables in the study and show how they are connected.

2.2 The Concept of sustainability of dairy projects

Sustainability can be defined as continuation of benefits after major assistance from a donor has been completed/withdrawn (Okun, Op.Cit) in the context of donor funded projects. Project sustainability is indicated by the ability to continue to meet objectives defined in terms of benefit levels (Hoclgkin, Op.Cit). Project sustainability can be viewed as the ability of a project to initiate a process by which benefits are maintained.

Dairy project sustainability is defined as the ability of a dairy production system to continue producing a stream of benefits that are realized and continue to be maintained long after donor funding has been stopped (IFAD 2010. Similarly, UNDP, (2000) considers a dairy project sustainable if it maintains its operations, services and benefits during its life time. However, World Bank,(2000) conceptualize a dairy project sustainable if it maintains an acceptable level of benefit flows through its economic life.

Widodo et al (1994) provided a comprehensive analysis of performance of 274 well established small holder dairy farms near Malang in East Java. This provides a picture of the interlocking issues of sustainability. Their description and analysis identified farm size and feed supply as key constraints on returns to labour and investment. Limited feed supply led to decline in production, health and reproductive performance in cows. On the other hand

Preston (1990) and as in all farming systems, argued that dairy production at smallholder level is only sustainable if for each unit it has a high degree of self-sufficiency and promotes self-reliance,optimises employment opportunities, does not contaminate its own or interdependent neighbouring environmental units or it does not destroy or irreversibly degrade natural ecosystems.

2.3 Climate and sustainability of donor funded dairy projects

Agricultural production has always been affected by weather variability. In Michigan, Climate change has had critical impact on the animal feed supply and water availability. The change has effect on the time of planting of forage feed supplies hence reduces the quality and quantity hence impacts on the availability, price and animal performance, (Burlew, 2016).

In the entire United states in America, there has been studies that even calculated estimated losses in milk yield, dry matter intake (DMI) and reproductive losses due to heat stress as follows. Losses in milk ranged from a low of 150 lb per cow per year for Wyoming to a high of 4,568 lb per cow per year for Louisiana. Florida and Arizona were 3,975 and 1,607 lb, respectively (St-Pierre et al., 2003). High-yielding cows are more affected by heat stress than low producers (Johnson, 1987) because high producers consume more nutrients and produce more metabolic heat. Environmental modifications to minimize heat stress, coupled with an excellent nutritional program are necessary to maintain DMI and milk yield during the summer months in America.

Kardasian,(2012) states that change, however, was expected to negatively impact the industry in the future. Climatic events such as rising temperatures and atmospheric carbon dioxide concentrations changed the prices of dairy farms' inputs, including feed, fuel, and electricity. (Gregory J. Peter,2014) Higher temperatures additionally caused heat stress for dairy cows, leading to a reduction in milk yields. While climate change negatively affected dairy farms, it also helped 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. Major environmental constraints to high productivity in the tropics are ambient temperature and humidity, annual and seasonal availability of feed resources, internal and external parasites and a variety of bacterial and viral infections (Backlund, 2009). The effect of climate was minimized either

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 have 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).

African continent is subject to drought and food insecurity. Even before climate change issues became evident, serious concerns had been raised about Agriculture in Africa, which has the slowest rate of productivity increase in the world (Seo and Mendelsohn, 2006). The direct effects of climate change included, for example, higher temperatures and changing rainfall patterns, which translated into the increased spread of existing vector-borne diseases and macro parasites, accompanied by the emergence and circulation of new diseases. In some areas, climate change could also generate new transmission models.

Water scarcity increased at an accelerated pace and affects between 1 and 2 billion people (IFAD, 2009). Climate change had a substantial effect on global water availability in the future. Not only did it affect livestock drinking water sources, but also had a bearing on livestock feed production systems and pasture yield. As climate changes and becomes more variable, niches for different species alter. This modified animal diets and compromised the ability of smallholders to manage feed deficits.

Changes in the primary productivity of crops, forage and rangeland from rising temperatures increased lignifications of plant tissues and thus reduced the digestibility and the rates of degradation of plant species. The resultant reduction in livestock production had effect on the food security and incomes of smallholders. Interactions between primary productivity and quality of grasslands required modifications in the management of grazing systems to attain production objectives. Livestock keeping was a safety valve for smallholder farmers if warming or drought caused their crops to fail. The study therefore seek to find out how these climatic factors determine sustainability of dairy projects in Malava sub county, an objective of the study.

2.4 Technology and sustainability of donor funded dairy projects

Technology is the technical means people used to improve their surroundings. It is also knowledge of using tools and machines to do tasks efficiently. Technology involves application of knowledge, tools and skills to solve problems and extend human capacity (Johnson, 1989:3). On the other hand, Larkin (1992:23) defined technology as a body of

knowledge and actions about applying resources, developing, producing, using, assessing, and extending the human potential, controlling and modifying the environment". Bonabana-Wabbi (2002) explained that it is the actual application of that knowledge that was termed technology. Although in the Enos and Park (1988) study, the focus is non agricultural, this definition fits agricultural technologies too. From their definition, it is clear that technology is aimed to ease work of the entity to which it applied. In this study, a technology, as it related to dairying, is a set of new practices integrated into a dairy production package that aimed to assist a farmer to produce milk more efficiently and effectively than the conventional methods.

According to Bonabana-Wabbi (2002), the dynamic process of adoption involved learning about a technology over time. In fact many innovations required a lengthy period often of many years from the time they became available to the time they were widely adopted (Bonabana-Wabbi, 2002; Rogers, 1995; Enos and Park, 1988). The rate of adoption is usually measured by the length of time required for certain percentage of members of a system to adopt an innovation. Extent of adoption on the other hand was measured from the number of technologies being adopted and the number of producers adopting them.

Depending on the technology investigated, various parameters were employed to measure adoption. Measurements also depended on whether they were qualitative or quantitative. For instance in the study investigating the adoption of improved seed and fertilizer in Tanzania, Nkonya, Schroeder and Norman (1997) estimated the intensity of adoption by examining the area planted to improved seed and the area receiving fertilizer. For another study that investigated the adoption of use of single-ox technology, pesticide and fertilizer use, the dependent variable was the number of farmers using pesticide and fertilizer (Kebede, Gunjal and Coffin, 1990).

There are many possible sources of information about the new technology (Rogers, 1995). A farmer learned from his or her own experimentation with the technology. Advice and technical information is available from the extension service or the media. If there were many farmers in somewhat similar circumstances, then the process of learning about the new technology was social. Farmers learned about the characteristics of the new technology from their neighbor‘s experiments. In a study carried out in Ghana by Conley & Udry (1998), concluded that farmers learning occurs through social networks rather than in the context of the collective experiment.

Most empirical studies used econometric models often related the adoption decision to households and technological characteristics. Numerous studies have found that constraints imposed by these factors discouraged technology adoption (Umali and Schwartz 1994; Nicholson et al 1999). These factors influenced the awareness, availability, costs, benefits and even the risks associated with the different livestock technologies and management practices (Benin et al 2003). Therefore, understanding the determinants of the farmers' adoption of various milk productions and marketing technologies is critical to success implementation of programs in liberalized dairy industry. Little work was done to examine how the adoption of new technologies determined sustainability of donor funded dairy projects in Malava –Kenya , the objective of this study.

Artificial insemination (AI) is one of the most effective tool available to cattle producers to improve productivity and profitability of their cattle operation. A.I which is one of the technologies used in cattle breeding was commercially available for more than 65 years and utilized very effectively in the dairy industry. However, it was underutilized in the U.S. in beef herds. As a point of comparison, about 66 percent of the nations dairy cows were A.I bred and the use of AI by 11 commercial swine producers was 70-75 percent. AI was, however, much more common in dairy production than in beef production, though AI gained ground in beef breeding herds due to the increased access and marketing of superior and favorable proven sires (Books, 2010).

Knowledge of artificial insemination to cattle is important which achieves a high success rate in cattle breeding herds where owning a herd bull is expensive. The quantity of milk (yield) produced in a year by an animal varied enormously according to breed, feed and management practices (Macaskill, 2010). The world average of 2,300 kg/year Per cow was somewhat meaningless because it was influenced heavily by the large numbers of poor-yielding animals in less developed countries across the globe.

Hemme et al.(2004) for example observed that India, despite emerging the leading milk producing country of the world in 2001, recorded a 5% decline in production of the cross bred dairy cattle. Patel, (2001) attributed India’s low milk production levels to low genetic potential for milk production, poor nutrition and poor management and care of the dairy cattle. In many developed dairying countries, yields were typically 4,000–5,000 kg/year/head and exceptionally reached 6,000–8,000kg/year/head particular intensively managed Enterprises. In such systems, cows were selected on the basis of yield and the calving.

The world milk production after stagnating in 2009 rebounded in 2010 and was expected to grow initially in excess of 2% annually for the next three years, causing prices to decline. As prices adjusted downward, the growth in milk production after 2013 was expected to be less vigorous (Books, 2010). Extension services, which provided support for the dairy farmers geared towards improved management, feeding, fertility and veterinary care was crucial to sustainable small scale dairy farming. Many of these extension service providers offer artificial Insemination services that aimed to further improved milk yields with pedigree dairy cattle. Genetics, artificial insemination services were expected to grow in the future, as the government of India continued to develop protocols for imported genetics products (A.M. Roussel, 2006).

On a study that determined factors influencing adoption of dairy technology on small holder dairy farmers in selected zones of Amhara and Oromia National Regional States, Ethiopia, Dehinenet, Mekonnen, Kidoido, Ashenafi and Bleich (2014) used the Heckman two stage models to identify the factors that influenced adoption of the technology and level of adoption. Farm and household level data were obtained from 384 farmers consisting of 192 adopters and 192 non adopters. The results demonstrated that family size, farming experience, availability of dairy production extension services, availability of cross breed cows, accessibility of saving institutions, total income from milk and milk products, availability of training on livestock, age of household head and off farm activity participation played significant roles on both the probability of dairy technology adoption and its level of adoption.

In Kenya, the previous studies carried indicated that understanding the factors that affected the farmers' adoption of various milk productions and marketing technologies was critical to successful implementation of programs in the kenyan liberalized dairy industry. (Bebo, 2003; Director of Livestock production, 2008) variously indicated that the former Coast, Western and Nyanza Provinces were poor in adoption of dairy technologies with poor nutrition of livestock being recorded as the main reason for poor livestock production. Little work had been done to examine how technological factors influence sustainability of dairy funded projects in Malava sub- county, Kenya which was, the objective of this study.

2.5 Culture and sustainability of donor funded dairy projects

There is a high level of agreement in the literature that social, economic and institutional frameworks play an important role in determining who does what, and who gets what in Livestock development. Social and cultural norms dictate the division of labour and

control over assets. Policy and institutional structures often restrict existing sources of support to women, particularly credit that is acquired for large ruminants.

(FAO 2012) World wide, women and men are involved in livestock production, but, compared to women; men had easier access to technology and training, mainly due to their strong position as head of the household and greater access to off-farm mobility. In most countries, research and planning activities in the livestock sector, such as breeding, handling, feeding and health care, are largely dominated by men. Official livestock services are often controlled by men and extension personal are primarily men who are not accustomed or trained to teach technical subjects to women. Extension programmes and educational materials are mainly designed by and oriented towards men. Although in most societies all household members were involved in some way or another in livestock production, the decision making processes within the family and the division of labour for activities such as feeding, milking, health care, processing and marketing differs between regions, societies and households (Yisehak,2008).

In the U.S, a large body of research had demonstrated that household-level motivations, cultural and social values, and socialization had a primary influence on farm structure, management, and adaptation (Gasson and Errington, 1993; Lobley and Potter, 2004; Salamon, 1992; Bennett, 1982). At present, in many communities, women's access to information and training in modern livestock management and dairying continue to be limited and even indirect. Successful training should be oriented towards those household members which execute these tasks. For example, in communities where sick animals are mainly treated by women, they have knowledge of the symptoms and cure for animal diseases. But if they had no access to training, progress in best practices and appropriate herding to reduce diseases was difficult. Therefore, where extension services were dominated by men and where women had little access to training due to socio-culturally-defined gender roles, men needed to be persuaded to see the relevance and the benefit of training women. Only through a carefully planned gender approach can livestock production goals and successful training of women and men be achieved (Fao, 2008).

Mumba, Samui, Pandey and Tembo (2012) carried out a study on the effect of socio-economic factors affecting profitability of smallholder dairy farmers in Zambia. Results of their study suggested that:-Level of education; dairy cow herd size; and distance to the market, significantly affected the profitability of smallholder dairy farming in Zambia. An increased level of education and dairy cow herd size, with a unit decrease in distance to the

market, led to an increased profitability of smallholder dairy enterprise, other factors held constant. Age,gender,marital status and household size had no significance on the profitability of smallholder dairy enterprise. The average age of the respondents was 48.8 years, which signifies that very few youths were involved in this enterprise.

In a study on gender roles in small holder dairy farming: pertinent issues on access and control over dairy farming resources in Arumeru district, Tanzania Kimaro, Lyimo- Macha and Jeckoniah (2013) found that women still bear more burdens in this enterprise such as milking, fetching animal feeds, cleaning barn and marketing of milk products just to mention a few. It was also observed that, men and children were less involved in these activities. Group membership relatively enabled women to gain control and access over income obtained from dairy farming and other resources. Access and control over income was not proportional to individual's input. It was worse for women who were not in groups whereby their men had more access and control over the income obtained from 23 sales of dairy products. Women in groups were likely to get involved in several aspects such as production, management and decision-making over revenues and expenditures obtained from sales of dairy products.

A study carried out in Amhara and Oromia National regional states, Ethiopia revealed that availability of training on livestock, age of household head and off farm activity participation played significant roles on both the probability of dairy technology adoption and its level of adoption (Dehinenet, Mekonnen, Kidoido, Ashenafi and Guerne Bleich,2014). Abayomi Samuel Oyekale (2013.).

In a study carried out in East African region, a typical East African household, being married puts a lot of financial pressure on the household heads, which also motivated desire for raising dairy cattle due to their high productivity. On the study above, it implied that married household heads had a pool of family labour from where labour, time for attending to dairy cattle was drawn. However, the parameter of having food problem was also statistically significant ($p<0.05$). This implied that households that reported food problems had their probabilities of raising dairy cattle decreased by 0.3160. This was expected because of high maintenance cost of dairy cattle.

Households that operated at the verge of poverty was not able to meet the expected high maintenance cost of dairy cattle. This study concluded that although dairy cattle offer opportunities to increased milk productivity in rural Kenya, adoption was still low. Also,

integrated efforts reduced persistent hunger and poverty among smallholder farmers in rural Kenya which went a long way in enhancing households' adoption decision.

Maarse (1995) noted that women performed most of the work in most dairy production enterprises but very little was done to come up with technologies that would ease their labor burden leave alone unearthing its influence on dairy technology adoption. A study done in Kilifi district on labor distribution in dairy production indicated that women performed 30% of dairy activities, children 26%, men 20%, hired labor 18%, and others 6%. (National Dairy Development Program 1990). Indigenous groups like the Maasai, Boran,Samburu and and Sabaot in Kenya have a strong historic dairy tradition. They share many customs and regard milk as a product of harmony that is offered free to relatives, friends and visitors (Bayé 2000, Sadou 2000, Suttie 2001). Due to population growth, land shortage and increased interest in production and consumption, market-oriented dairy systems were evolved, with the use of high performing graded animals and/or higher inputs.

Majority of the population in Malava sub-county keep cattle and apart from milk also for social and cultural purposes. The cattle offered social security for the family as any house hold without a head of cattle was considered poor. The head of cattle cushion the family against inflation and acted as saving and therfore was easily converted to money during hard times. Dowry was paid in form of cows, and the more numbers one paid the richer the family was considered. The indigenous occupants of Malava Sub-county Viz Kabras considered cowdung as a blessing to the family therefore even the poorest house hold strived to own a cow even through being given freely by a considerate neighbour just to take care of and all the offsprings would eventually be passed back to the owner and the caretaker benefited from cow dung, a bit of milk and an off-spring depending on how generous the giver was (Sub county social services report, 2014).

Dairying has been an integral farming used with crop farming because of milk, increased crop yield as a result of manure and has been used as an entry enterprise by many partners in poverty eradication in the county at large (County Livestock Production report, 2015). Low milk production made dairy farming in the sub county unsustainable and this recorded a project failure rate that was higher than the national average of 40%. due to Climatic,technological,cultural and government policies. The study therefore seek to find out how cultural factors determine sustainability of dairy projects in Malava sub county, an objective of the study.

2.6 Extension Services and sustainability of donor funded dairy projects

Extension services provision which is actually capacity building is a conceptual approach referring to strengthening the skills, competencies and ability of people and communities in developing societies to overcome their exclusion and suffering (Wikipedia, 2012). The United Nations Development Programme (UNDP) defines capacity building as a long term continual process of development that involves all the stakeholders (UNDP, 2011). On the one hand, people learn from the consequences of their behavior (i.e., reinforcement); thus, they are likely to increase (decrease) the frequency of behavior that has resulted in positive (negative) consequences. This is also referred to as experiential learning (Huber 1996)

On the other hand, people can engage in vicarious learning by observing others before engaging in a particular behavior because doing so enables them to avoid needless and costly errors (Bandura, 1977). Information is required at all levels in the marketing channel. Before you decided to process and market any dairy product, it is important to know the potential market for each particular product (Kotler et al, 2009). This then requires securing and utilizing market information. Echeme & Nwachukwo (2010) concluded that the level of capacity building have positive impact on the implementation of Fadama II projects

There is a need to improve the capacity of milk producers and traders to understand and deal with milk marketing increasing their awareness of global changes. In addition, training in agro ecological technologies and practices for the production and conservation of fodder improves the supply of animal feed and reduces malnutrition and mortality in herds. The survival of individual dairy producers and traders will very much depend on how successfully they can win consumer confidence in their products. This calls for knowledge and skills in marketing

2.6.1: Trainings attended and sustainability of donor funded dairy projects

Studies have shown that farmer 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 (Macaskill, 2010). In Nigeria for instance, accessing agriculture services from the government is a big 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 training centres , Farmers commodity days, Field days are just platforms where dairy farmers can interact, ask questions and receive invites from fellow dairy farmer in particular to show case on his/her dairy breed. In such an interactive sessions, extension officers are able to educate and disseminate information on parasite prevention, first aid kit, breeding and A.I service to dairy cattle .Farmers too are linked up with agents who willfully commit to find market for farmers milk (Metcalfe, 2014).

In a study carried out in Ghana by Conley & Udry (1998), concluded that farmers learning occurs through social networks rather than in the context of the collective experiment and this need consistent backstopping by the extension agents. Various models about the relationship between market orientation and innovation have been proposed (Verhees, 2007). In many cases in kenya, extension service providers are not seen (Director of Agriculture report 20011). The government even had tried to provide uniforms but the truth of the matter is that the sevices being offered are obsolete and therefore the farmers are not satisfied by the services being offered. Muriuki (2003) reported that most of the extension officers skills could not match the farmers hence were not of any help to the dairy farmers as the farmers seemed to be more knowledgeable than the extension officers themseves on te technical areas and this led to the farmers low level of satisfaction.

2.6.2 Agricultural training centres and sustainanbility of donor funded projects

Agricultural training centres serve as platforms on which new technologies are disseminated for the purpose of enhanced agricultural productivity (Kebede, Gunjal and Coffin, 1990). H.G Muriuki (2008), reported that farmers are not able to reach most agricultural training centres where new technologies on production are exhibited. In the context of dairy production, it means the farmers would still remain to practice rudimentary meyhods of pests and diseases control, breeding methods, methods of feeding and cattle rearing just to mention but a few and all these would determine productivity in a negative way.

2.7 Government Policies and sustainability of donor funded dairy projects

Milk and dairy produce are essential elements of the daily diet almost everywhere in the world. Some 750 to 900 million people (or 12-14 percent of the world population) relied

on dairy farming to some extent. Dairy development therefore serve as a powerful tool for reducing poverty. Dairying operate under a variety of economic policies that directly or indirectly affect the ability of smallholders to save, invest, manage risk, trade and compete. Sound macroeconomic policies first and foremost provide price stability needed for long-term planning of investments, a competitive financial market where savings can be accumulated and channelled to areas with high rates of return and where public sector resources for an efficient rural infrastructure are available.

Scholars and policy makers believe that dairy policies is a major player of sustainability of dairy projects. Dairy policies in western Europe and north America are principally geared to the support of farm prices and the stabilisation of the producer income whereas most policies in developing countries and especially in the sub sahara Africa is aimed at providing cheap food to urban populations. This situation has led to policy conflicts (FAO. 1978 in milk and milk products: Supply, demand and trade projections for 1985. In (FAO commodity projections 1985. FAO, Rome). Policies in Indian dairy industry has been able to integrate the petty milk traders into the overall milk collection and distribution system thus creating complementary rather than competitive relationship in the operations of the dairy industry (Brumby and Gryseels, p.2 of this ILCA Bulletin). Dairy development objectives were similar in most of the countries of sub-Saharan Africa, but policy instruments achieved these objectives based on the potential of individual countries for dairy production.

The Asian Development Bank (ADB 1993) study on policies and strategies for livestock improvement in developing countries concluded that the primary policy failure was promotion of inappropriate technology. Kenyan policy objectives has focused on equity, growth and participation. The success of dairy production by smallholders apart from cattle population and better breeds, was also a result of a suitable climate and an enabling policy and institutional environment (Conelly 1998; Thorpe et al. 2000).

In kenya, dairy industry policies are contained in various government documents, which included written policies, legislation, development plans, sessional papers, legal notices and many others (MoALD, 1993). Dairy industry policies in kenya was described as one of the most impressive in developing world and can boast of a century progress. Policy and legislative environment are affected by the following issues, namely; pace of policy revisions to allow the dairy farmers compete favourably in the international market, institutional capacities to enforce regulations, stakeholder representations, infrastructure and services

environment, provision of health services, provision of breeding services, access to credit and market accessibility(KDB 1996)

There is an urgent need for a quick review of the policies and regulations that are not in tandem with broader national goals (e.g., Creation of employment) and the economic reality of the day. Harmonization of the different acts that affected the dairy sector is required to reduce existing conflicts. Private Service provision is encouraged with appropriate policies to fill gaps created by the liberalization process. Where that was not possible, sustainable alternatives were sought, such as the introduction of cost sharing, or the training and equipping of community-based service providers. Institutions charged with the implementation of stated policies and regulations were made effective by provision of adequate resources and capacity. Where appropriate, institutions explored alternative systems, such as self-regulation and partnership with the private sector and full representation of all stakeholders on key bodies which influenced policy ensured that the process of policy reform fully reflected the economic realities currently operating in the dairy sector. **(**Kenya Smallholder Dairy Project website, 2004).

On the other hand donor policies are important because they influence how contracts are prepared, the duration of funding, and what is funded. OECD report (1989) identified important donor policies related factors that affected project sustainability. These included: Planning horizon, delivery and contracting mechanisms and operation and maintenance costs. It was widely recognized that the usual three to five year planning horizon for development programs and projects was often inadequate in terms of promoting sustainable benefits, particularly when behavioural and institutional change were included in the objectives or if there are multiple local agencies involved or a wide geographical spread.

Open-ended commitments were not appropriate; however, phasing implementation over a longer period was a management strategy which supported sustainable benefits. Phasing required that goals and objectives were clear from the beginning and that there were clear decision points at the end of each phase. Where there is uncertainty about local policy, capacity or commitment then an initial pilot phase, which led on to a number of subsequent phases, is more in the rule than the exception (White, Salamanca and Courtney, 2002).

A strong sense of local ownership and genuine participation in design by both men and women are critical to successful implementation and sustainable benefits. However, policies on how donors aid program was designed and delivered can work against this. According to

Francis (2001), the key concerns include: i) Design process; Designs which are expected to result in sustainable benefits should build on local demand and initiatives. Design missions are therefore appropriately phased over an extended time-line (that is; one mission of three to four weeks is not usually adequate for larger more complex projects). More 'up front' time for design is not the only answer; an extended inception phase and allowance for a 'progressive design' process during implementation (using annual planning procedures to restructure the program/project scope) is a practical responses to this issue. ii) Team selection; the professionalism and inter-personal skills (expatriate or locally engaged) is an important factor in sustainability.

Selection policies and criteria are therefore ensured that as broad labour market as possible is tapped and that the best consultants are selected. iii) Development is a dynamic and often high-risk activity, it is therefore important that designs have flexibility and lead to contracting approaches that allow field-level managers to respond quickly to changing circumstances and which encourage them to keep sustainable benefits in mind. iv) Monitoring and reporting frameworks based on log-frames should look beyond the contracted activity and output levels and incorporate regular assessment of the movement towards achieving sustainable outcomes. v) Partner selection; The government-to-government nature of bilateral aid programs requires that high-level (national) aid coordination mechanisms are in place. However, when programs and projects are being implemented in partnership with county or sub-county agencies or communities, it is important for sustainability that donors agree with this level of government that document their roles and responsibilities, and that there is appropriate channels for delivering resources and receiving feedback (ESADA 2008)

Funding policies often focus on new capital investments to the exclusion of supporting operation and maintenance budgets as this had adverse effects on sustainability, particularly in economies undergoing severe internal budget deficit problems. New capital projects required additional operation and maintenance funds that draw from the same limited pool of funds that finance other ongoing programs. A longer-term and more transitional approach to operation and maintenance cost funding is required, based on a rigorous and realistic assessment of the local capacity to meet these costs(World bank , 2005 commission)

According to Natasha (2003), programs and projects which integrate with, and build on, local management structures has better prospects for promoting sustainability of benefits than those which establish new or parallel structures. The capacity of local agencies to

manage or absorb new structures, systems, ideas and funds is often not adequately assessed and over-optimistic assumptions are made. Getting the management structure 'right' require an adequate institutional analysis during the project design phase and this requires specific knowledge, skills and field.

In most of the groups funded by many donors, they are encouraged to form rules and regulations that would guide their operations. Many dairy Common interest groups were for example encouraged to form rules that assisted them to regularly carry out elections and even pass on offsprings to the new beneficiaries. All the rules and guidelines are anchored on the policies of the department of social services. Therefore in this study, government policies was a moderating factor to determinants of sustainability of the donor funded dairy projects in Malava north sub-county which was an objective.

2.8 Theoretical framework

This study was guided by a population theory and economic model.

2.8.1 Theory of population

Sustainability of donor funded dairy project can be premissed on the theory of population written by Malthus. 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. His argument was essentially that population grew geometrically (1,2,4,8,16,32) whereas food production and resource provision grew at a slower arithmetic rate (1,2,3,4,5,6). He concluded that because of this more and more peasants and subsistence farmers lived poorer and poorer lives until some checks came into place. He proposed that there would be positive checks, which raised the death rate like hunger, diseases and war and preventative ones, which lower the birth rate like postponement of marriage and celibacy. His work went through many editions but never again was sustainability revised as far as the selection here was concerned (Books, 2010).

Alternative viewpoint came from Esther Boserup, a Danish economist who published ‘‘The Economics of Agrarian Change under Population Pressure’’, who suggested that human innovation and technological advances would allow food production to keep up with population growth. She said that the conditions of agricultural growth, process of raising production at the cost of more work at lower efficiency is described as "agricultural intensification".

Julian Simon supported Boserup’s view that humanity would innovate its way out of disaster. "We now have in our hands; - really, in our libraries - the technology to feed, clothe,

and supply energy to an ever-growing population for the next seven billion years." (Simon, along " The State of Humanity: Steadily improving 1995).

From the proposed study, it was assumed that use of technological innovations contributed to sustainability of donor funded dairy projects by increasing food availability through milk and therefore increased income to the farmers who later plough back the investment and even expand the enterprise in keeping up with population increase.

2.8.2 Economic Model

Sustainability of donor funded dairy project was premissed on the economic models theory which proposed to sustain opportunity usually in the form of capital. According to the classic definition formulated by the economist Robert Solow, we should think of sustainability as an investment problem, in which we must use returns from the use of natural resources to create new opportunities of equal or greater value. Social spending on the poor or on environmental protection, while perhaps justifiable on other grounds, takes away from this investment and so competes with a commitment to sustainability.With another view of capital, however, the economic model might look different. If we do not assume that"natural capital" is always interchangeable with financial capital, argued Daly (1996) and other proponents of ecological economics, then sustaining opportunity for the future requires strong conservation measures to preserve ecological goods and to keep economies operating in respect of natural limits. From the above mentioned model, dairy project acts as an economic unit for investment hence its sustainability lies on use of returns to create new opportunities.

2.9 Conceptual framework

The conceptual framework was developed from the independent and depent variables. Climate determinants played a very big role in milk production and therefore income increase were considered independent variables. Technology determinants like type of technologies, the number of technologies adopted that increased production among others was considered an independent variable in the study. Culture also an independent variable included gender roles, culture and beliefs, level of education and alternative farming practice thereby influencing dairy farming in the study. Extension services provision to the dairy farmers, level of of satisfaction with extension officers, types of services offered, number of training centres available, number of trainings attended and skills and knowledg eacquired by the farmers wasalso an independent variable in the sustainability of the donor funded dairy projects in

Malava sub-county, kenya. Policy by the government on donor projects, subsidies, infrastructure and lastly force majeure were considered as moderating variables on the determinants of sustainability of the donor funded dairy projects.

On the other hand which is dependent variable, sustainability of the donor funded dairy projects factors considered were increase in milk production and income from the milk sales were considered.

2.9.1 The relationship between determinants and sustainability of dairy projects

The figure below shows the relationship between the independent and the dependent variables

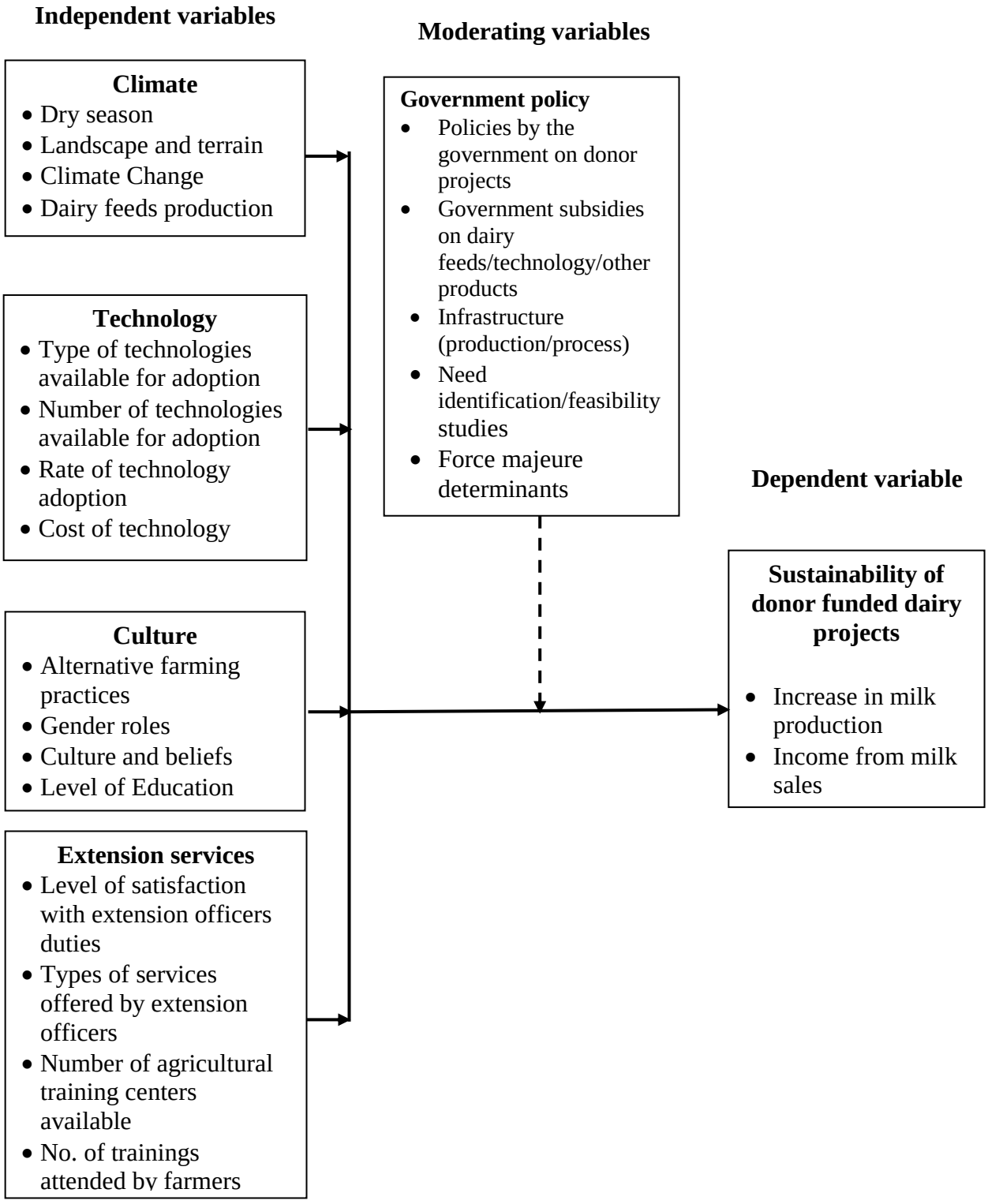

Figure 2.1: Conceptual framework of the Study

The above conceptual framework show key determinants of sustainability of the donor funded dairy projects in Malava sub-county, Kenya. In order to achieve the full potential of dairy farming in Malava sub-county Kenya, (Backlund, 2009) the above factors played a pivotal role and needed to be looked at. Up to date climate factors like dry seasons, landscape and terrain,climate change and dairy feeds production were considered. Under factors of technology the themes for the study were,type of technologies available for adoption,number of technologies availble for adoption,rate of the technology adoption and the cost of the technology.

Other variables were culture. Under culture, themes considered were;alternative farming practices,gendr roles, culture and beliefs and the level of education. Another variable was extension services. These formed the key independent variables that determined sustainability of donor funded dairy projects; a case of Malava sub -county, Kenya. The moderating variable was the policies put in place by the government. This study capitalized on independent variables and focused on their influence positively or negatively on dependant variable; Sustainability of donor funded dairy projects (Assessment.1986).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter details 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 adopted a descriptive research design. According to Cooper and Emory (1995), the objective of the descriptive study is to describe phenomena as it exists at present. A descriptive design was appropriate for this study as it enabled the researcher to investigate the target population and established the factors under investigation. The study adopted both qualitative and quantitative research approaches. The qualitative data was analysed using the content analysis from narration of experience obtained. An interview schedule and questionnaire was used for data collection since it was cheap, unbiased and able to collect large amounts of data.

The adopted design which generated both qualitative and quantitative data from the research objectives. This is because it is most appropriate as it involves description, analysis and interpretation of the circumstances at the time of the study.(Peil, 1995). Qualitative and quantitative data analysis was done to determine the relationships between the independent and the dependent variables. The descriptive research design involves the selection of a sample from the population to be studied. This design facilitated the collection of enormous data within a short time and with minimal efforts and financial constraints.

3.3 Target Population

The target population for this study was 1802 small scale dairy farmers from Malava sub county (Liu, 2008). 34 in number of key informants included sub-county livestock production officer. Employees working in the western kenya CDD donor funded project in Malava, Kenya, Livestock officers, relevant stakeholders. These included; Assistant chiefs, sub commitees and representative samples drawn from each of these groups.

3.4 Sampling Procedure

By use of Krejcie & Morgan table (1970), the sample size prepared was 351. From a population of 1800 farmers, a sample of 317 farmers were interviewed. Systematic sampling techniques was adopted in this case. The dairy farmers were interviewed by use of questionnaires. This was appropriate due to the non-homogeneity of the dairy farmers funded projects in terms of size of projects and therefore benefits to be realised. Through focus group discussions, the study focused on the technical staff from livestock department, and other relevant technical staff where applicable, This helped the study to achieve the needed information. A systematic sample of respondents was drawn from the categories which represent the target population. The sample size was summarized and presented.

N=1800, n=317, K=N/n=5.67, This was rounded off to 6

3.4.1 Target respondents

Table below summarises the number of dairy farmers clustered in the six wards covered in Malava sub-county

Table 3.1: Target population

Ward	No. of dairy farmers	Proportion	Sample Size	Sampling Procedure
West Kabras	434	0.23	79	Stratified random sampling
Chemuche	196	0.11	31	
East Kabras	324	0.18	57	
Butali/Chegulo	250	0.14	44	
Manda/Shivanga	370	0.21	67	
Shirugu/Mugai	226	0.13	39	
Total	**1,800**	**1.00**	**317**	

The second sub-set included a total of 34 key respondents, (7 livestock staff, 7 ward administrators, 10 Assistant chiefs and 10Pool MATs from western Kenya Community driven development and flood mitigation project in Malava sub-county, and census approach was

adopted to interview all the key informants. Out of the 34 key respondents, 25 took part in the interview.

3.5 Methods of data collection

The study utilized primary data which was both qualitative and quantitative data. This data was collected through administration of questionnaires. A questionnaire was designed to capture the various variables of the study. The questionnaire had both open-ended and closed questions covering issues on the project sustainability. Open ended questions had free responses from the respondents, without providing or suggesting any structure for the replies. The closed questions enabled the researcher to analyze data easily using the stated alternatives. These alternatives were designed in such a way as to be simple for the respondents to understand. Questionnaires were chosen because they helped the researcher to collect large amount of information in a large area within a short period of time (Orodho, 2003).

Questionnaire were self administered. The researcher collected primary data through field research and an introductory letter from The University of Nairobi and a permit from the National Council for Science, Technology and Innovations in the state department of higher education, science and technology (NACOSTI) before embarking on the data collection exercise. The documents were presented to the respondents together with the letter of transmittal. The researcher re-assured the respondents about the confidentiality of their feedback. This encouraged the respondents to be honest.

3.6 Validity of Research instruments

Validity is the accuracy and meaningfulness of inferences, which are based on the research results; it is the degree to which results obtained from the analysis of the data actually represent the phenomenon under study (Mugenda & Mugenda, 2003). The researcher looked into the following measures to ensure validity: Survey questions to be made based on literature review. The questionnaires were pre-tested on a pilot survey carried out in South Kabras ward and amendments made to make it clearer to respondents. The instrument was subjected to face validity by the University supervisor (Clark, 1998). Best and Khan (2005) suggested that the validy of the instrument is asking the right questions framed from the least ambigous way and based on study objections.

3.7 Reliability of Research instruments

Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials, Mugenda and Mugenda (2003). Joppe (2000) defines reliability as the extent to which results are consistent over time and an accurate representation of the total population under study. If the results of a study can be reproduced under a similar methodology, then the instrument is considered to be reliable. A mini study was conducted of 35 farmers outside the area targeted for the research. After a week, the mini study was repeated and findings drawn using Cronbachs alpha co-efficient using SPSS package. The reliability co-efficient was >0.7, thus the instrument was reliable. (Clark, 1998)

Reliability was evaluated using Cronbach alpha. Table 3.2 shows that Alpha value for climate factors was 0.855; technology factors was 0.732; factors on culture was 0.798; sustainability was 0.803; and government policies was 0.800 which registered acceptability (>0.6). This showed that instrument consistently measured what it was intended to measure.

Table 3.2: Cronbach's Alpha Analysis

Variables	Cronbach Alpha	N
Climate	.855	4
Technology	.732	4
Culture	.798	4
Extension services	.727	5
Sustainability	.803	2
Government policies	.800	5

3.8 Methods of Data Analysis

According to Bryman and Cramer (1997), data analysis seeks to fulfill research objectives and provide answers to the research questions. The choice of analysis procedures depended on how well the techniques were suited to the study objectives and scale of measurement of the variable in question. The researcher used both qualitative and quantitative methods of data analysis. Qualitative data was analysed using content analysis of themes and expressed as naratives. Raw data collected was edited organized, into themes, grouped, interpreted, and presented in frequency tables.

Quantitative, data from the study was edited and analyzed using the Statistical Package for Social Sciences (SPSS) a computer software. All questionnaires were edited and responses coded before data entry into the computer for further analysis by use of the Statistical Package for Social Scientists (SPSS). Cross tabulation with chi-square tests was the main method used for data analysis. After analysis, data was summarized and presented in form of frequency tables, percentages, and chi-tets.

3.8 Operational definition of Variables

The below matrix was used to operationalize objective, variable, indicator, measurement and measurement scale, data collection tools and data analysis.

Table: 3.3 Operationalization Table

Objective	Indicators	Measurement Scale	Data Collection Tools	Tools Analysis
To determine the extent to which climate determine sustainability of donor funded dairy projects	- Dry seasons - Climate changes - Landscape and terrain - Dairy feeds production	- Ordinal - Ordinal - Ordinal - Ordinal	Questionnaires	- Frequency tables, contingency analysis with chi-square
To assess the extent to which technology determine sustainability of donor funded dairy projects	- Types of technologies available for adoption - Number of technologies available for adoption - Rate of technology adoption	- Ordinal - Ordinal - Ordinal	Questionnaires	- Frequency tables, contingency analysis with chi-square

	- Cost of technology	- Ordinal		
To evaluate the extent to which culture determine sustainability of donor funded dairy projects	- Alternative farming practices - Gender roles - Culture and beliefs - Level of education	- Ordinal - Ordinal - Ordinal - Ordinal	Questionnaires	- Frequency tables, contingency analysis with chi-square
To establish the extent to which extension services determine sustainability of donor funded dairy projects	- Level of satisfaction with extension officers duties - Types of services offered by extension officers - Number of agricultural training centers available - Number of trainings attended by farmers	- Ordinal - Ordinal - Ordinal - Ordinal	Questionnaires	- Frequency tables, contingency analysis with chi-square

3.9 Ethical considerations

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 communally 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 respondents 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) of adoption; 25% indicated lack of enough trainings/trainers; 9.7% indicated ignorance; 7.7% indicated lack of enough materials; while 5% indicated insufficient time.

3.10 Summary

This chapter covers the research method used in carrying out the study. It includes research design, target population, sampling procedure, data collection instruments, validity and reliability of research instruments included, pilot testing and data analysis techniques.

CHAPTER FOUR

DATA, PRESENTATION INTERPRETATION AND DISCUSSION

4.1 Introduction

This chapter presents the study findings in line with the guiding objective. The presentation is in six sections. Section 4.2 presents the findings on the response rate and the background information. Section 4.3 the climate factors, section 4.4 technological factors, section 4.5 the cultural factors and section 4.6 the policies that influence sustainability of donor funded dairy projects in Malava sub-county, Kenya.

4.2. Questionnaire Return Rate

From a sample size of 317, 258 questions were returned completely duly filled. This gave 80% return rate.

Table: 4.1: Questionnaire Return Rate

Respondents	Target Population	Sample size	Returned	Percentage
Funded dairy Farmers	1,800	317	258	80.0
Total	**1800**	**317**	**258**	**80.0**

4.3: Demographic characteristics of the respondents

In this case the study looked at;gender of the respondents,their marital status and educational level as discussed here below.

4.3.1 Gender of the respondents

The study was interested in establishing the demographic characteristics of the population under study and in which categories were presented as gender, marital statuses,education level and the period one had been in farming. Thompson (2007) asserts that studying demographic trends is important, as the size of different demographic groups changes over time as a result of economic, cultural and political circumstances. Therefore the

study sought to establish the gender of respondents as a component within demographics and the results were sort as follows;

Table 4.2: Gender of the respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	167	64.7	64.7	64.7
	Male	91	35.3	35.3	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.2 revealed that 167 (64.7%) females participated in the study as majority followed 91 (35.3%) males. Implying that more females than males who participated in the study were involved either directly or indirectly in donor funded dairy projects within Malava sub-county.

4.3.2 Respondents' marital status

As a component within demographics of the population's study, the study sought to establish the marital characteristic among the population under study and the results were as presented in table 4.3;

Table 4.3: Frequency distribution on respondents' marital status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single	47	18.2	18.2	18.2
	Married	145	56.2	56.2	74.4
	Widow	66	25.6	25.6	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.3. revealed that majority of respondents that took part in the study were married as represented by 145 (56.2%), followed by widowed respondents, 66 (25.6%)

and lastly the minority group were the single who stood at 47 (18.2%). Implying that majority of married were likely to be involved in the donor funded dairy projects, than were widows and married. This would maybe be attributed to the cumbersomeness of taking care of such projects.

4.3.3 Education level of respondents

In the study, educational level of the respondents were looked at to establish whether this within other variables determined the dependent variable of the study. The findings were as shown in the table below.

Table 4.4: Frequency distribution on respondents education level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	69	26.7	26.7	26.7
	Primary	59	22.9	22.9	49.6
	O-level	130	50.4	50.4	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.4 indicated that majority of respondents in the study were of O-level education status as presented by 130 (50.4%), followed by semi-literate at 69 (26.7%) and lastly, those with Primary level of education qualification stood at 59 (22.9%). This implied that majority of famers involved in donor funded dairy projects were of O-level status of education. The study further sought to study the period one had been in dairy production as a component of demographic factors and the results were as presented in tbale 4.5;

4.3.4 Respondents period of years in dairy farming

The study also looked at the period that the respondents had practiced dairy farming and the results were as in the table below.

Table 4.5: Frequency distribution on the period respondents have been in farming

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 - 3 years	124	48.1	48.1	48.1
	2 - 5 years	91	35.3	35.3	83.3
	3 - 6 years	43	16.7	16.7	100.0
	Total	**258**	**100.0**	**100.0**	

According to findings from this study in table 4.5, majority of farmers had been in farming for a period between 1 – 3 years, 124 (48.1%) followed by those who had been in dairy farming for a period between 2 – 5 years, 91 (35.3%) and lastly farmers that had been in dairy farming for the period between 3 – 6 years were represented by 43 (16.7%). This could have been attributed to the county government's consideration of dairy enterprise as a flagship project.

4.4. Climate as a determinant of sustainability of donor funded dairy projects

This was the first objective of the study where the researcher sought to establish the extent to which climate determined sustainability of donor funded dairy projects in Malava sub-county. According to Burlew (2016) climate change has had critical impact on the animal feed supply and water availability. The change has effect on the time of planting of forage feed supplies hence reduces the quality and quantity hence impacts on the availability, price and animal performance.

4.4.1. Dry seasons

The study therefore sought to establish whether dry seasons as a component within climate determined sustainability of donor funded dairy projects whereby respondents were asked to state their responses from within a scale (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree) and the results were as presented in table 4.6;

Table 4.6: Frequency distribution dry season and sustainability of dairy projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	114	44.2	44.2	44.2
	A	122	47.3	47.3	91.5
	NS	12	4.7	4.7	96.1
	D	10	3.9	3.9	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.6 indicated that majority among farmers who participated in the study 122 (47.3%) agreed that dry seasons determine sustainability of donor funded dairy projects, followed by 114 (44.2%) who strongly agreed, 12 (4.7%) that were not sure and lastly 10 (3.9%) who disagreed that dry seasons determine sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.7;

Table 4.7: Cross tabulation on dry season and sustainability of dairy projects

			Dry season determines sustainability of donor funded dairy projects				Total
			SA	A	NS	D	
Project sustainability	yes	Count & % within dry season	62 54.4%	84 68.9%	10 83.3%	7 70.0%	163 63.2%
	no	Count & % within dry season	52 45.6%	38 31.1%	2 16.7%	3 30.0%	95 36.8%
	Total	**Count & % within dry season**	**114** **100.0%**	**122** **100.0%**	**12** **100.0%**	**10** **100.0%**	**258** **100.0%**

According to results from the contingency table 4.7, while 68.9% within determining sustainability under strongly agree category respondents opined that dry season determines sustainability of donor funded dairy projects in Malava sub-county, whereas 31.1% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between dry seasons and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value = 7.772, df = 3, p = .051). 54.5% of the farmers strongly agreed that dry seasons determine sustainability of donor funded dairy projects in Malava sub-county. This may be attributed to the scarcity of forages, and water sources and quantity reducing during the dry seasons.

The findings concure with Mendelsohn and Seo (2006) in their study found out that that higher temperatures and changing rainfall patterns, translated into the increased spread of existing vector-borne diseases and macro parasites, accompanied by the emergence and circulation of new diseases. IFAD (2009) recorded that dry seasons affect livestock drinking water sources, but also had a bearing on livestock feed production systems and pasture yield which modified animal diets and compromised the ability of the small holders to manage feed deficits

4.4.2. Climate change determinants

The study investigated from among responses provided by the population under study as to whether changes witin climate determined sustainability of donor funded dairy projects whereby respondents were asked to state their responses from within a scale (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree) and the results were as presented in table 4.8

Table 4.8: Frequency distribution on climate change and sustainability of projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	115	44.6	44.6	44.6
	A	120	46.5	46.5	91.1
	NS	13	5.0	5.0	96.1
	D	10	3.9	3.9	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.8 indicated that majority among farmers who participated in the study, 120 (46.5%) agreed that climate change determines sustainability of donor funded dairy projects, followed by 112 (44.6%) who strongly agreed, 13 (5.0%) that were not sure and lastly 10 (3.9%) who disagreed that climate changes determine sustainability of donor funded dairy projects. When joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.9;

Table 4.9: Cross tabulation on climate change and sustainability of dairy projects

			Climate change determines sustainability of donor funded dairy projects				
			SA	**A**	**NS**	**D**	**Total**
Project sustainability	Yes	Count & % within climate change	55 47.8%	91 75.8%	11 84.6%	6 60.0%	**163** **63.2%**
	No	Count & % within climate change	60 52.2%	29 24.2%	2 15.4%	4 40.0%	**95** **36.8%**
	Total	**Count & % within climatic change**	**115** **100.0 %**	**120** **100.0%**	**13** **100.0%**	**10** **100.0%**	**258** **100.0%**

According to results from the contingency table 4.9, while 75.8% within determining sustainability under agree category opined that climate change determines sustainability of donor funded dairy projects in Malava sub-county, whereas 24.2% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between climate changes and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value

= 22.5041 df = 3, p = .001). 47.8% farmers strongly agreed that climate changes determines sustainability of donor funded dairy projects in Malava sub-county.

The findigs above concure with Burlew (2016) that the change has effect on the time of planting of forage feed supplies hence reduces the quality and quantity hence impacts on the availability, price and animal performance.

4.4.3 Landscape and terrain

The study inquired from among responses provided by the population under study as to whether landscape and terrain as a factor within climate determines sustainability of donor funded dairy projects whereby respopndents were asked to state their responses from within a scale (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree) and the results were as presented in table 4.10

Table 4.10: Distribution on landscape and terrain on sustainability of dairy projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	113	43.8	43.8	43.8
	A	122	47.3	47.3	91.1
	NS	13	5.0	5.0	96.1
	D	10	3.9	3.9	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.10 indicated that majority among respondents who participated in the study 114 (44.2%) strongly agreed that landscape and terrain determines sustainability of donor funded dairy projects, followed by 112 (47.3%) who agreed, 12 (4.7%) were not sure and lastly only 10 (3.9%) disagreed that terrain determines sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.11;

Table 4.11: Cross tabulation on landscape and terrain on sustainability of the projects

Landscape and terrain determines sustainability of donor funded dairy projects							
			SA	**D**	**NS**	**A**	**Total**
Project sustainability	Yes	Count & % within landscape and terrain	58 51.3%	89 73.0%	10 76.9%	6 60.0%	**163** **63.2%**
	No	Count & % within landscape and terrain	55 48.7%	33 27.0%	3 23.1%	4 40.0%	**95** **36.8%**
	Total	**Count & % within landscape and terrain**	**113** **100.0%**	**122** **100.0%**	**13** **100.0%**	**10** **100.0%**	**258** **100.0%**

According to results from the contingency table 4.11, while 63.2% determines sustainability. Under Agree category respondents opined that landscpae determines sustainability of donor funded dairy projects in Malava sub-county, whereas 27.0% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between landscape and terrain and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value = 12.929, df = 3, p = .005). 51.3% farmers strongly agreed that landscape and terrain determines sustainability of donor funded dairy projects in Malava sub-county. This may be attributed to the micro- climate thar comes with the changes in the terrains and even the topograpical relief which would influence fodder production and even the pests and diseases build up which would influence production.

4.4.4. Dairy feeds production

The study sought to establish whether as a component within climate, dairy feeds production determined sustainability of donor funded dairy projects whereby respopndents

were asked to state their responses from within a scale (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree) and the results were as presented in table 4.12

Table 4.12: Distribution on dairy feeds production and sustainability of dairy projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	113	43.8	43.8	43.8
	A	121	46.9	46.9	90.7
	NS	13	5.0	5.0	95.7
	D	11	4.3	4.3	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.12 indicated that majority among farmers who participated in the study 121 (46.9%) agreed that dairy feeds production determine sustainability of donor funded dairy projects, followed by 113 (43.8%) who strongly agreed, 13 (5.0%) that were not sure and lastly 11 (4.3%) who disagreed that dairy feeds production determines sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.13;

Table 4.13: Tabulation on dairy feeds production and sustainability of dairy projects

Dairy feeds production determines sustainability of donor funded dairy projects							Total
			SA	**A**	**NS**	**D**	
Project sustainability	Yes	Count & % within dairy feeds production	60 53.1%	87 71.9%	10 76.9%	6 54.5%	**163** **63.2%**
	No	Count & % within dairy feeds production	53 46.9%	34 28.1%	3 23.1%	5 45.5%	**95** **36.8%**
	Total	Count & % within dairy feeds production	**113** **100.0%**	**121** **100.0%**	**13** **100.0%**	**11** **100.0%**	**258** **100.0%**

According to results from the contingency table 4.13, while 71.9% under agree category, respondents opined that dairy feeds production determines sustainability of donor funded dairy projects in Malava sub-county, whereas less than half 54.5% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between dairy feeds production and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value = 10.302, df = 3, p = .016). 47.8% farmers strongly agreed that dairy feeds production determine sustainability of donor funded dairy projects in Malava sub-county. Feeds produced enhances good feeding regimes and this results into enhanced milk production and therefore improved sales hence income at the household level.

4.5. Technology as a determinant of dairy project sustainability

Technology is aimed to ease work of the entity to which it applied. This was the second objective of the study whereby technology, as relates to dairying, is a set of new practices

integrated into a dairy production package that aimed to assist a farmer to produce milk more efficiently and effectively than the conventional methods. Bonabana-Wabbi (2002) asserts that the dynamic process of adoption involved learning about a technology over time. In fact many innovations required a lengthy period often of many years from the time they became available to the time they were widely adopted (Bonabana-Wabbi, 2002; Rogers, 1995; Enos and Park, 1988). The study therfore sought to study whether components within technology determined sustainability of dairy donor funded projects in Malava sub-county of kenya. These were studied under the following sub-thematic areas;

4.5.1. Types of technologies available for adoption

As a component within technology, the types of technologies available for adoption were studied to establish whether they determined sustainability of donor funded dairy projects. Technologies studied included Zero grazing, ticks and flies control, worms and helminthes control, artificial insemination and feed compounding. Respondents were asked to state their responses from within a scale measuring their perception and satisfaction levels (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree) and the responses solicited were as presented in table 4.14

Table 4.14: Frequency on type of technologies and sustainability of dairy projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	119	46.1	46.1	46.1
	A	117	45.3	45.3	91.5
	NS	13	5.0	5.0	96.5
	D	9	3.5	3.5	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.14 indicated that majority among farmers who participated in the study 119 (46.1%) strongly agreed that type of technology available for adoption determined sustainability of donor funded dairy projects, followed by 117 (45.3%) who agreed, 13 (5.0%) that were not sure and lastly 9 (3.5%) who disagreed that type of technologies available for adoption determined sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in

combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.15;

Table 4.15: Tabulation on type of technologies and sustainability of dairy projects

Type of technologies available for adoption determine sustainability of donor funded dairy							**Total**
			SA	**A**	**NS**	**D**	
Project sustainability	Yes	Count & % within type of technologies available for adoption	64 53.8%	84 71.8%	9 69.2%	6 66.7%	**163** **63.2%**
	No	Count & % within type of technologies available for adoption	55 46.2%	33 28.2%	4 30.8%	3 33.3%	**95** **36.8%**
	Total	**Count & % within type of technologies available for adoption**	**119** **100.0%**	**117** **100.0%**	**13** **100.0%**	**9** **100.0%**	**258** **100.0%**

According to results from the contingency table 4.15, while 71.8% within determining sustainability under Agree category respondents opined that types of technologies available for adoption determines sustainability of donor funded dairy projects in Malava sub-county, whereas less than half 28.2% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between type of technology available

for adoption and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value = 8.503, df = 3, p = .037). 53.8% farmers strongly agreed that type of technology available for adoption determine sustainability of donor funded dairy projects in Malava sub-county. The technology in this case included pests control, good milking techniques, feed compounding with high energy values to mention just a few.

The finding above concure with the literature. Macaskill (2010) reported that the quantity of milk (yield) produced in a year by an animal varied enormously according to breed, feed and management practices which is as a result of technology.

4.5.2. Number of technologies available for adoption

As a component within technology, the study sought to solicit responses from within the population on their levels of satisfaction as to whether the number of technologies available for adoption regards and the results were as presented in table 4.16;

Table 4.16: Frequency on Number of technologies and sustainability of dairy projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	113	43.8	43.8	43.8
	A	121	46.9	46.9	90.7
	NS	13	5.0	5.0	95.7
	D	11	4.3	4.3	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.16 indicated that majority among farmers who participated in the study 121 (46.9%) agreed that number of technologies available for adoption determines sustainability of donor funded dairy projects, followed by 113 (43.8%) who strongly agreed, 13 (5.0%) that were not sure and lastly 11 (4.3%) who disagreed that number of technologies available for adoption determine sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such

small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.17;

Table 4.17: Tabulation on number of technologies and sustainability of dairy projects

Number of technologies available for adoption determines sustainability of donor funded dairy projects							**Total**
			SA	**A**	**NS**	**D**	
Project sustainability	Yes	Count & % within technologies available for adoption	60 53.1%	85 70.2%	10 76.9%	8 72.7%	**163** **63.2%**
	No	Count & % within technologies available for adoption	53 46.9%	36 29.8%	3 23.1%	3 27.3%	**95** **36.8%**
	Total	**Count & % within technologies available for adoption**	**113** **100.0%**	**121** **100.0%**	**13** **100.0%**	**11** **100.0%**	**258** **100.0%**

According to results from the contingency table 4.17, while 70.2% within determining sustainability under agree category respondents opined that technologies available determines sustainability of donor funded dairy projects in Malava sub-county, whereas 29.8% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between number of technologies available for adoption and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value = 9.023, df = 3, p = .029). 53.1% farmers strongly agreed that number of technologies available for adoption determine sustainability of donor funded dairy projects in Malava sub-county.

Number of the technologies available at the farmers disposal reduces the costs of pests and diseases control thereby increasing the chances of increased milk production. This concures with Books (2010), wereby world milk production after stagnating in 2009 rebounded in 2010 as a result of the technologies adopted.

4.5.3. Rate of technology adoption

Wabbi, et. Al (2002) assert that many innovations required a lengthy period often of many years from the time they became available to the time they were widely adopted. The rate of adoption is usually measured by the length of time required for certain percentage of members of a system to adopt an innovation. Extent of adoption on the other hand was measured from the number of technologies being adopted and the number of producers adopting them. Therefore, the study aimed to establish whether, the rate of technology adoption as a component within technology determined sustainability of donor funded dairy projects and responses were solicited from within a scale measurign their perception and satisfaction levels (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree) and the responses solicited were as presented in table 4.18;

Table 4.18: Frequency on rate of technology adoption and sustainability of dairy projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	118	45.7	45.7	45.7
	A	117	45.3	45.3	91.1
	NS	13	5.0	5.0	96.1
	D	10	3.9	3.9	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.18 indicated that majority among farmers who participated in the study 118 (45.7%) strongly agreed that rate of technology adoption determines sustainability of donor funded dairy projects, followed by 117 (45.3%) who agreed, 13 (5.0%) that were not sure and lastly 10 (3.9%) who disagreed that rate of technology adoption determine sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square

as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.19;

Table 4.19: Tabulation on rate of technology adoption and dairy projects sustainabilty

Rate of technology adoption determines sustainability of donor funded dairy projects							**Total**
			SA	**D**	**NS**	**A**	
Project sustainability	Yes	Count & % within rate of technology adoption	62 52.5%	85 72.6%	10 76.9%	6 60.0%	163 63.2%
	No	Count & % within rate of technology adoption	56 47.5%	32 27.4%	3 23.1%	4 40.0%	95 36.8%
	Total	**Count & % within rate of technology adoption**	**118** **100.0%**	**117** **100.0%**	**13** **100.0%**	**10** **100.0%**	**258** **100.0%**

According to results from the contingency table 4.19, while 52.5% within determining sustainability under Strongly agree category respondents opined that rate of technology adoption determines sustainability of donor funded dairy projects in Malava sub-county, whereas 47.5% held a contrary opinion. Pearson chi-square test was conducted to examine whether there was a relationship between rate of technology adoption by farmers and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value = 11.349, df = 3, p = .010). 52.5% farmers strongly agreed that rate of technology adoption by farmers determine sustainability of donor funded dairy projects in Malava sub-county. The findings concures with the findings

of Bebo (2003) Director of Livestock production (2008) that Coast, Western and Nyanza Provinces were poor in adoption of dairy technologies with poor nutrition of livestock being recorded as the main reason for poor production

4.5.4. Cost of technology

As a component within technology, the cost of available technologies were measured. From within a scale measurign their perception and satisfaction levels with teh cost of available technolgoies (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree) and the responses solicited were as presented in table 4.20

Table 4.20: Frequency on cost of technology and sustainability of dairy projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	155	60.1	60.1	60.1
	A	89	34.5	34.5	94.6
	NS	7	2.7	2.7	97.3
	D	7	2.7	2.7	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.20 indicated that majority among farmers who participated in the study 155 (60.1%) strongly agreed that cost of technology determines sustainability of donor funded dairy projects, followed by 89 (34.5%) who agreed, 7 (2.7%) that were not sure and lastly 7 (2.7%) who disagreed that cost of technologies determine sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.21. The cost of the technology would also determine its up take for use by the funded dairy farmers.

Table 4.21: Tabulation on cost of technology available and dairy projects sustainability

Cost of technology and and sustainability of donor funded projects							Total
			SA	**A**	**NS**	**D**	
Project sustainability	Yes	Count & % within cost of technology and sustainability of donor funded projects	97 62.6%	55 61.8%	5 71.4%	6 85.7%	**163** **63.2%**
	No	Count & % within cost of technology and sustainability of donor funded projects	58 37.4%	34 38.2%	2 28.6%	1 14.3%	**95** **36.8%**
Total		**Count & % within cost of technology and sustainability of donor funded projects**	**155** **100.0%**	**89** **100.0%**	**7** **100.0%**	**7** **100.0%**	**258** **100.0%**

According to results from the contingency table 4.21, while 62.6% within determining sustainability under Strongly agree category respondents opined that cost of technology determines sustainability of donor funded dairy projects in Malava sub-county, whereas 37.4% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between cost of technology and sustainability of donor funded dairy projects. The results revealed that there was no significant relationship between the two variables (chi-square value = 1.830, df = 3, p = .608). 62.6% farmers strongly agreed that cost of technology determine sustainability of donor funded dairy projects in Malava sub-county. The findings agree with studies done by Benin et al (2003) that costs affect the

adoption of the available technology. These would include cost of drugs, pesticides and veterinery services and even management practices like zero grazing.

4.6. Culture as a determinant of sustainability of donor funded dairy projects

High level of agreement has been reported in the literature that social, economic and institutional frameworks play an important role in determining who does what, and who gets what in Livestock development. Social and cultural norms dictate the division of labour and control over assets. Macha and Jeckoniah (2013) established that gender roles as pertains to women in society bore more burdens in this enterprise such as milking, fetching animal feeds, cleaning barn and marketing of milk products just to mention a few. Components within culture were tested and responses solicited were as follows;

4.6.1. Alternative farming practices

As a component within technology, alternative farming practices were measured. From within a scale measuring their perception and satisfaction levels with the cost of available technolgoies (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree) and the responses solicited were as presented in table 4.22;

Table 4.22: Frequency on alternative farming practices and dairy sustainability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	117	45.3	45.3	45.3
	A	117	45.3	45.3	90.7
	NS	12	4.7	4.7	95.3
	D	12	4.7	4.7	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.22 indicated that a close majority among respondents in this category 117 (45.3%) strongly agreed and agreed respectively that alternative farming practices determines sustainability of donor funded dairy projects, followed by 12 (4.7%) and another 12 (4.7% who were not sure and disagreed respectively that alternative farming practices determined sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships

among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.23;

Table 4.23: Tabulation on alternative farming practices and dairy projects sustainability

Alternative farming practices and sustainability of donor funded dairy projects							**Total**
			SA	**A**	**NS**	**D**	
Project sustainability	Yes	Count & % within alternative farming practices	61	84	10	8	**163**
			52.1%	71.8%	83.3%	66.7%	**63.2%**
	No	Count & % within alternative farming practices	56	33	2	4	**95**
			47.9%	28.2%	16.7%	33.3%	**36.8%**
Total		**Count & % within alternative farming practices**	**117**	**117**	**12**	**12**	**258**
			100.0%	**100.0%**	**100.0%**	**100.0%**	**100.0%**

According to results from the contingency table 4.23, while 52.1% within determining sustainability under Strongly agree category respondents opined that alternative farming practices determines sustainability of donor funded dairy projects in Malava sub-county, whereas a slight majority 47.9% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between alternative arming practices and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value = 12.024, df = 3, p = .007). 47.8% farmers strongly agreed that alternative farming practices determine sustainability of donor funded dairy projects in Malava sub-county. Supposing there is a cheaper alternative farming practice with the same or better returns than dairy farming, that would automatically be prefered from these findings. The findings concure with the studies done by Baye et al (2000) on indigenous groups like the maasai, Samburu, Boran and Sabaot in Kenya.

4.6.2. Gender roles and sustainability of donor funded dairy projects

The study sought to establish whether gender roles as a component within culture determines sustainability of donor funded dairy projects whereby respondents were asked to state their responses from within a scale (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree) and the results were as presented in table 4.24;

Table 4.24: Frequency on gender roles and sustainability of dairy projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	117	45.3	45.3	45.3
	A	119	46.1	46.1	91.5
	NS	12	4.7	4.7	96.1
	D	10	3.9	3.9	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.24 indicated that majority among farmers who participated in the study 119 (46.1%) agreed that gender roles determines sustainability of donor funded dairy projects, followed by 117 (45.3%) who strongly agreed, 12 (4.7%) that were not sure and lastly 10 (3.9%) disagreed that gender roles determine sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.25;

Table 4.25: Cross tabulation on gender roles and sustainability of dairy projects

Gender roles and sustainability of donor funded dairy projects							Total
			SA	**A**	**NS**	**D**	
Project sustainability	Yes	Count & % within gender roles	62 53.0%	85 71.4%	9 75.0%	7 70.0%	**163** **63.2%**
	No	Count & % within gender roles	55 47.0%	34 28.6%	3 25.0%	3 30.0%	**95** **36.8%**
	Total	**Count & % within gender roles**	**117** **100.0%**	**119** **100.0%**	**12** **100.0%**	**10** **100.0%**	**258** **100.0%**

According to results from the contingency table 4.25, while 53.0% within determining sustainability under Strongly agree category respondents opined that gender roles determines sustainability of donor funded dairy projects in Malava sub-county, 47.0% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between gender roles and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value = 9.622, df = 3, p = .022). 53.0% farmers strongly agreed that gender roles determine sustainability of donor funded dairy projects in Malava sub-county.

The results of the study concure with Marse (1995) who noted that women performed most of the work in the dairy production exercises but this was on technology that would ease their labour burden. It also concures with the report of NDDP (1990) of Kilifi district.

4.6.3. Culture and beliefs and sustainability of donor funded dairy projects

The study sought to establish whether as a component within culture, social beliefs determine sustainability of donor funded dairy projects. Respopndents were asked to state their responses from within a scale (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree) and the results were as presented in table 4.26;

Table 4.26: Frequency distribution on beliefs and sustainability of dairy projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	165	64.0	64.0	64.0
	A	77	29.8	29.8	93.8
	NS	8	3.1	3.1	96.9
	D	8	3.1	3.1	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.26 indicated that majority among farmers who participated in the study 165 (64.0%) strongly agreed that culture and beliefs determines sustainability of donor funded dairy projects, followed by 77 (29.8%) who agreed, 8 (3.1%) were not sure and lastly 8 (3.1%) disagreed that culture and beliefs determine sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.27. The culture of the sub tribe in Malava conditions a household to at least have a head of cattle. Those who may not afford are given by the relatives.

Table 4.27: Cross tabulation on beliefs and sustainability of dairy projects

Beliefs and sustainability of donor funded dairy projects

			SA	A	NS	D	Total
Project sustainability	Yes	Count & % within beliefs	100 60.6%	53 68.8%	5 62.5%	5 62.5%	**163** **63.2%**
	No	Count & % within beliefs	65 39.4%	24 31.2%	3 37.5%	3 37.5%	**95** **36.8%**
	Total	**Count & % within beliefs**	**165** **100.0%**	**77** **100.0%**	**8** **100.0%**	**8** **100.0%**	**258** **100.0%**

According to results from the contingency table 4.27, while 60.6% within determining sustainability under strongly agree category respondents opined that culture and beliefs on dairy animal keeping determines sustainability of donor funded dairy projects in Malava sub-county, whereas a minority, 39.4% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between culture and beliefs and sustainability of donor funded dairy projects. The results revealed that there was no significant relationship between the two variables (chi-square value = 1.530, df = 3, p = .675). 60.6% farmers strongly agreed that culture and beliefs determine sustainability of donor funded dairy projects in Malava sub-county.

The findings above on the culture and beliefs concure with findings of Lobley and Potter (2004) in the U.S that cultural and social values at the household levels had a primary influence on farm structure, management and adaptation. This was achoed also by FAO (2008) that culturally defined gender roles has a direct relationship to dairy production.

4.6.4. Level of education and sustainability of donor funded dairy projects

The study sought to find out whether as a component within cultural fators, level of education determined sustainability of donor funded dairy projects whereby respopndents were asked to state their responses from within a scale (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree) and the results were as presented in table 4.28;

Table 4.28: Frequency distribution table on level of education and dairy sustainability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	165	64.0	64.0	64.0
	A	74	28.7	28.7	92.6
	NS	10	3.9	3.9	96.5
	D	9	3.5	3.5	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.28 indicated that majority among farmers who participated in the study 165 (64.0%) strongly agreed that level of education determines sustainability of donor funded dairy projects, followed by 74 (28.7%) who agreed, 10 (3.9%) that were not sure and

lastly 9 (3.5%) who disagreed that level of education determines sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.29;

Table 4.29: Cross tabulation on level of education and sustainability of dairy

Level of education and sustainability of donor funded dairy projects							
			SA	**A**	**NS**	**D**	**Total**
Project sustainability	Yes	Count & % within level of education	101 61.2%	48 64.9%	8 80.0%	6 66.7%	163 63.2%
	No	Count & % within level of education	64 38.8%	26 35.1%	2 20.0%	3 33.3%	95 36.8%
	Total	**Count & % within level of education**	**165** **100.0%**	**74** **100.0%**	**10** **100.0%**	**9** **100.0%**	**258** **100.0%**

According to results from the contingency table 4.29, while 61.2% within determining sustainability under Strongly agree category respondents opined that level of education determines sustainability of donor funded dairy projects in Malava sub-county, whereas less than half 38.8% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between level of education as a component within cultural aspects and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value = 1.628, df = 3, p = .653). 61.2% farmers strongly agreed that a farmers' level of education determine sustainability of donor funded dairy projects in Malava sub-county.

The findings in this case concures with the findings of Mumba, Samui, Pandey and Tembo (2012) carried out a study on the effect of socio-economic factors affecting profitability of smallholder dairy farmers in Zambia. Results of their study suggested that:-

Level of education among others significantly affected the profitability of smallholder dairy farming in Zambia.

4.7. Agricultural extension services

According to Roussel (2006) extension services provide support for the dairy farmers geared towards improved management, feeding, fertility and veterinary care that are crucial to sustainable small scale dairy farming. Many of these extension service providers offer artificial Insemination services that aimed to further improved milk yields with pedigree dairy cattle. This was the fourth objectiove of teh study where level of satisfaction, typesa of services offered by extension officers, number of agricultural training centres, and number of trainings attended were tested and responses presented as follows;

4.7.1. Level of satisfation with extension services and sustainability of dairy projects

As a component within agricultural services available to the farmers and their supposed determinant factor to sustainability of dairy donor funded projects, the study sought to establish whether farmers' perceived level of satisfaction with extension officers' duties in providing infomation, and other services determined sustainability of donor funded dairy projects and respondents were asked to state their responses from within a scale (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree) and the results were as presented in table 4.30;

Table 4.30: Frequency on level of satisfation of extension services and dairy projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	118	45.7	45.7	45.7
	A	116	45.0	45.0	90.7
	NS	13	5.0	5.0	95.7
	D	11	4.3	4.3	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.30 indicated that majority among farmers who participated in the study 118 (45.7%) strongly agreed with their level of satisfaction with extension officers services determines sustainability of donor funded dairy projects, followed by 116 (45.0%) who agreed, 13 (5.0%) that were not sure and lastly 11 (4.3%) who's level of satisfaction with agricultural extension officers' duties was the least as to determine sustainability of donor

funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.31;

Table 4.31: Tabulation on level of satisfaction of extension services and dairy projects

Level of satisfaction of services offered by extension officers and sustainability of donor funded dairy projects

			SA	A	NS	D	Total
Project sustainability	Yes	Count & % within level of satisfaction with extension officers duty	63 53.4%	83 71.6%	11 84.6%	6 54.5%	163 63.2%
	No	Count & % within level of satisfaction with extension officers duty	55 46.6%	33 28.4%	2 15.4%	5 45.5%	95 36.8%
	Total	**Count & % within level of satisfaction with extension services**	**118** **100.0%**	**116** **100.0%**	**13** **100.0%**	**11** **100.0%**	**258** **100.0 %**

According to results from the contingency table 4.31, while 53.4% within determining sustainability under Strongly agree category respondents who opined on their level of satisfaction with extension officers services on determining sustainability of donor funded dairy projects in Malava sub-county, less than half 46.6% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between level of satisfaction with extension services provided for by agricultural extension officers

and sustainability of donor funded dairy projects, the results revealed that there was a significant relationship between the two variables (chi-square value = 11.277, df = 3, p = .010). 53.7% farmers strongly agreed that farmers level of satisfaction with extension services provided for by agricultural extension officers determine sustainability of donor funded dairy projects in Malava sub-county.

The findings from this study concurs with the studies done by Rogers 1995 who found out that there are many possible sources of information about the new technoloy and information to farmers. A farmer learned from his or her own experimentation with the technology. Advice and technical information is available from the extension service or the media or even through social networks Udry (1998) and all tese would determine the farmers satisfaction with the extension staff.

4.7.2. Types of extension services offered and sustainability of dairy projects

Types of services offered by extension workers available to dairy farmers incline a farmer's attitude and perception towards adopting technologies and improved methods geared to increasing production in dairy farming. As a component within agricultural services the study sought to establish whether the types of services offered by extension officers determined sustainability of donor funded dairy projects and respondents were asked to state their responses from within a scale (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree) and the results were as presented in table 4.32;

Table 4.32: Frequency on services types offered and sustainability of dairy projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	160	62.0	62.0	62.0
	A	75	29.1	29.1	91.1
	NS	12	4.7	4.7	95.7
	D	11	4.3	4.3	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.32 indicated that majority among farmers who participated in the study 160 (62.0%) strongly agreed that types of services offerd by extension officers determines sustainability of donor funded dairy projects, followed by 75 (29.1%) who agreed, 12 (4.7%) that were not sure and lastly 11 (4.3%) who disagreed that types of services offered

by extension officers determine sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.33;

Table 4.33:Tabulation on extension services types and dairy projects sustainability

Types of services offered by extension officers and sustainability of donor funded dairy projects

			SA	A	NS	D	Total
Project sustainability	Yes	Count & % within types of services offered by extension officers	106	38	10	9	163
			66.3%	50.7%	83.3%	81.8%	63.2%
	No	Count & % within types of services offered by extension officers	54	37	2	2	95
			33.8%	49.3%	16.7%	18.2%	36.8%
	Total	**Count & % within types of extension services offered**	**160**	**75**	**12**	**11**	**258**
			100.0%	**100.0%**	**100.0%**	**100.0%**	**100.0%**

According to results from the contingency table 4.33, while 66.3% within determining sustainability under Strongly agree category respondents opined that types of services offered by extension officers determines sustainability of donor funded dairy projects in Malava sub-county, whereas less than half 33.8% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between types of services offered by extension officers and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value = 9.434,

df = 3, p = .024). 66.3% farmers strongly agreed that type of services offered by extension officers determine sustainability of donor funded dairy projects in Malava sub-county.

The results from the study concures with Books (2010) about AI that gained populatrity in beef production due to the increased access and marketing of the superior and favourable proven sires. The findings also concures with Benin et al 2003 on awareness, availability, costs benefits and even the risks involved in livestock technologies availble.The level of capacity building have positive impact on the implementation of projects (Echeme & Nwachukwo 2010).

4.7.3. Number of agricultural training centres

Centres for agricultural trainings purposedly structured to assist dairy farmers play an important role in information disseminating, research and development. It is within such centres that custom conditions could be controlled, information and skills transfered to farmers and potential farmers attracted to involve in such production in dairy farming. As a component within agricultural extension services, the study sought to understand whether the number of agricultural training centers determined sustainability of donor funded dairy projects in Malava sub-county and respondents were asked to state their responses from within a scale (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree)and the results were as shown in table 4.34

Table 4.34: Frequency distribution on training centers and dairy projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	123	47.7	47.7	47.7
	A	115	44.6	44.6	92.2
	NS	10	3.9	3.9	96.1
	D	10	3.9	3.9	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.34 indicated that majority among farmers who participated in the study 123 (47.7%) strongly agreed that number of agricultural training centers available

determines sustainability of donor funded dairy projects, followed by 115 (44.6%) who agreed, 10 (3.9%) in respect of not sure and disagree who postulated that number of agricultural training centres available determined sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.35;

Table 4.35: Tabulation on number of training centers and dairy projects

Number of agricultural training centers available and sustainability of donor funded dairy projects							
			SA	**A**	**NS**	**D**	**Total**
Project sustainability	Yes	Count & % within satisfaction with number of agricultural training centers available	71	78	7	7	**163**
			57.7%	67.8%	70.0%	70.0%	**63.2%**
	No	Count & % within satisfaction with number of agricultural training centers available	52	37	3	3	**95**
			42.3%	32.2%	30.0%	30.0%	**36.8%**
	Total	**Count & % within satisfaction with number of agricultural training centers available**	**123**	**115**	**10**	**10**	**258**
			100.0%	**100.0%**	**100.0%**	**100.0%**	**100.0%**

According to results from the contingency table 4.35, while 63.6% within determining sustainability under Strongly agree category respondents opined that number fo agricultural training centres determines sustainability of donor funded dairy projects in Malava sub-county, whereas less than half 42.3% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between number of agricultural training centers available and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value = 3.041, df = 3, p = .385). 57.7% farmers strongly agreed that the number of agricultural training centers available determine sustainability of donor funded dairy projects in Malava sub-county.

4.7.4. Number of attended trainings and sustainability of donor funded dairy projects

Seminars, and workshops organised by agricultural officers and other project implementors play a major role in ensuring sustainability of such projects. According to Rogers (1995) possible sources of information about the new technology could be learning from one's own experimentation with the technology. Advice and technical information is available from the extension service officers or the media further is pivot to such information and with organised groupings, more information could be shared from among a group of farmers. Therefore as a component within agricultural extension services, the study sought to establish whether the number of trainings attended by a farmer determined sustainability of donor funded dairy projects. Respondents were asked to state their responses from within a scale (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree) and the rsults presented in table 4.36;

Table 4.36: Frequency on attended trainings and dairy projects Sustainability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	123	47.7	47.7	47.7
	A	113	43.8	43.8	91.5
	NS	10	3.9	3.9	95.3
	D	10	3.9	3.9	99.2
	SD	2	.8	.8	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.36 indicated that majority ofthe farmers who participated in the study 123 (47.7%) strongly agreed that number of trainings attended by a farmer determines sustainability of donor funded dairy projects, followed by 113 (43.8%) who agreed, 10 (3.9%) that were not sure, 10 (3.9%) disagreed that number of trainings attended by a farmer determines sustainability of donor funded dairy projects. Lastly 2 (0.8%) strongly disagreed with number of training attended by a farmer determined sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.37;

Table 4.37: Cross tabulation on attended trainings and sustainability of dairy projects

Number of trainings attended by a farmer and sustainability of donor funded dairy projects								
			SA	**A**	**NS**	**D**	**SD**	**Total**
Project sustainability	Yes	Count & % within number of trainings	68 55.3%	79 69.9%	8 80.0%	6 60.0%	2 100.0%	163 63.2%
	No	Count & % within number of trainings	55 44.7%	34 30.1%	2 20.0%	4 40.0%	0 .0%	95 36.8%
	Total	**Count & % within number of trainings attended**	**123 100.0%**	**113 100.0%**	**10 100.0%**	**10 100.0%**	**2 100.0%**	**258 100.0%**

According to results from the contingency table 4.37, while 55.3% within determining sustainability under Strongly agree category respondents opined that number of trainings

attended by a farmer determines sustainability of donor funded dairy projects in Malava sub-county, whereas a slight majority 44.7% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between number of trainings attended by a farmer and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value = 7.922, df = 4, p = .094). 47.8% farmers strongly agreed that number of trainings attended by a farmer determine sustainability of donor funded dairy projects in Malava sub-county.

The findings concure with the Kenya dairy board report (2011) that Dairy farmers have platforms where education can be accessed. Agricultural shows, Agricultural training centres, Farmers commodity days, Field days are just platforms where dairy farmers can interact, ask questions and receive invites from fellow dairy farmer in particular to show case on his/her dairy breed. In such an interactive sessions, extension officers are able to educate and disseminate information on parasite prevention, first aid kit, breeding and A.I service to dairy cattle and Metcalfe (2014).

4.7.5. Knowlegde and skills acquired by a farmer and sustainability of dairy projects

According to Conley & Udry (1998) advice and technical information is available from the extension service or the media. Sources about the characteristics of the new forms of adoptable dairy farming technology from organised workshops and on farm trainings results in proper acquisition of such knowledge and skills. The study sought to find out whether as a component within agricultural extension services, knowledge and skills acquired by farmers determined sustainability of donor funded dairy projects and respondents were asked on their opinion measureed on a scale of (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree) and the rsults presented in table 4.38;

Table 4.38: Frequency on Skills and knowledge acquired and dairy projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	128	49.6	49.6	49.6
	A	111	43.0	43.0	92.6
	NS	7	2.7	2.7	95.3
	D	12	4.7	4.7	100.0
	Total	258	100.0	100.0	

Results from table 4.38 indicated that majority among farmers who participated in the study 128 (49.6%) strongly agreed that skills and knowledge acquired by a farmer determines sustainability of donor funded dairy projects, followed by 111 (43.0%) who agreed, 12 (4.7%) that disagreed and lastly 7 (2.7%) who were not sure of whether skills and knowledge acquired by farmers determine sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.39;

Table 4.39: Tabulation on Skills and knowledge acquired and dairy projects

Skills and knowledge acquired by farmers and sustainability of donor funded dairy projects							
			SA	**A**	**NS**	**D**	**Total**
Project sustainability	Yes	Count & % within skills and knowledge acquired by farmers	83 64.8%	69 62.2%	4 57.1%	7 58.3%	163 63.2%
	No	Count & % within skills and knowledge acquired by farmers	45 35.2%	42 37.8%	3 42.9%	5 41.7%	95 36.8%
	Total	**Count & % within skills and knowledge acquired by farmers**	**128** **100.0%**	**111** **100.0%**	**7** **100.0%**	**12** **100.0%**	**258** 100.0%

According to results from the contingency table 4.39, while 64.8% within determining sustainability under Strongly agree category respondents had the opinion that skills and

knowledge acquired by farmers determines sustainability of donor funded dairy projects in Malava sub-county, whereas less than half 32.2% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between skills and knowledge acquired by farmers and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value = .433, df = 3, p = .933). 64.8% farmers strongly agreed that skills and knowledge determine sustainability of donor funded dairy projects in Malava sub-county.

4.8. Other determinants of sustainability of donor funded dairy projects

The Study also tried to look at other determinants like; Policies by the government on donor projects,government subsidies on dairy feeds & technology,Infrastructure for production and processes, Need identification/feasibility studies and force majeure as discussed here below.

4.8.1. Policies by the government on donor funded projects

The study sought to find out whether as a component within other factors, policies by the government on donor funded projects determined sustainability of donor funded dairy projects and respondents were asked on their opinion measureed on a scale of (SA = strongly agree, A = Agree, NS = not sure, D = disagree and SD = Strongly disagree) and the rsults presented in table 4.40;

Table 4.40: Frequency table on policies by the government on the projects sustainability

		Frequency	Percent	ValidPercent	Cumulative Percent
Valid	SA	116	45.0	45.0	45.0
	A	120	46.5	46.5	91.5
	NS	10	3.9	3.9	95.3
	D	12	4.7	4.7	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.40 indicated that majority among farmers who participated in the study 120 (46.5%) agreed that policies by the government on donor determines sustainability of donor funded dairy projects, followed by 116 (45.0%) who strongly agreed, 12 (4.7%) that disagreed and lastly 10 (3.9%) who were not sure of whether policies by the govenrment on

donor funded projects determine sustainability of donor funded dairy projects. When a crosstabulation was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.41;

Table 4.41: Tabulation on Policies by the government sustainability of dairy projects

Policies by the government on donor funded dairy projects determining sustainability of donor funded dairy projects							
			SA	**A**	**NS**	**D**	**Total**
Project sustainability	Yes	Count & % within policies by the government on donor funded projects	59 50.9%	89 74.2%	7 70.0%	8 66.7%	163 63.2%
	No	Count & % within policies by the government on donor funded projects	57 49.1%	31 25.8%	3 30.0%	4 33.3%	95 36.8%
Total		**Count & % within policies by the government on donor funded projects**	**116 100.0%**	**120 100.0%**	**10 100.0%**	**12 100.0%**	**258 100.0%**

According to results from the contingency table 4.41, while 50.9% within determining sustainability under Strongly agree category respondents opined that policies by the government determine sustainability of donor funded dairy projects in Malava sub-county, whereas slightly half 49.1% held a contrary opinion. When a A Pearson chi-square test was conducted to examine whether there was a relationship between policies by the government

on donor funded projects and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value = 14.055, df = 3, p = .003). 50.9% farmers strongly agreed that policies by the government on donor funded projects determine sustainability of donor funded dairy projects in Malava sub-county.

The findings of the study agrees with the Asian Development Bank (ADB 1993) study on policies and strategies for livestock improvement in developing countries concluded that the primary policy failure was promotion of inappropriate technology. Success of dairy production by smallholders apart from cattle population and better breeds, was also a result of a suitable climate and an enabling policy and institutional environment (Conelly 1998; Thorpe et al. 2000).

4.8.2. Government subsidies on dairy feeds and other products and sustainability

Findings from the study established that respondents perception on government subsidie on dairy feeds/technology/other products and sustainability of donor funded dairy projects. The results were as presnted in table 4.42;

Table 4.42: Subsidies on feeds and other products and the projects sustainability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	121	46.9	46.9	46.9
	A	114	44.2	44.2	91.1
	NS	9	3.5	3.5	94.6
	D	14	5.4	5.4	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.42 indicated that majority among farmers who participated in the study 121 (46.9%) strongly agreed that government subsidies on dairy feeds/technology/other products determines sustainability of donor funded dairy projects, followed by 114 (44.2%) who agreed, 14 (5.4%) that disagreed and lastly 9 (3.5%) who were not sure of whether governmnet subsidies on dairy feed/technology/other products determine sustainability of

donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.43;

Table 4.43: Government subsidies on dairy feeds/technology/other products and the projects sustainability

Government subsidies on dairy feeds/technology/other products and sustainability of donor funded dairy projects							
			SA	**D**	**NS**	**A**	**Total**
Project Sustainability	Yes	Count & % within government subsidies	69 57.0%	76 66.7%	7 77.8%	11 78.6%	163 63.2%
	No	Count & % within government subsidies	52 43.0%	38 33.3%	2 22.2%	3 21.4%	95 36.8%
	Total	**Count & % within government subsidies**	**121** **100.0%**	**114** **100.0%**	**9** **100.0%**	**14** **100.0%**	**258** **100.0%**

According to results from the contingency table 4.43, while 57.0% within determining sustainability under Strongly agree category respondents opined that government subsidies determines sustainability of donor funded dairy projects in Malava sub-county, whereas 43.0% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between government subsidies on dairy feeds/technology/ and other products and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value = 4.816, df =

3, p = .186). 47.8% farmers strongly agreed that government subsidies on dairy inputs determine sustainability of donor funded dairy projects in Malava sub-county.

4.8.3. Infrastructure

Findings from the study established that respondents perception on infrastructure as a component within other determinants that affect sustainability of donor funded dairy projects. The results were as presnted in table 4.44;

Table 4.44: Frequency distribution on Infrastructure and sustainability of dairy projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	121	46.9	46.9	46.9
	A	115	44.6	44.6	91.5
	NS	10	3.9	3.9	95.3
	D	12	4.7	4.7	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.44 indicated that majority among farmers who participated in the study 121 (46.9%) strongly agreed that infrastructure determines sustainability of donor funded dairy projects, followed by 115 (44.6%) who agreed, 12 (4.7%) that diasgreed and 10 (3.9%) who were not sure of whether infrastructure determined sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.45;

Table 4.45: Cross tabulation on Sustainability of dairy projects and infrastructure

Infrastructure and sustainability of donor funded projects							
			SA	**D**	**NS**	**A**	**Total**
Sustainability	Yes	Count & % within infrastructure	76 62.8%	72 62.6%	7 70.0%	8 66.7%	**163** **63.2%**
	No	Count & % within infrastructure	45 37.2%	43 37.4%	3 30.0%	4 33.3%	**95** **36.8%**
	Total	**Count & % within infrastructure**	**121** **100.0%**	**115** **100.0%**	**10** **100.0%**	**12** **100.0%**	**258** **100.0%**

According to results from the contingency table 4.45, while 62.8% within determining sustainability under Strongly agree category respondents opined that infrastructure determines sustainability of donor funded dairy projects in Malava sub-county, whereas 37.2% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between infrastructure and sustainability of donor funded dairy projects. The results revealed that there was no significant relationship between the two variables (chi-square value = .286, df = 3, p = .963). 62.8% farmers strongly agreed that infrastructure determine sustainability of donor funded dairy projects in Malava sub-county.

4.8.4. Feasibility studies before project allocation and sustainability of dairy projects

Findings from the study established that respondents perception on Need identification/feasibility studies by the government before project allocation as a component within other factors that afefct sustainability of donor funded dairy projects. The results were as presnted in table 4.46;

Table 4.46: Frequency on feasibility studies on sustainability of dairy projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	120	46.5	46.5	46.5
	A	116	45.0	45.0	91.5
	NS	10	3.9	3.9	95.3
	D	12	4.7	4.7	100.0
	Total	**258**	**100.0**	**100.0**	

Variables and their relations Results from table 4.46 indicated that majority among farmers who participated in the study 120 (46.5%) strongly agreed that need identification/feasibility studies by need identification/feasibility studies by government before project allocation determines sustainability of donor funded dairy projects. When a joint frequency distribution of cases within in category government before project allocation determines sustainability of donor funded dairy projects, followed by 116 (45.0%) who agreed, 12 (3.1%) that disagreed and lastly 10 (3.9%) that were not sure of whether was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.47;

Table 4.47:Feasibility studies before project allocation and sustainability of dairy projects

Need identification/feasibility studies before project allocation and sustainability of donor funded dairy projects							
			SA	**D**	**NS**	**A**	**Total**
Sustainability	Yes	Count & % within feasibility studies by government before project allocation	81 67.5%	64 55.2%	8 80.0%	10 83.3%	163 63.2%
	No	Count & % within feasibility studies by government before project allocation	39 32.5%	52 44.8%	2 20.0%	2 16.7%	95 36.8%
	Total	**Count & % within feasibility studies by government before project allocation**	**120 100.0%**	**116 100.0%**	**10 100.0%**	**12 100.0%**	**258 100.0%**

According to results from the contingency table 4.47, while 67.5% within determining sustainability under Strongly agree category respondents held the opinion that feasibility studies by the government before project allocation determines sustainability of donor funded dairy projects in Malava sub-county, whereas less than half 32.5% were of a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between need identification/feasibility studies by the government and sustainability of donor funded dairy projects. The results revealed that there was a significant relationship between the two variables (chi-square value = 7.471, df = 3, p = .058). 67.5% farmers strongly agreed that need identification/feasibility studies by government determine sustainability of donor funded dairy projects in Malava sub-county.

4.8.5. Force majeure determinants

Findings from the study established that respondents perception on the force majeure as a component within other determinants that affect sustainability of donor funded dairy projects. Such determinants from the study included project implementation with multiple

agencies, breed types, animal diseases, e.t.c. respondents were asked to state on a scale their level of agreement and the results were as presnted in table 4.48;

Table 4.48: Frequency distribution on Force majeure determinants and dairy projects

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SA	184	71.3	71.3	71.3
	A	60	23.3	23.3	94.6
	NS	8	3.1	3.1	97.7
	D	6	2.3	2.3	100.0
	Total	**258**	**100.0**	**100.0**	

Results from table 4.48 indicated that majority among farmers who participated in the study 184 (71.3%) strongly agreed that force majeure factors determined sustainability of donor funded dairy projects, followed by 60 (23.3%) who agreed, 8 (3.1%) that were not sure and lastly 6 (2.3%) who disagreed that force majeure factors determine sustainability of donor funded dairy projects. When a joint frequency distribution of cases within variables and their relations in category was conducted in combination with chi-square as an indicator of association seeking to establish relationships among two or more of the variables owing to the fact that categorical variables often had such small numbers of possible values that could not be assumed in the study and the results were as shown in table 4.49;

Table 4.49: Cross tabulation on Force majeure determinants and dairy projects

Force majeure determinants and sustainability of donor funded dairy projects							
			SA	**D**	**NS**	**A**	**Total**
Project Sustainability	Yes	Count & % within force majeure factors	117 63.6%	38 63.3%	5 62.5%	3 50.0%	163 63.2%
	No	Count & % within force majeure factors	67 36.4%	22 36.7%	3 37.5%	3 50.0%	95 36.8%
	Total	**Count & % within force majeure determinants**	**184 100.0%**	**60 100.0%**	**8 100.0%**	**6 100.0%**	**258 100.0%**

According to results from the contingency table 4.49, while 63.6% within determining sustainability under Strongly agree category respondents opined that force majeure factros determines sustainability of donor funded dairy projects in Malava sub-county, whereas less than half 36.4% held a contrary opinion. When a Pearson chi-square test was conducted to examine whether there was a relationship between force majeure determinants and sustainability of donor funded dairy projects. The results revealed that there was no significant relationship between the two variables (chi-square value = .463, df = 3, p = .927). 63.6% farmers strongly agreed force majeure determinants affect sustainability of donor funded dairy projects in Malava sub-county.

The findings from the study concures with Thorpe et al (2000) who described the success of dairy production by smallholders apart from cattle population and better breeds, was also a result of a suitable climate and an enabling policy and institutional environment On the other hand donor policies are important because they influence how contracts are prepared, the duration of funding, and what is funded (OECD report 1989).

CHAPTER FIVE

SUMMARY OF THE RESEARCH FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter is a synthesis of the entire study, and contains summary of research findings, exposition of the findings, commensurate with objectives, conclusions and recommendations based thereon.

5.2 Summary of Findings

Climate determinants were; Dry season, Landscape and terrain, Climate change and changes of dairy feeds production. On the dry season, 54.5% of the farmers strongly agreed that dry seasons determine sustainability of donor funded dairy projects in Malava sub-county with a p value of 0.51. This may be attributed to the scarcity of forages, and water sources and quantity reducing during the dry seasons. On the landscape and terrain, 51.3% farmers strongly agreed determines sustainability of donor funded dairy projects whereas on the climate change, 75.8% agreed that climate change had a significant relationship in this study p = .001. Under feeds production, 71.9% under agree category, respondents opined that dairy feeds production determines sustainability of donor funded dairy projects in Malava sub-county. This variable obtained a p value of 0.016.

The themes under technology as an independent variable were; types of technologies available for adoption,number of technologies availble for adoption, rate of technology aption and the cost of technology. The results revealed that there was a significant relationship between the two variables (chi-square value = 8.503, df = 3, p = .037), On the number of technolgies available, The results revealed that there was a significant relationship between the two variables (chi-square value = 9.023, df = 3, p = .029) with 53.1% farmers strongly agreeing. On the rate of technology adoption, the results revealed that there was a significant relationship between the two variables (chi-square value = 11.349, df = 3, p = .010). 52.5% farmers strongly agreed. Lastly on the technology cost, there was no significant relationship between the two variables (chi-square value = 1.830, df = 3, p = .608). 62.6% farmers strongly agreed that cost of technology determine sustainability of donor funded dairy projects in Malava sub-county.

In the the third variable, the themes under consideration were, alternative farming practices, gender roles, cuture and beliefs,and level of education of the respondents. 52.1% within determining sustainability under strongly agree category respondents opined that culture and beliefs on dairy animal keeping determines sustainability of donor funded dairy projects in Malava sub-county, (chi-square value = 12.024, df = 3, p = .007). Under the gender roles, 53.0% strongly agreed. The results revealed that there was a significant relationship between the two variables (chi-square value = 9.622, df = 3, p = .022). On the culture as a theme, 60.6% strongly agreed to determine dairy sustainability. 39.4% held a contrary opinion. The results revealed that there was no significant relationship between the two variables (chi-square value = 1.530, df = 3, p = .675). Under level of education, 61.2% strongly agreed that it influenced dairy sustainability. The results revealed that there was a significant relationship between the two variables (chi-square value = 1.628, df = 3, p = .653).

Extension services factors were; Level of satisfaction with extension officers duties,types of services offered by extension officers, number of agricultural training centres available and the number of trainings attended by the farmers. In this, the findings were as follows; 53.4% strongly agreed and less than 46.6% held a contrary opinion. These results revealed that there was a significant relationship between the two variables (chi-square value = 11.277, df = 3, p = .010). On the types of extension services, 66.3% strongly agreed that it has a strong influence on the sustainability and 33.8% held a contrary opinion. The results revealed that there was a significant relationship between the two variables (chi-square value = 9.434, df = 3, p = .024). 63.6% strongly agreed that number of training centres had a positive influence on sustainability. There was a significant relationship between the two variables (chi-square value = 3.041, df = 3, p = .385) With chi-square value = 7.922, df = 4, p = .094, 47.8% farmers strongly agreed that number of trainings attended by a farmer determine sustainability of donor funded dairy projects in Malava sub-county.ith

Government policies on donor funded projects revealed a strong association index of .003. Results from the study also indicated that majority among farmers who participated in the study 120 (46.5%) agreed that policies by the government on donor determines sustainability of donor funded dairy projects. The policies are subsidies on dairy feeds, technology,other products , distribution of the extension service providers, feasibility studies of the projects before implementation, among others. Therefore results concure with other studies carried out by (Conelly 1998; Thorpe et al. 2000) that reported that, success of dairy

production by smallholders apart from cattle population and better breeds, was also a result of a suitable climate and an enabling policy and institutional environment.

5.3 Conclusions

The study concludes that determinants of sustainability of donor funded dairy projects include; climate determinants, factors within technology, determinants within culture, extension services and government policies.

In relation to objective 1, climate as a determinant highly influences sustainability of the donor funded dairy projects in Malava sub-county Kenya. These has come from the inferentials of dry seasons p=0.51, landscape and terrain p values =0.005, climate change,0.001 and dairy feeds feeds production a p value of 0.016 of from the above analysis. Therefore the themes in the climate variable had significance on the sustainability of the donor funded dairy projects, a case of Malava sub county; Kenya.

Under objective 2, that considered technology factors, technology adoption as a theme mostly influenced sustainability of the donor funded dairy projects, a case of Malavs, sub-county Kenya, with P vlue of 0.010, followed by 0.029 on the number of technologies available,Rate of technology came third and cost of technology had a weak influence on the sustainability of the donor funder projects, a case of Malava sub-count, Kenya.

Culture as an objective three with the four themes, conclusions would be drawn as follows, culture and beliefs highly influenced the sustainability of donor funded dairy projects a case of Malava sub-county Kenya, followed by the gender roles, level of education of the farmers and culture had very little influence on the donor funded dairy projects a case of Malava sub-county, Kenya.

Extension services would highly influence sustainability of the donor funded dairy projects, a case of Malava sub-county Kenya as has been strongly supported from these findings. Level of extension services satisfaction highly determined the sustainability, followed by extension services types. Trainings attended by farmers had less influence by this category. This could be attributed to a strong face of livestock extension within the sub-county.

5.4 Recommendations

The study established that determinants of sustainability of donor funded projects such as factors within climate, Technology, culture, government policies and extension services do influence positively sustainability of donor funded projects in farmers. However, the findings indicated that the nature of family set ups for instance widowers and that these projects sometimes do not operate into the fore seeable future probably due to insufficient knowledge of management by the farmers. The study therefore recommends the following:

1. The study recommends that there should be regional climate change strategies through involvement of other partners including setting up climate change regional centers for excellence in each County/Sub-county, development of climate change projections like for every five years. This would make the dairy farmers be resilient to the changing weather conditions
2. There should be established training centres at Malava sub county to demonstrate new technologies where farmers would be able to learn and adopt.
3. The study recommends that technological issues like A.I, feeds compounding, ticks and flies control be subsidized to enable many dairy farmers adopt them as this leads to increase in milk production. Access to dairy information is enhanced to enable farmer's access extension services timely and cheaply.
4. The study recommends that there should be enhanced trainings and capacity building to the dairy farmers by extension service providers as this would improve on the dairy productivity hence the sustainability of the donor funded dairy projects through technology adoption.
5. The study recommends that county government should develop strong policies that support development and sustainable dairy farming since there was a strong relationship between government policy and the sustainability of the dairy projects.

5.5. Suggestion for Further Study

This study sought to examine determinants of sustainability of donor funded dairy projects in Malava sub-county. The study was limited to donor funded dairy farmers in Malava sub-county and therefore the results cannot be generalized to other Agricultural sectors or sub counties. The researcher therefore suggests the following:

1. A similar study should be conducted in other sub counties like Lurambi, Shinyalu, Lugari, and Likuyani to mention a few and to donor funded projects other than dairy farming.
2. A similar study should be conducted on other determinants influencing dairy projects sustainability which were not concern for this study
3. The study therefore suggests that institutional implementation and subsequent monitoring and evaluation procedures be implemented as follow up to donor funded project to allow successful sustainability of intended issues, further, gaps within needs identification ought to be tackled before project allocation.

5.6 Contribution to the Body of Knowledge

This study contributes to the existing body of knowledge by offering deeper insight on the determinants of sustainability of donor funded dairy projects; a case of Malava Sub-county, Kenya. This study has established that factors within climate, technology, culture and government policy determine sustainability of donor funded dairy projects in Malava Sub-county, Kenya.

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APPENDICES

APPENDIX I: TRANSMITAL LETTER

David O. Olang'
P.O. Box 2763-50100,
Kakamega.
Cell Phone:+254 729750700,
Email: dolangs@gmail.com

Dear Sir/Madam,

RE: TRANSMITTAL LETTER

I am a postgraduate student at The University of Nairobi Kakamega extra mural centre . I am collecting data for my research and humbly invite you to take part in this survey aimed at establishing **"Determinants of sustainability of donor funded dairy projects a case of Malava sub-county, Kenya''**

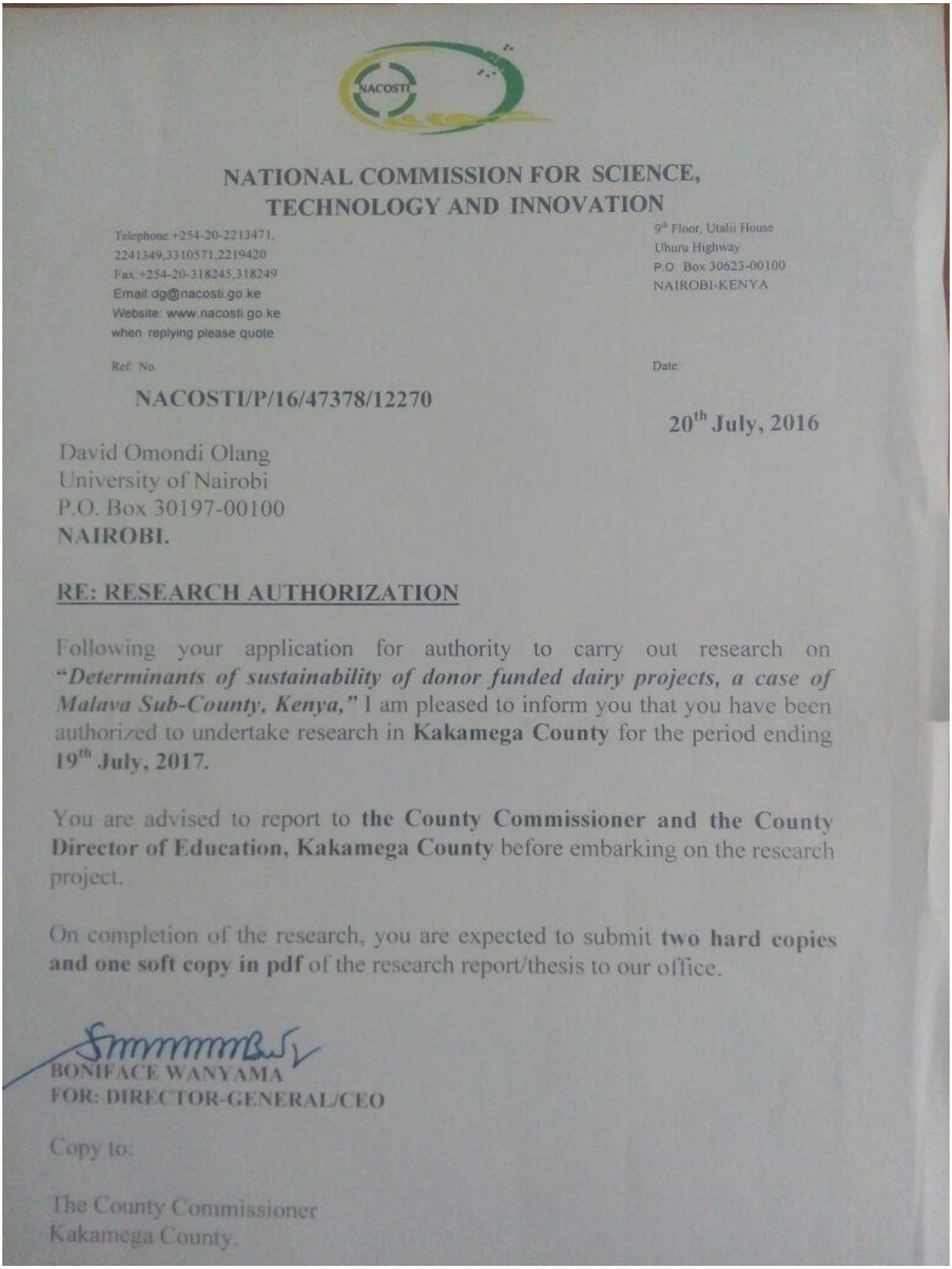
You have been selected to be part of this study. I, therefore, hereby kindly request your assistance in filling the accompanying questionnaire by answering the questions honestly and completely. The information being sought is meant for research purposes only and will not be used against anyone. I guarantee confidential treatment of the information that you will provide.

Thank you in advance,

Yours Sincerely,

David O. Olang'
Reg no, L50/76556/2014

APPENDIX II:RESEARCH AUTHORIZATION LETTER



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471, 2241349,3310571,2219420
Fax: +254-20-318245,318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
when replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No. NACOSTI/P/16/47378/12270

Date: 20th July, 2016

David Omondi Olang
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Determinants of sustainability of donor funded dairy projects, a case of Malava Sub-County, Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Kakamega County** for the period ending **19th July, 2017.**

You are advised to report to **the County Commissioner and the County Director of Education, Kakamega County** before embarking on the research project.

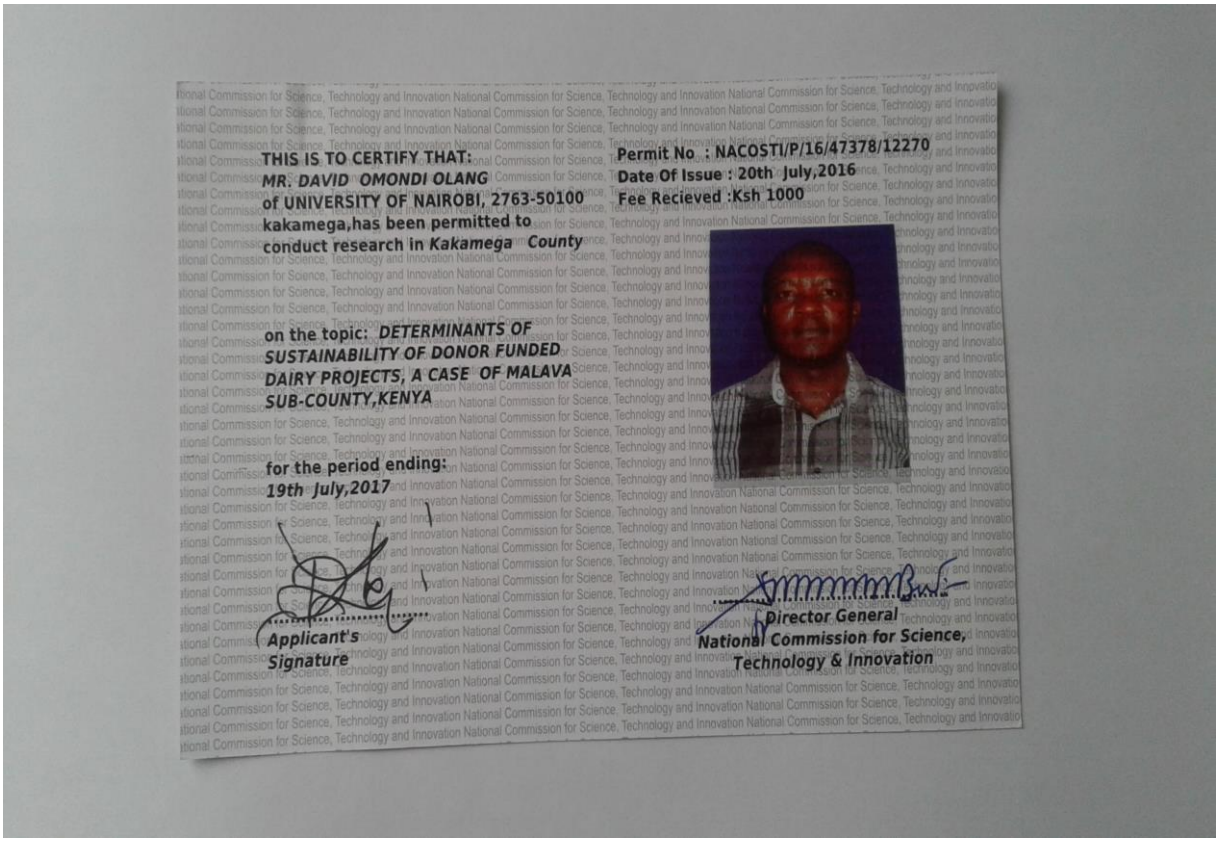
On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Kakamega County.

APPENDIX III : RESEARCH PERMIT



THIS IS TO CERTIFY THAT:
MR. DAVID OMONDI OLANG
of UNIVERSITY OF NAIROBI, 2763-50100
kakamega,has been permitted to
conduct research in *Kakamega County*

on the topic: *DETERMINANTS OF SUSTAINABILITY OF DONOR FUNDED DAIRY PROJECTS, A CASE OF MALAVA SUB-COUNTY,KENYA*

for the period ending:
19th July,2017

Applicant's Signature

Permit No : NACOSTI/P/16/47378/12270
Date Of Issue : 20th July,2016
Fee Recieved :Ksh 1000

Director General
National Commission for Science, Technology & Innovation

APPENDIX IV: QUESTIONNAIRE

This questionnaire has been designed to collect information from Malava Sub-County, factors influencing sustainability of donor funded dairy projects and is meant for academic purposes only. The questionnaire is divided into three parts. Part 1 seeks to capture the profile of respondents while Part B and Part C will capture issues pertaining to the area of study. Please complete each section as instructed. Do not write your name or any other form of identification on the questionnaire. All the information in this questionnaire will be treated in confidence.

SECTION I: BACKGROUND INFORMATION

1. Please indicate your Gender Female □ Male

2. Please indicate your marital status Married □ Single

3. What is your level of educational? □ O-level □Undergraduate □Postgraduate

4. How long have you engaged in dairy farming in years?

SECTION B PART 1: CLIMATE FACTORS

In this section please tick ( ) the most appropriate response for each of the statements in the table below with the following score in mind; Strongly disagree (SD=1); Disagree (D=2); Not sure (NS=3) Agree (A=4) & Strongly agree (SA=5)

	STATEMENT	**SA=1**	**A=2**	**NS=3**	**D=4**	**SD=5**
1	Inadequate rainfall					
2	Continuous wet conditions					
3	Unpredictable weather conditions					

4. Other types of effects due to climatic conditions in the list above (Kindly add below)

……...

.....

SECTION B PART 2: INFORMATION TECHNOLOGY

In this section please tick ( ) the most appropriate response for each of the statements in the table below with the following score in mind; Strongly disagree (SD=1); Disagree (D=2); Not sure (NS=3) Agree (A=4) & Strongly agree (SA=5)

	STATEMENT	**SA=1**	**A=2**	**NS=3**	**D=4**	**SD=5**
5	The County has a system for fast delivery of dairy services					
6	Information on dairy farming is easily assessable within the County					
7	Information technology use has has cut cost and improved production of dairy farming					
8	The County has diversified into other sectors to promote dairy farming in terms of facilities availed to farmers					

Other types of effects due to information technology

NO	**FACTORS ON TECHNOLOGY**	**LEARNED**		**ADOPTED**	
		YES	NO	YES	NO
9	Artificial Insemination				
10.	Zero grazing				
11	Feed Compounding				
12	Silage making				
13	Hay making				
14	Maize stovers treatment				
15	Planting of forder trees				

16	Ticks and flies Control				
17	Worms and Helminthes Control				
18	Biogas Production				

19. Have you increased your milk production as a result of new methods of dairy farming?

Yes ( ) No ( ) Don't Know ( )

20. If your answer in question 3 is Yes, by how much?----------Litres/day

21. What are your challenges in adopting these new technologies?.....

SECTION B PART 3: FACTORS ON CULTURE

In this section please tick ( ) the most appropriate response for each of the statements in the table below with the following score in mind; Strongly disagree (SD=1); Disagree (D=2); Not sure (NS=3) Agree (A=4) & Strongly agree (SA=5)

	STATEMENT	**SA=1**	**A=2**	**NS=3**	**D=4**	**SD=5**
22	The County often trains us on dairy farming practices					
23	I use the modern farming practices in my dairy production					
24	The community has a culture of helping each other in dairy farming					
25	The community social life dictates that each house hold engages in dairy farming					

26. Other types of effects due to socio-cultural factors that are not mentioned in the list above (Kindly add below)

SECTION C PART I: SUSTAINABILITY OF DONOR FUNDED DAIRY PROJECTS

In this section please tick ( ) the most appropriate response for each of the statements in the table below with the following score in mind; Strongly disagree (SD=1); Disagree (D=2); Not sure (NS=3) Agree (A=4) & Strongly agree (SA=5)

	STATEMENT	**SA=1**	**A=2**	**NS=3**	**D=4**	**SD=5**
27	I have received free training on dairy farming organized by donors					
28	The training has helped improve my dairy farming productivity					
29	I received a boast in monetary terms to support my dairy farming from donors					
30	Since I received the funding my production has never reduced					

31. Other types of effects due donor funding not in the list above (Kindly add below)

……

SECTION D PART I: GOVERNMENT POLICIES

In this section please tick ( ) the most appropriate response for each of the statements in the table below with the following score in mind; strongly disagree (SD=1); Disagree (D=2); Not sure (NS=3) Agree (A=4) & Strongly agree (SA=5)

	STATEMENT	**SA=1**	**A=2**	**NS=3**	**D=4**	**SD=5**
32	County government of has policies guiding dairy production					
33	County government promotes and subsidizes A.1 services					
34	County government supports organised milk marketing					

35	County government subsidizes credit for farmers to purchase dairy cows					
36	County government supports dairy farmers to form cooperative societies					
37	County government gives dairy cows to farmers in order to support dairy farming					

THANK YOU FOR YOUR TIME!

APPENDIX V: 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 Malava 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? To what extent?

.....

.....

5. What is your opinion on the technology adoption, weather changes, cultural factors as a determinant of sustainability of donor funded dairy projects

i) Technology adoption

.....

.....

ii) Weather changes

.....

.....

iii) cultural factors

.....

.....

6. Does technology adoption support small scale dairy farming in this region?

.....

.....

7. What is the influence of extension services on sustainability of dairy project

.....

.....,.....

8. Which challenges do the following stakeholders face regarding development and sustainability of dairy in future (Personal, group or governmental)

Personal.....

Governmental.....

Farmers.....

NGO’s and other stakeholders.....

Thank you very much for your participation

APPENDIX VI: KREJCIE AND MORGAN TABLE

Total	*Sample*	*Total*	*Sample*	*Total*	*Sample*
10 ⇒	10	220 ⇒	140	1200 ⇒	291
15 ⇒	14	230 ⇒	144	1300 ⇒	297
20 ⇒	19	240 ⇒	148	1400 ⇒	302
25 ⇒	24	250 ⇒	152	1500 ⇒	306
30 ⇒	28	260 ⇒	155	1600 ⇒	310
35 ⇒	32	270 ⇒	159	1700 ⇒	313
40 ⇒	36	280 ⇒	162	1800 ⇒	317
45 ⇒	40	290 ⇒	165	1900 ⇒	320
50 ⇒	44	300 ⇒	169	2000 ⇒	322
55 ⇒	48	320 ⇒	175	2200 ⇒	327
60 ⇒	52	340 ⇒	181	2400 ⇒	331
65 ⇒	56	360 ⇒	186	2600 ⇒	335
70 ⇒	59	380 ⇒	191	2800 ⇒	338
75 ⇒	63	400 ⇒	196	3000 ⇒	341
80 ⇒	66	420 ⇒	201	3500 ⇒	346
85 ⇒	70	440 ⇒	205	4000 ⇒	351
90 ⇒	73	460 ⇒	210	4500 ⇒	354
95 ⇒	76	480 ⇒	214	5000 ⇒	357
100 ⇒	80	500 ⇒	217	6000 ⇒	361
110 ⇒	86	550 ⇒	226	7000 ⇒	364
120 ⇒	92	600 ⇒	234	8000 ⇒	367
130 ⇒	97	650 ⇒	242	9000 ⇒	368
140 ⇒	103	700 ⇒	248	10000 ⇒	370
150 ⇒	108	750 ⇒	254	15000 ⇒	375
160 ⇒	113	800 ⇒	260	20000 ⇒	377
170 ⇒	118	850 ⇒	265	30000 ⇒	379
180 ⇒	123	900 ⇒	269	40000 ⇒	380
190 ⇒	127	950 ⇒	274	50000 ⇒	381
200 ⇒	132	1000 ⇒	278	75000 ⇒	382
210 ⇒	136	1100 ⇒	285	100000 ⇒	384

Adopted from research advisors.com

APPENDIX VII: MALAVA SUB - COUNTY MAP