



Factors Influencing Milk Production Project Among Small Scale Dairy Farmers in Bomet East Sub County, Bomet County, Kenya

Michael Kipkirui Cheruiyot and Dr. Moses M. M. Otieno

ABSTRACT: The research was based on the factors influencing milk production project among small scale dairy farmers in Bomet East Sub County, Bomet County, Kenya. The study was guided these objective : to determine the extent to which demographic characteristics of small scale dairy farmers influent milk production project in Bomet East Sub- count, to analyze how cattle breeds variability affects milk production project in Bomet East Sub county , to examine how marketing factors influence milk production project among Small scale dairy farmers BometEast Sub county and to assess the extent to which training influences milk production project among small scale dairy farmers in Bomet East sub -county. The study is of significant to small scale dairy farmers through the Ministry of Livestock and Fisheries on reducing unemployment, improvement of livelihood among dairy farmers and boosting economy as a county as well as reducing poverty as well as basis for scholars for further research. The study was granted the basic assumption that the respondent were able to give information objectively and honestly. Moreover, the study was also based on the assumption that data collection instrument was reliable as valid in taking the desired outcomes. The study was enhanced on the social- Psychology Theory of Reasoned Action (TRA) and Theory of Culture of Poverty. The target population was 4,004 small scale dairy farmers. The researcher adopted in the study probability sampling design which achieved 404 respondents by employing stratified random sampling technique package in descriptive survey design. The compost of 400 farmers, three livestock officer and an official from KDB. The data collected was analyzed using SSPS version 20. The successful returned questioners are 400 respondents (99%).The finding showed that most of those who practice dairy farming are male(60) of age 26-35 years(32%).90 are married individual and most (68%) are of primary and below in education level The findings also showed that most have cross breed dairy cattle utilizing natural mating. The major market for their milk is neighbors and local shop/hotel of less than 1 km from their farms. Service as per the finding from Government livestock officers are poor(46) and most (40%) get training from GOK. Due to level of education and conduct with officers, the major source of information is through media(local radio station, Kass FM or Chamke FM)(40%). It is recommended the promotion of gender balance have to be promote and embrace ICT technology on transmitting information. Further research has to be made on how cooperatives are to promote milk production project.

Introduction

1.1 Background of the study

The dairy industry is a major employer in the world and it is growing further as the demand for milk is increasing with the growth in population to over the 7 billion mark. The total milk production in the world has increased by 35% whereas per capita world milk production has declined by 10%. This indicates that the world milk production does not keep pace with the increase in world population.

Smallholder dairy farming has remained an important source of livelihood in most developing countries, however the main challenge has remained poor quality and quantity of feeds leading to low milk productivity. Dairy has also continued providing a regular source of income and spreading income risk since agriculture related income was always seasonal. (Osuji1974). Challenges of dairy cattle feeding if addressed could thus guarantee a sustainable livelihood to smallholder dairy farmers in many parts of the world. 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 management and care of the dairy cattle.

United Kingdom (UK) dairy industry accounted for 18% of the total agricultural output in 2015. The number of dairy cows in the UK has declined steadily since 2007 from 3.0 million to 1.5 million in 2015 which a reduction of 20%. Where farm gate milk price rose from 18p/litre in 2007 to 34p/litre in 2015. United Kingdom is the third largest milk producers in European Union. This is after Germany and France and tenth largest in the world. UK produces around 14 billion litres per year and most of this milk is consumed within as



liquid milk and dairy products. In 2015 (January- November) around 48% of the milk processed is used as liquid milk and 26% were processed as cheese.

Development of dairy in China was slow before 1978. After the market policy was release up to 1996, the national GDP per capital increased by 12.5% annually. Then dairy grow very fast after training of dairy farmers on adopting new technology improves milk productivity in china.

In Africa, Kenya is the only country, after South Africa that produces enough milk for both domestic consumption and export. Sudan on the other hand is the largest producer of milk in the Common Market for Eastern and Southern Africa (COMESA), but it does not produce enough to satisfy both domestic and export markets.

Regionally, republic of Rwanda PortaScience and African breeder services Total cattle management to ensure that 10,000 smallholder dairy farmers received related training in animal variability towards improving their milk production in the regions of Rwanda. Government of Rwanda support programs to ensure that there is one-cow-per-family so as to achieve its target. PortaScience also involved farmers to get access to the use of technology to increase their milk production. It also had plans to expand with other commercial partners into East African countries, which is good news to 20 million smallholders in the region.

In Uganda dairy sub-sector contributes much of its economy of about 9% of the total agriculture GDP. This is about 3% of the country's overall GDP. Milk production in Uganda is about one billion litres per year. Exotic/ cross breeds constitutes less than 20% of the cattle population. In 2007, these breeds produce 60% of all milk in Uganda. Over 2.5million households in Uganda engage in milk production with national herd of 7.5 million heads of cattle comprising 6.2 million indigenous and 1.3 million either exotic or crossbreeds (2011/2012 household survey) . Government of Uganda also takes the lead in building infrastructure and providing technical services to smallholders (Sikawa, *et al*, 2009. Kenya's dairy industry is a dynamic and plays an important economic and nutrition role in the lives of many people ranging from farmers to milk hawkers, processors and consumers.

Kenya has one of the largest dairy industries in Sub-Saharan Africa. The current population statistics for milking cattle is 3.8 million (Government of Kenya, 2009). A survey conducted by Smallholder Dairy Project (SDP) asserts that there are approximately 6.7 million dairy cattle in Kenya (SDP, 2005). The Food Agricultural Organization (FAO) on the other hand estimates a figure of 5.5 million milking animals (Techno serve, 2008). The dairy industry is the single largest agricultural subsector in Kenya, larger even than tea (Muriukiet *al*,2004). It contributes 14 percent of agricultural GDP and 3.5 percent of total GDP (Government of Kenya, 2009). The industry has grown tremendously since its liberalization in 1992.

Liberalization led to a rapid growth of the informal milk trade that mainly consists of small scale operators dealing in marketing of raw milk. At that time, there was an emergence of new institutional arrangements in milk collection, processing and marketing, which included hawkers, brokers' self-help groups, neighbors and business establishment like hotels (Karanja, 2003).

The informal sector controls an estimated 70 percent of the total milk marketed in Kenya (KDB, 2009; Government of Kenya, 2006). This sector is important and is driven by among other factors the traditional preferences for fresh raw milk and its relatively lower cost. However, this has not been established in Bomet East sub-county regions of Bomet County. Raw milk markets offers both higher prices to producers and lower prices to consumers but with several challenges relating to quality control and standards, and the associated health and safety concerns.

The informal milk market has in the past faced several challenges. This was because prior to change in 2004, informal vendors, including mobile milk traders and bar vendors, and milk transporters, were not recognized under the old dairy policy. As a result, they were frequently harassed as powerful dairy market players sought to protect their interests and increase market share. There were also concerns over food safety and quality of sold by the informal sector players. The dairy policy at the time focused on promoting value addition and increases the market share of pasteurization milk while attempting to address potential public health risks of consuming raw milk. However, since 2004, there has been a major change in policy and practice towards the informal milk market (Leksmono, *etal*, 2006).

The dairy policy now clearly acknowledges the role of Small Scale Milk Vendors (SSMVs) and contains specific measures to support them. These include: development of low-cost appropriate technologies, training on safe milk handling, provision of incentives for improved milk collection and handling systems, and establishment of supportive certification system. While the Dairy Policy is still in progress, awaiting approval by parliament, there has been a proactive engagement by the Kenya Dairy Board in training and certification of SSMVs, in order to safeguard public health and assure quality of the raw milk (Leksmono, *et al*, 2006).

Bomet East Sub County had many wards: Kiprerres, Longisa, Kembu, Merigi and Chemaner. East of Bomet County headquarters. It is to the South East of Bomet county head quarters and to the North of Narok County at altitude of about 1800 meters above the sea level. It has an area of 311.1 square KM and human population of



122,273 people (KNBS, 2009). The Sub County has a total of 15 million litres annually (District livestock population annual report 2012). The climate being favorable for the Sub County is adjacent to Mau Forest which attract hence promoting milk productivity if well exploited. Currently, each of the two existing cooling plant in the Sub County: Longisa Dairy cooling plant and Sot Dairy cooling plant are collecting over 10,000litres daily and deliver to New Kenya Cooperative Creameries(NKCC).

1.2 Statement of the Problem

Dairyfanning remains a major concern in rural households especially in Bomet East Sub-County, Bomet County from the annual reports from ministry of livestock 2010 and 2012, it is seen that the small scale dairy farmers in Bomet East Sub-County have an average production To sustain an increment of milk production, farmers in Bomet East Sub-County are required to produce 18Litres of milk per cow daily.

1.3 Purpose of the Study

The purpose of this study was to investigate factors influencing milk production project among small scale dairy farmers in Bomet East Sub-County.

1.4 Research Objectives of the Study

The study was guided by the four objectives as stated below;

1. To determine the extent to which demographic characteristics influence milk production project among small-scale dairy farmers in Bomet East Sub-County.
2. To analyze how cattle breeds variability influence milk production project among small-scale dairy farmers in Bomet East Sub-County.
3. To examine how marketing factors influence milk production project among Small scale dairy farmers in Bomet East Sub-County
4. To assess the extent to which training influences milk production project among small scale dairy farmers in Bomet East sub-county.

1.5 Research Questions

1. To what extent does demographic characteristics influence milk production project among small-scale dairy farmers in Bomet East Sub-County?
2. In what ways does cattle breed variability influence milk production project among small-scale dairy farmers in Bomet East Sub-County?
3. In what ways does marketing factors influence milk production project among Small scale dairy farmers in Bomet East Sub-County?
4. To what extent does training influences milk production project among small scale dairy farmers in Bomet East sub-county?

1.6 Significance of the Study.

The study is justified on the following grounds; First, to generate useful information on milk production project among smallholder dairy farmers. The information will generate additional information on the already existing information on dairy farming technologies to dairy industry stakeholders. Secondly, the study provides information and a strategy on improving food security, improving household incomes and alleviating poverty through understanding the challenges and prospects facing the smallholders.

According to Muriuki (2001), the Kenya dairy industry is dominated by smallholders and greatly contribute livelihood of many people. About 625, 000 smallholder producer households are involved directly in milk production for market and about 25% of the households are involved in marketing. ILRI (1999), in a study of small dairy farming in Kenya generated research-based evidence of economic significance. It revealed that there are 35, 000 full-time jobs for both men and women in milk production, transportation, processing and sales.

Thirdly, the study creates general awareness of milk production project among small scale dairy farmers involved in the dairy industry, namely policymakers, animals' nutritionists, veterinarians, sociologists, NGOs, dairy groups, research scientists, inseminators, farmers and consumers. This puts them in a better position when offering solutions and recommendations on the best way to implement milk production project.

The information generated is useful in developing the dairy industry in line with Vision 2030 that recognizes livestock development. Indeed a country like Kenya where over 57% of people live below the poverty line and economic growth rates average 5% a year, a lot needs to be done by people of all sectors if the situation is to change(GOK, 2009).



The study will also act as a source of information to future researchers and scholars who will use it as a basis for future research in the dairy industry.

1.7 Limitations of the Study

The study was limited by a number of factors such as unfavorable weather conditions as it was undertaken during the period of long rain in Bomet East Sub County. Therefore most roads remained impassable hence hindered implementation for data collection process. This was overcome by planning visits at noon and using motorbike to reach even remote areas.

The study was also limited by suspicion from the respondent who decline to give some information where as others gave false information. These were overcome by showing the letter transmission from University and by explaining to the respondent that the purpose of the study was purely academic and that any information given was to be treated with utmost confidence.

1.8 Delimitations of the Study

The study was focusing on factors influencing milk production project among small scale dairy farmers in Bomet East Sub County, Bomet County. It only focused on small scale dairy farmers in Bomet east sub County. These dairy farmers are geographically in five wards of Bomet East Sub County namely: Kipreres, Longisa, Kembu, Merigi and Chemaner ward.

1.9 Basic assumptions of the Study

The study was based on the basic assumption that the data collection instrument was valid and reliable in measuring the desired outcome. Moreover, it was assumed that the respondent were willing to give information honestly and objectively.

1.10 Definition of Significant Terms as used in the study

Breed variability refers to the different breeds of cattle as owned by the farmers; farmer's major breeds of dairy cattle e.g. Friesian, Guernsey, and Ayrshire

Dairy farmer refers to class of agriculturalist practicing long term production of milk for eventual sale.

Demographic characteristics refers to social factors of the dairy farmers e.g. age, marital status, sex among others that in one way or the other affect.

Factors refer to constituent or element or variables that brings effect or results or indicate a specific multiple, number or number quantity of milk produce.

Marketing refers to all activities involved in production flow of goods (milk) and services from point.

Milk production refers to the rate at which milk is produced as per the number of heads of dairy cattle which is measured by monthly income or quantity of milk produced per month.

Small scale Dairy Farmers refers to farmers keeping dairy cows with a herd of less than five cattle. In this research therefore farmers with a herd of less than five cattle irrespective of the breeds were considered to be smallholder farmers.

Small scale refers means limited or average and means in this study a farmer practicing dairy farming with small number of less than five herds.

Training refers to having knowledge on dairy farming in order to increase milk production, (having known how among dairy farmers) of production of milk consumers for the purpose of satisfying consumer demand.

1.11 Organization of the Study

The study is organized in three chapters. Chapter one features on the background of the study, statement of the problem, purpose of the study and objective of the study. Moreover chapter one also presents such questions, significance of the study and limitation of the study. In addition it captures the delimitation of the study, basic assumptions of the study, as well as definition of the significance terms as used in the context of the study.

Chapter two reviewed the literature based on objective of the study. It further looks at the conceptual framework and finally the summary of the literature review. Chapter three covers the research methodology of the study. The chapter also describes the research design, target population, sampling procedure, rules and techniques of data collection, pretesting, data analysis, ethical consideration and finally definition of variables.

Chapter four presented data analysis, presentation and interpretation. Finally, Chapter five contains a summary of the discussions, conclusions and recommendations as well as areas for further research.



Literature Review

2.1 Introduction

This chapter contains a literature review on concept of milk production, demographic characteristics, breed variability, marketing and training of small scale dairy farmers on milk production project. It also covers theoretical framework, conceptual framework of the study and summary of literature review.

2.2. Milk Production Project

Over the last 24 years, total milk production in the world has increased by 32% whereas per capita world milk production has declined by 9%. This indicates that the world milk production has not kept pace with the increase in world population. Nonetheless, as opposed to the trend towards intensification of milk production in developed countries, production growth in developing countries is a large part due to increasing numbers of milk animals and dairy farms and only a small part due to productivity gains (Knips, 2009).

India is the world largest producer of dairy products in the world while the world largest exporter of dairy products is New Zealand (Knips, 2009). Milk production grew steadily in East Africa in the 1980s and 1990s. The pace of growth has since accelerated following recent high rates of income growths and urbanization, though the exact figure are not easy to verify. According to Ngigi (2004), milk production increased during the 1990s at an annual rate of 4.1% in Kenya and 2.6% in Uganda, (Uganda Investment 2002) suggests that the figure was higher in Uganda, with production having risen from 365 million litres in 1991 to 900 million litres in 200. One reason for such high growth is high domestic consumption. Milk consumption in Kenya is 145 litres per person per year, which is among the highest rates in developing world (SDP), spurring an estimated 4 billion litres of production in 2003 (Export Processing Zones Authority 2005). Although only about 35% of milk produced is marketed, at a retail price of US\$0.75 or more per litres,

The Kenyan dairy industry is estimated to generate \$2billion litres per year (Strategic Business Partners 2008). Much of the market demand is met by smallholder dairy farmers, typically with 1-3 cows on farms measuring 5-1.5 hectares. According to the International Livestock Research Institute (ILRI), by 2006 -here were approximately 1.8 million small holder farmers in Kenya (SDP).

The Kenya dairy farming Sub-sector is one of the most vibrant in East Africa and it has the highest milk per capita availability and consumption (Ngigi, 2004). Kenyans including people from Bomet East Sub-County are amongst the highest milk consumers in the developing world, consuming an estimated 150 litres per person per year, more than five times milk consumption in other East African countries (SDP, 2005). The smallholder dairy Sub-sector is a crucial one as it accounts for 80% of the total number of cattle in the country and it also contributes 70% of the total milk output (IFAD, 2006).

Most of the dairy farming is done on the Kenyan highlands which are over 1000 m above sea level. These areas are highly populated as compared to the lowland and the population provides market for the milk produced, which is complementary. Over and above the population that provides markets the highlands have the favorable agro ecology for dairy farming (Staal, et al, 1997).

The small scale dairy farming enterprise has been found out to be very profitable. This is because of the good milk prices. Despite the withdrawal of some government Subsidies like the artificial insemination the business continues to thrive. The good market prices resulted from the liberalization of the dairy sector (Ngigi, 2003).

Dairy production in Kenya is divided into small scale and large scale with the small scale farming being the most popular as it constitutes 70-80% of the total dairy Subsector (Ngigi, 2003; Karanja 2004; IF AD, 2006). The smallholder group is also divided into four Sub-groups which are resource poor, small scale intensive, part time dairy farmers and crop oriented dairy farmers (IFAD, 2006). These groups have different characteristics which make them have different constraints. Their production is done by a number of systems, which include intensive and extensive grazing.

Intensive grazing (also known as zero grazing) is used where there are small land sizes and therefore farmers feed their animals in stalls with very minimal movement. There are those who practice extensive production where mostly the animals graze and they are not stall fed.

The third method is where the farmers have a hybrid system such that the animals are fed in the stalls and also are allowed to graze on their own. These systems are normally referred to as free, semi-zero and zero grazing representing increasing intensification (Bebe et al., 2003a).

Many small scale farmers practice intensive dairy farming where they do stall feeding and a combination of stall feeding and grazing. This is because of their small land sizes usually less than 5 acres (Bebe et al., 2003a). Because of intensification most of the farmers prefer to keep large mature breeds (Bebe et al., 2003b) as they believe they are more productive as compared to others. In terms of output the smallholder open grazing is realized to have less output than the zero grazing itself (Karanja, 2003). This can be attributed to the use of concentrate and supplements in the zero grazing system and intensive feeding programs. The production



systems are influenced by the agro climatic characteristics of the area, land productivity potential and prevalence of animal diseases.

In contrast, according to Stot (1983) there are four milk production systems practiced by the Kenya small holders: Open grazing (a) with zebu cattle where cattle are herded on own or other people's farms or on communal lands, (b) With upgraded cows which involves the use of cultivated pastures with some minerals and concentrates; semi zero grazing. Cows are identified by pure exotic or highly up-graded dairy cows. Cows are grazed on open fields for most of the day and supplemented with concentrates in fodder or hay; zero grazing. Has the highest milk yield. Feeds are brought to the cows kept in stalls. The system is labor intensive, requires heavy initial capital investment but maximizes the use of land resource

The widespread adoption of dairy cattle in the country was stimulated by several interacting factors such as: the conducive policy and institutional environments provided by successive Government; the presence of significant dairy populations (owned by settler farmers); a Sub tropical geography suitable for dairy cattle; and smallholder communities who kept cattle and who had milk as an important part of their diet (Thorpe et al., 2000). Kenya is self-sufficient in milk production versus demand. In 2005, the country produced approximately 3.5 billion litres of milk, against a consumption of about 3 billion litres.

The Kenya dairy policy change of 2004, which incorporated small-scale milk producers and traders into the milk value chain and liberalized informal milk markets, has led to an increase in the amount of marketed milk, number of licensed milk vendors and a boost in demand for milk, leading to benefit for Kenyan milk producers, vendors and consumers. As a result of this policy change, milk production was targeted to increase to 4.2 and 5 billion litres by 2010 and 2015, respectively (Kenya Dairy Board, 2006). The dairy processing industry in Kenya comprises of target, medium and small scale processors.

Milk production is usually influenced by a variety of factors, in this study we will look into the following four factors namely: demographic characteristics breed variability, marketing structure and training of farmers.

2.3 Demographic Characteristics and Milk Production Project

According to Donna Garske(1991), demographics are the quantifiable statistics of a given population. Commonly examined demographics include gender, age, and ethnicity, knowledge of languages, disabilities, mobility, home ownership, employment status, and even location.

Demographic profiling is essentially an exercise in making generalizations about groups of people. As with all such generalizations many individuals within these groups will not conform to the profile - demographic information is aggregate and probabilistic information about groups, not about specific individual's. With this definition in the background, price of milk that dairy farmers receive will always be affected by the population and by extension the location they are, it is expected that dairy farms will move to areas with higher milk prices.

Studies by Wheat (1973), Morgan (1967, Calzonetti and walker (1991), suggest that the chief location factors of include demand for products which is an off shoot of marketing of the product; cost of factors of production such as labour and raw materials. Transportation (proximity) to markets, land, and infrastructure; a minimum level of development is required to attract any investment by the population to a given location, or entice the population to indulge in a certain economic activity and influence the level of success that they are bound to experience.

Kenyans consume an estimated 145 litres per person per year, more than five times milk consumption in other East African countries (SDP, 2005). Among all developing countries, only Mongolians and Mauritians consume more milk per dollar earned than do Kenyans (ILRI, 2007). Therefore populated area may provide a good market and boost production; though the population may have other non-economic issues that affect their choice of economic activity and the level of dedication the put into the activity of choice.

Across the years, a higher percentage of male-headed households kept improved cows compared to their female counterparts. On the other hand, more female-headed households kept local animals, indicating that they had less access to improved dairy breeds and perhaps dairy technologies in general. Baltenweck and Staal (2000), who found that female-headed households were more likely to have less access to information on milk production project. Overall, the percentage of households keeping improved animals increased over the years.

Large-scale farms are normally located farther away from towns or communities and from public waterways than are small-scale farms. Also, small-scale farms tend to be located closer to market outlets compared to large-scale farms. This is an advantage especially for perishable products such as milk, where distance to market outlet is vital.

2.4 Cattle Breed Variability and Milk Production Project

The dairy herd was mainly confined within the high potential areas and was composed of Friesian, Ayrshire, Guernsey, and Jersey as pure breeds and their crosses which make up over 50% of the total herd



(Muriuki, 2001). In the low potential areas, milk production was mainly from indigenous zebu and Sahiwal breeds, while in the arid areas, camels and goats were the most important producers of milk. 84% of the Kenyan marketed milk comes from cattle, 12% from camel and 4% from goats.

The dairy cattle population has grown tremendously from about 1.8 million in 1960 to about 4 million in 2005. Between June 2009 and May 2010, milk productivity was highest in the High Potential maize Zone (297 litres/cow), followed by Central Highlands (233 litres/cow), while Western and Eastern Lowlands had the lowest milk productivity at 67 and 91 Litres/cow, respectively (Wambugu S. et al. 2011). This can be partly attributed to the types of breeds kept in those areas.

The country's dairy cattle are estimated at 3.5 million head. Dairy cattle are mainly kept in medium to high rainfall areas. The key top dairy breeds are Ayrshire, Friesian, Guernsey and Jersey. Dairy production is one of the most leading enterprises in the livestock Sub-sector and forms an important livelihood to most small scale farmers. In 2008, the total milk production is estimated at 2.6 billion liters out of which more than 70% is produced by pure breed *Bos-Taurus* breeds and their crosses (KDDP, 2001). The main *Bos-Taurus* breeds kept include Holstein Friesian, Ayrshire, Jersey and Guernsey.

The ever increasing human population and concurrent urbanization will require efforts be geared towards increasing milk production to offset any resultant deficits. Improved milk production can be achieved through appropriate breed improvement program. Precise and accurate knowledge of genetic and phenotypic parameters are critical in planning and developing appropriate breed improvement strategies (Kahi et al., 2004).

Such breeding programs should be undergoing regular appraisal to identify optimum efficiency and predicts possible rates of improvements. Thus, bifurcation of the phenotypic trend into genetic and environmental trends will enable the assessment of the effectiveness of the selection program and management conditions over time (Musani and Meyer, 1997; Ojango and Pollot, 2001). This will also help in designing more appropriate genetic improvement and management strategies aimed at increasing milk production. However, estimate of genetic and phenotypic trends for various cattle breeds on small, medium and large scale farms are scarce in literature.

More so, no information is available on the phenotypic characteristics of the cattle breeds kept in Bomet Eas Sub County. Since feed, feeding systems and management are real constraints to intensification, the development and use of genotypes such as crossbreeds (*Bos Taurus* x *Bosindicus*) has been shown to give the benefits of both increased production and tolerance to climatic and nutritional stresses (McDowell 1989).

There is evidence that indigenous cattle are more resistant than *Bos Taurus* to ticks and tick-borne diseases (Baker &Rege 1984). In addition, they probably use feed more efficiently at low feeding levels and have the ability to select high quality diets when grazing course tropical pastures (McDowell1989). The use of improved animals (Friesian, Jersey, Guernsey and Ayrshire) requires high management, large amounts of concentrates/cow and low forage to concentrate ratio of the magnitude 40:60 (McDowell 1989). These requirements are lacking in the smallholder sector and therefore use of improved pure exotic dairy cows should not be encouraged.

The problem of exotic cows in the environment with feed and management constraints was reported in Friesian cows, which produced 1,736 to 2,540 kg/lactation (Mostageeret al, 1987). All these factors add to one deciding factor that a farmer considers when choosing a breed to keep and thus affecting their milk productivity.

2.5 Marketing and Milk Production Project

Marketing is defined as the set of human activities directed at facilitating and consummating exchanges. All business activities facilitating the exchange are included in marketing (Philip kotler, 2003).Marketing involves all activities involved in the production, flow of goods and services from point of production to consumers. Marketing includes all activities of exchange conducted by producers and middlemen in commerce for the purpose of satisfying consumer demand.

Kenya is one of the highest consumers of milk in the developing world, consuming an estimated 145 litres per person, per year; more than five times the milk consumption in other East African countries (Small Holder Dairy Project, 2005) .In Africa, Kenya is the only other country, after South Africa, that produces enough milk for both domestic consumption and export. Sudan on the other hand is the largest producer of milk to the Common Market for East and Southern Africa (COMESA).

The Kenyan dairy industry has grown tremendously since its liberalization in 1992. Liberalization led to a rapid growth of the informal milk trade that mainly consists of small scale operators dealing in marketing of raw milk. At that time, there was an emergence of new institutional arrangements in milk collection, processing and marketing, which included hawkers, brokers, self-help groups, neighbors and business establishments like hotels (Karanja, 2003). The informal markets controls an estimated 70% of the total milk marketed in Kenya (KDB, 2009; Government of Kenya, 2006).



Until the 1990s, the Kenya Creameries Corporation (KCC) processed all the milk in Kenya, but its monopoly slowly decreased between 1993 and 1996 (Olok- Asobasi and Serunjogi, 2001). Many private processors have joined the dairy business since 1992, and have increased greatly since 1999. According to the industry statistics by the Kenya Dairy Board, in 2010, there were an estimated 27 processors, 64 mini dairies, 78 cottage and 1,138 milk bars. After the liberalization of the milk industry, there were concerns over food safety and quality of milk sold by the informal sector players.

The dairy policy at the time focused on promoting value addition and increasing the market share of pasteurization milk while attempting to address potential public health risks of consuming raw milk. However, since 2004, there has been a major change in policy and practice towards the informal milk market (Leksmono, *et al.*, 2006). The dairy policy now clearly acknowledges the role of Small Scale Milk Vendors (SSMVs) and contains specific measures to support them. These include: development of low-cost appropriate technologies, training on safe milk handling, provision of incentives for improved milk collection and handling systems, and establishment of supportive certification system.

While the Dairy Policy is still in progress, awaiting approval by parliament, there has been a proactive engagement by the Kenya Dairy Board in training and certification of SSMVs, in order to safeguard public health and assure quality of the raw milk (Leksmono, *et al.*, 2006). The Kenyan dairy market suffered when KCC collapsed but since the revival of KCC and further emergence of numerous small scale processors, milk marketing is not as challenging as it was at the time KCC was collapsed. The milk is either sold raw directly to consumers or to the processors.

The main players in the milk market are the processing companies, brokers and milk bars (Muriuki, *et al.*, 2003). The major constraint facing smallholder farmers is that they do not have proper means of delivering their milk to the process or sand also poor road infrastructure (Muriuki, *etal.*, 2003). This affects marketing of farmers' milk given the perishable nature of milk. There are conscious efforts to improve farmer groups which have been deemed to help farmers to be able to bear the transaction costs involved in marketing (Kirsten and Vince, 2005). This effort to help farmers overcome the transaction costs is thus a very key factor to assist farmers to be able to sell their milk more profitably, which in their absence can result to market failure of the smallholder dairy Sub-sector.

The supply chain of milk and its products is also an important factor influencing marketing and consequently profitability of milk and its products. The development of the supply chain is of importance as it will be instrumental in supporting the smallholder dairy farmers to achieve significant profitability. The smallholder dairy project has also been working on improving the channels in which milk is distributed. This includes the formal and informal channels. It has also been established that about 80% of the milk sold in Kenya goes through the informal channels (Karanja, 2004). Therefore the improvement of these marketing channels will also play an important role in improving the marketing and also the profitability of farmers.

Most of the informal milk marketing channels suffer from transaction arrangement problems. The most pronounced being the standard of measurement where the lack of standard of measurement has been known to be a major contributor to market failure to many of the commodity markets in Africa (Kristen and Vink, 2005).

2.6 Training of and Milk Production Project

Training is described as having knowledge or cognizance; aware of the difference between two or more versions (The Oxford Dictionary). Over the last decade, milk productivity growth has been positive. The increase in productivity may be attributed to a number of factors such as improved animal husbandry practices and veterinary care, better quality feeds, and adoption of more intensive grazing systems and improved cow breeds (Wambugu S. *et al.* 2011).

Farmer training is promoted by presence of extension officers in Kenya. Dairy producers aim to increase productivity at the lowest possible cost. Farmers seek to ensure that the safety and quality of their raw milk will satisfy the highest expectations of the food industry and consumers. In addition, on-farm practices should ensure that milk is produced by healthy cattle under sustainable economic, social and environmental conditions. This can be achieved by observing the best practices in the industry. Good dairy farming practices entail the following as stated by FAO (2009): Animal health; Milking hygiene; Nutrition (feed and water); Animal welfare; Environment and Socio-economic management. Farmers should take into consideration applying these principles & practices to the whole farm system within a philosophy of continuous improvement, starting with the livestock in scope (SAI).

Before liberalization of dairy industry 1992, the government used to provide the small-scale farmers with free services or at very low fee. However, with increased budgetary constraints resulting to the crises in the 1970s and early 1980s, and the global pressure to the developing countries to implement policies and institutional and restructuring reforms(SAP's), the government changed its involvement in small scale farm support initiatives(Ngigi, 2002). Hence, the decontrol of milk prices (1992), and the privatization of AI services



(1991), privatization of clinical services (1994), and implementation of the cost sale of veterinary drugs, were some reforms meant to create enabling dairy industry environment with less government interventions (Omiti, 2002). However, these measures meant that farming has become expensive and unaffordable to most dairy smallholders.

Chamberlin (1989) indicates that poor implementation of breeding programmes in developing countries has resulted to low milk yield. The high cost AI services, which are not affordable to most dairy smallholders, deny the farmers opportunities to use improved and superior semen to upgrade their dairy herd, hence tend to use of natural method which is even more disadvantageous compared to AI service. The unavailability and high cost of clinical services has led to increased cattle diseases prevalence, reduced productivity or even death of dairy cattle.

Farmer awareness is particularly important in milk production project for it has a significant effect on the farmers' choice of economic venture and their performance in that particular venture. The declining milk price to concentrate price ratio from 1985 through 1993 caused the decline in viability of dairying. It has been shown that unless the milk to concentrate price ratio is greater than one, the economics of feeding concentrates may be doubtful (Walsheet *al*, 1991). The declining milk price to concentrate price ratio may be used as a guide to choose feeds and the optimum quantity of concentrate to be fed in a given situation.

Farmers should have knowledge of these practices and how to apply them so as to be deemed aware therefore being aware entails knowing this potential production changing practices and whether they apply them or not is another issue. Awareness of the market dynamics by the farmer will also affect the amount of milk that reaches the market.

2.7 Theoretical Framework of the study.

A theory as defined by Mugenda and Mugenda (2003) is a set of concepts and interrelations that are assumed to exist among those concepts. It provides the basis for establishing the hypothesis to theories — a reasoned set of prepositions, which are derived from and supported be tested in the study. A theoretical framework is a collection of interrelated ideas based on by data or evidence (Kombo and Tromp, 2006).

2.7.1 Theory of Reasoned Action (TRA)

The theoretical framework of this study will be based on the social – psychological Theory of Reasoned Action (TRA), which is composed by intention, outcome beliefs, outcome evaluations subjective beliefs and motivation to comply (Ajzen and Fishbein, 1980). This Theory aims at explaining the relationship between attitude and behavior ours within human action. It is used to predict how individuals will behave based on their pre- existing attitude and behavioral intention. An individual decision to engage in a particular behavior is based on the outcomes the individual expects will come as result of performing the behavior.

The TRA has shown to be valid in the circumstances where an individual has volitional control over the behavior in question. In this study, the stronger intention of striving to improve milk production by analyzing factor influencing its success will increase the likelihood for the behavior to be performed.

The author does not hold the attitude concept as control and view attitude in context of the belief attitude, intention, and behavior sequence or series. “Traditional attitudes” are “external variables” in the author’s system and what stressed in predicting action is termed “attitude towards the behavior.” Because consideration of personality and values does not add to the goal of prediction, they are external to his theory.

2.7.2 Theory of Culture of Poverty

Different theorists believe that the way poverty is approached, defined, and perceived, plays a role in its perpetuation. The first theory of poverty, which emerged in sociology, was the Darwinian theory of poverty. This theory tries to explain poverty in terms of the behaviour and attitudes of the poor people. The poor are poor because they were lazy, did not work hard, squandered money in gambling, drinking and unnecessary luxuries and they had disorder of family life. They have no ambition, no inner calling for work, are fatalistic and suffer from an intractable in educability” as the Brock Committee phrased it (Matza, 1966:294). Psychologically this ‘behaviour’ of the poor could also be attributed to their frustration, because of experiencing poverty situation, which they could not deal with in a normal manner.

Oscar Lewis from his experience in Mexico also developed the theory of culture of poverty (Oscar L. 1959). According to Lewis, the culture of poverty is a syndrome that thrives in certain situations. It requires an economic setting of cash economy, a high rate of unemployment and under employment, low wages and people with low skills. Without voluntary or government support and stale families, the low income population tends to develop the culture of poverty against the dominant ideology of accumulation of the middle class. For them to survive, they have to develop their own institution because the other society tends to use and underpay them or simply ignore them.



As a result the poor embody a common set of values, norms and certain trends of behaviour which is different from the normal culture. Coming up on realising the underlying factors on milk production project will promote to alleviate poverty by facilitation food simply as well as creating employment.

2.8 Conceptual Frame Work of the Study

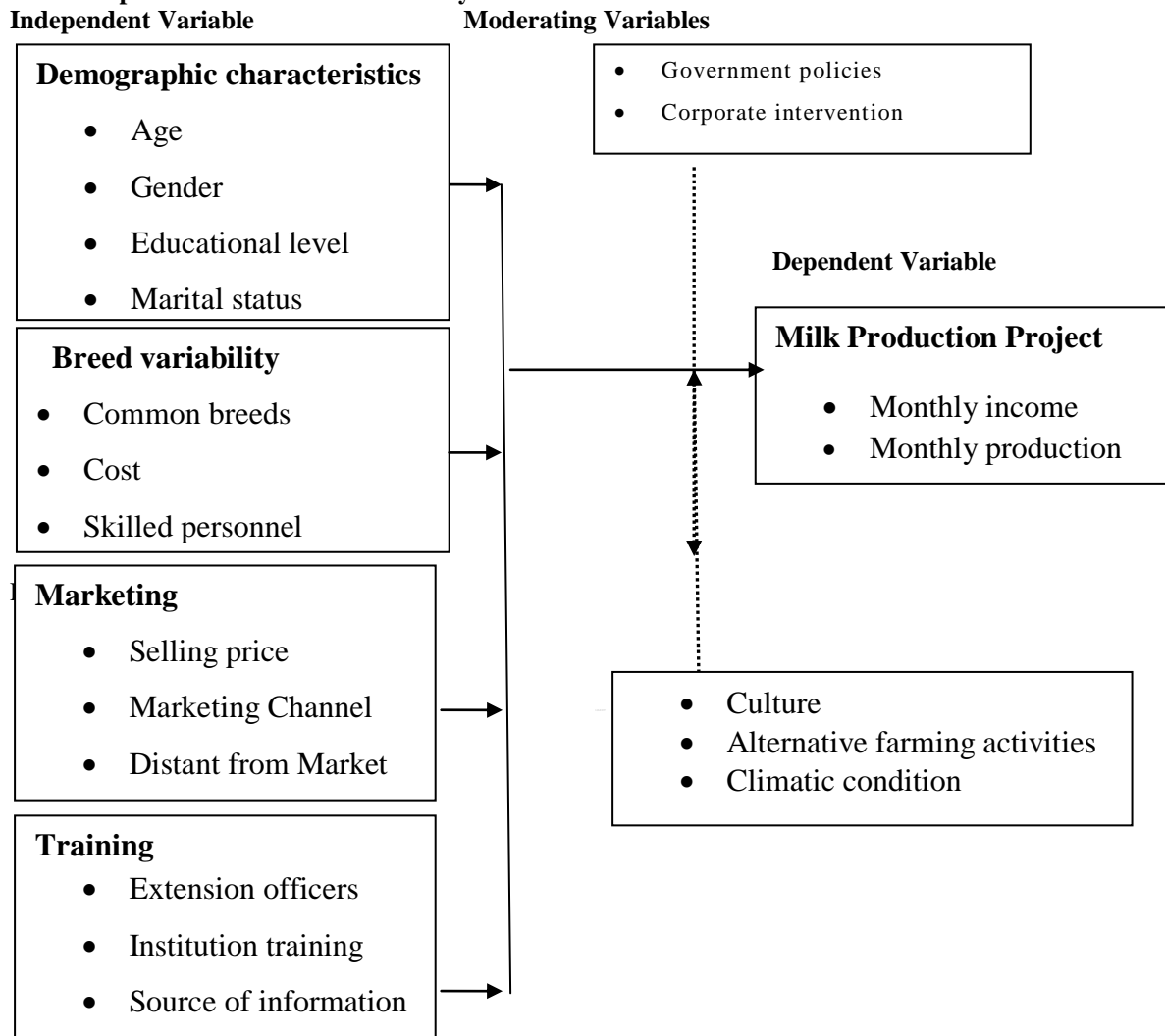


Figure 2.1.conceptual frame work.

2.9 Summary of Literature Review

What can we conclude from the literature reviewed above? What is the level of certainty for each of those conclusions? In order to answer these questions, it is important to appreciate that a recollection of all the literature reviewed strongly Substantiates the good of milk production that cannot be wished away in today's world. It is conclusive to say that from the literature review, bearing in mind the perceived gross benefits and gross costs, there are net benefits realized from the adoption of both large scale and small scale dairy farming.

It is however, surprising and a matter of greater concern on the reluctant and even sluggish pace that the some dairy farmers have not adopted towards high milk production. Bearing in mind fundamental principles in Theory Reasoned Action, consumer behavior, the key assumption is that the consumer is rational and seeks to maximize utilities (Benefits realized from the consumption of a given commodity). On the other end of the continuum, the theory of the firms indicates that firms seek to maximize benefits and minimize costs.

In the wake of these fundamental construes, dairy farming in particularly in developing nations like Kenya seem to be defying the odds and acting in a manner that would in dairy farming termed as "irrational". It is in the purview of these inconsistencies that the basis for undertaking this study was established. The gap in knowledge was a lack of comprehension of the real issues that curtail enhanced adoption of dairy farming in



developing nations like Kenya. To furnish such knowledge, this study poses the question: What are the factors affecting the adoption of dairy farming especially in Bomet East sub-county amongst the farmers.

Research Methodology

3.1 Introduction

This chapter captures the methodology that was used to conduct the research. It reviewed the research design, target population, the sampling size and sample selection. It also contains data collection instruments which are enhanced by pretesting, validation as well as reliability of the instrument in this study. It also features on procedure of data collection, method of data analysis, operationalization of variables as well as ethical issues in research.

3.2. Research Design

According to Mugenda and Mugenda (2003), research design is an arrangement of conducting, collection and analysis of data in a manner that to combine relevance to researchers purpose with economy in procedure. Also Kothari (2005) define a research design as a conceptual structure for collection, measurement and analysis of data.

In the view of Kisilu and Tromp (2006), descriptive survey research design is found suitable with studies that are quantitative and geared towards describing things as they exist. It enables in-depth collection of the information for it describes, explores and summarizes the data in distribution measurements. In this study descriptive survey research design was used, given that the study will be quantitative is the major characteristic and that it also targets a large population geographically spread in five wards of Bomet East Sub -County.

3.3 Target Population

As per Mugenda and Mugenda (2003), a target population refers to the accessible population from where a study sample is drawn and upon which the results are generalized. In this study the target population was 4,000 according to the researcher, 2016. The focus was to analyze questionnaire which was used to guide interview on the sampled respondents. Apart from these, four key information's; three officers from Ministry of Livestock and one official from Kenya Dairy Board (KDB) were included to make a total of 4,004 respondents.

3.4 Sample Size and Sample Selection

A sample refers to a subset of a target population (Kotari, 2005). It is a process of selecting a number of individuals or objects from a population such that the selected group contains elements representative of the characteristic found in the entire group (Orodho and Kombo, 2002). According to Singleton (1988), a sampling design is that part of the research plan that indicates how cases are to be selected for observation. There are two types of sample designs namely probability and non-probability.

3.4.1 Sample Size

In the views of Mugenda and Mugenda (2003), the correlation studies, 20 or more cases are enough for descriptive, Survey 10% - 30% of target population is enough for analysis and reporting. In the study therefore, the researcher intent to use 10% of the target population.

3.4.2 Sample Selection

Sample selection describes techniques that a researcher uses to select items from the target which depict several features of that population (Okombo and Orodho, 2002). In this study a probability sampling design was adopted as it accords equal representation of the target population in the final study sample.

According to Deming (1990), stratified sampling technique produce estimates of overall population parameters with greater precision and ensures a more representative sample is derived from a relatively homogeneous population. The researcher therefore used stratified sampling techniques given the fact that the target population. The study grouped the population into strata comprising of the various locations. From each stratum the study used simple random sampling to select 404 respondents.



Table 3.1 Target population and Study Sample Size

Stratum size	Target Population	Sample Percentage	Sample
Kiprerres Ward	600	10	60
Merigi Ward	650	10	65
Chemener Ward	800	10	80
Kembu Ward	950	10	95
Longisa Ward	1,000	10	100
Total	4,000	10	400

3.5 Data Collection Instruments

Data collection instruments describe those tools that the researcher develops in order to collect data from the respondents (Ogongo and Rotho, 2002). Given the fact that this study is quantitatively in nature and targeting a wide population spread geographically in the entire five wards of Bomet East Sub-County, Bomet County, the researcher developed questionnaire as the main data collection instrument.

A questionnaire is the best data collection instrument commonly used by Social Scientist in obtaining maximum information for descriptive studies (Kothari's, 2005). The questioners developed contain varied questions with most item being closed ended where as a few were open ended contingencies and matrix items. The choice of these question mixed is to ensure that both quantitative and qualitative data are obtained for the study.

3.6 Validity and Reliability of Instruments

Instrument pretesting is a preliminary study conducted in order to establish the effectiveness of data collection instrument (Mugenda and Mugenda, 2003). A pretest sample should be between 1% and 10% of studied sample size (Mugenda and Mugenda, 2003). In this study the researcher intent to use a pretest sample of size of 10% of the study sample size which is 40 respondents.

3.6.1 Instrument validity

According to Mugenda and Mugenda (2003), validity is a measure of what one purport to measure. It is the extent to which a measuring instrument yields the desired outcome (Kothari, 2005). In this study, the researcher ascertained instrument validity through adequate coverage of research objectives. Moreover instruments validity was also assured through peer review and expert judgment.

3.6.2 Instrument Reliability

According to Kothari (2005), a reliable instrument is that which give results with repeated trials. In the views of Mugenda and Mugenda (2003), a reliable instrument yield consistent results when repeated severally or any time a measurement is taken. In this study, the researcher a curtained instrument reliability using a split half reliability method. This was done by dividing the data collection instrument into two equal parts on the basis of odd and even appearances. By administering odd items to a respondent and measurement taken, even appearance was subsequently being administered to the same respondent and measurement taken. Using Pierson's Product moment coefficient of correlation (r), the two scores was compared and by obtaining and alpha value (α) of 0.6 and above, it indicated that the instrument was reliable.

3.7 Data Collection Procedures

According to Mugenda and Mugenda (2003), data collection procedure describes the steps in sequential order undertaken in the process of data collection. In this study, the researcher developed a research proposal, present an effect the necessary correction. Subsequently the researcher requested for letter of transmission from University so as to present to relevant authority seeking for permission to collect data. The researcher then dispatch to well trained research assistants to self administer the questionnaires to respondent in paten of the 20 copies per day until all copies are administered. This provides more in-depth and rich description was done by interviews, questionnaire, observations, focus group discussion and key informants.

3.7.1 Interviews

The study used structured interviews, where the researcher asked each respondent the same question. Face-to-face interviews were carried out and respondents purposively sampled. The researcher used a questionnaire with closed and open ended questions.



3.7.2 Observation

The researcher used observation method to verify some of the data collected from the respondents. Direct observations used in areas such determining level of education, presence breeds of dairy cattle, gender of the farmer, farm records and household structure. This method was used in order to reduce the chances of incorrect data being recorded.

3.7.3 Key Informant interviews

A key informant was anyone who could provide detailed information and opinion base on his or her knowledge of milk production project in the study area. The study interviewed four key informants who are involved in milk production projects the Sub County and those in leadership of the area. Key informants included; three officers from Ministry of Livestock and one official from Kenya Dairy Board (KDB).

3.8 Data Analysis Methods

Data analysis involves data editing, cleaning, organization and verification (Jaquar, 2006). Data collected was edited, coded and analyzed using the computer soft ware, Statistical Package for Social Sciences (SPSS, 2006). It was presented in form of table presentations. Descriptive statistic approach was used to analyze the data. This includes the use of tables, frequencies distribution and percentages. This helped critically in checking of the data transformation, data modeling, information summary, suggesting of conclusions and decisions making in the study.

3.9 Operationalization of Study Variables

The Operationalization of a variables means manipulating both the independent and dependent variables in such a way that they end up having a few levels thus becoming measurable.

Table 3.1 Operationalization of study variables

Objectives	Variable	Indicators	Measures	Scale
To determine the extent to which demographic characteristics influence milk production project	Independent variable Demographic Characteristics	<ul style="list-style-type: none"> Age Gender Educational level Marital status 	Years Type Type Certificate	Ratio Nominal Nominal
	Dependent variable Milk production project	<ul style="list-style-type: none"> Monthly income Monthly production 	No years. Amount milk Total amount	Ratio Ratio
To analyze how cattle breeds variability affect milk production project	Independent variable Breed variability	<ul style="list-style-type: none"> Common breeds Cost Skilled personnel 	Number Number Type number	Ratio Ratio Nominal Ratio
	Dependent variable Milk production project	<ul style="list-style-type: none"> Monthly income Monthly production 	Amount milk Total amount	Ratio Ratio
To examine how marketing factors Influence milk population project	Independent variable Marketing	<ul style="list-style-type: none"> Selling price Marketing Channel Distant from Market 	Price per litre List of market No of km	Ratio Ratio Ratio
	Dependent variable Milk production project	<ul style="list-style-type: none"> Monthly income Monthly production 	Amount milk Total	Ratio Ratio



To assess the extent to which training influence milk production project	Independent variable Training	<ul style="list-style-type: none"> • Extension officers • Institution training • Source of information 	amount Number Type Type	Ratio Ratio Ratio
	Dependent variable Milk production project	<ul style="list-style-type: none"> • Monthly income • Monthly production 	Amount Total amount	Ratio Ratio

3.10 Ethical Consideration

In the views of Donald (2008), ethics refer to the degree of conduct that researcher is expected to observe in order to undertake credible study. Ethical measures are principles the researcher should bind herself to in conducting the research before data collection (Macmillan and Schumacher, 1993). Initial approval was secured from the University of Nairobi.

Once the respondents were identified, their informed consent was sort before administering the questionnaires. The respondents were assured that the information given was for the purpose of this research and was to be treated with utmost confidentiality. In this study the researcher observe all ethical issues in research rouging from plagiarism to the relationship to the respondents.

Data Analysis, Interpretation and Presentation of Findings

4.1 Introduction

This chapter presents and discusses the interpretation and presentation of the findings. This chapter presents analysis of the data on to investigate factors influencing milk production among small scale dairy farmers in Bomet East Sub-County. The chapter also provides the major findings and results of the study objectives.

4.2 Questionnaire Response rate

Questionnaires were administered to small scale dairy farmers from Bomet East Sub County.

Table 4. 1: Response Rate

Frequency	Percentage	
Returned	400	99
Not returned	4	1
Total	404	100

As in table 4.1 , the study targeted 4004 respondents as computed in the chapter three of the study. The study targeted 404 respondents out of which 400 questionnaires were filled and returned giving a response rate of 99%.The other 4 were spoiled(1%).The four extension officers from ministry of livestock two from each region of study and one official from Kenya dairy board were all interviewed by the researcher hence a 100% response rate. This was possible due to the fact that the questionnaire was administered by research assistants and risk of non-return was minimized because as soon as the questionnaire was well filled out was recovered.

4.3 Demographic characteristics of farmer and milk production project

The demographic characteristics of the respondents are presented in this section of this study. These are social factors that potentially influence milk production project and include age, gender, education level and marital status of small scale dairy farming.

4.3.1 Age distribution of farmer by region

Table 4.2 Age category of the respondents by region

Age Category of the Respondent	Frequency	Percentage
Below 18years	4	1
18 -25years	32	8
26 -35years	128	32
36 -45years	112	28
46 -50years	48	12



Above 50years	76	19
Total	400	100

Table 4.2 shows that most of respondents were between the ages of 26 and 35 years of age with a36 respondents being 25 years and below. An elderly population though less productive is more settled and experienced in whatever the economic endeavors they undertake. Age may also be an impediment when it comes to innovation as younger people are deemed more innovative.

According to government of Kenya, (2012)the average age of a farmer is 60 years. Very few youth people who involve themselves in dairy farming and those who does don't give dairy farming the seriousness it deserves. Therefore youth should be encouraged to enter into dairy farming through milk value chain, value addition and any other stage of milk value chain and eventually they will engage in production after realizing the benefits.

4.3.2 Distribution of farmers by gender

A personal attribute of the farmer's analysis in the study was their gender. During the data collection exercise, farmers were asked to state their gender.

Table 4.3 Gender of the Respondent

Gender of the Respondent	Frequency	Percentage
Male	240	60
Female	160	40
Total	400	100

The Table 4.3 shows that male respondents make up more than half the population comprised of 240 males (60%) and 69 females (39%).This shows that more men are involved trying to control resources in the household.

4.3.3 Education Level of the Respondents

Table 4.4: Education level of respondents

Education Level of the respondent	Frequency	Percentage
Primary Level and Below	272	68
Secondary	112	28
Post-Secondary	16	4
Total	400	100

As shown in Table 4.4, 68% of the respondents from Bomet East Sub County had attained education from primary level and below and 32% had attained secondary education as their highest qualification.

According to Karanja (2003) such limited education levels are likely to negate the adoption of new and improved dairy production practices by farmers leading to low milk production. Education generally increases a person awareness of his/her environment and ability to acquire and process information about his/her environment and to detect changes in it. Education also enhances the farmers' ability to identify alternatives and compare costs Mbwesa (2004).This study supported the proposition by Bhola et al (2006) that people with low levels of education had difficulty finding a paid job and therefore sees no other possibility than engage in farming.

4.3.3 Marital Status of the Respondents

In the study, respondents were asked to state their marital status.



Table 4.5: Marital Status of respondents

Marital Status of the respondent	Frequency	Percentage
Married	360	90
Single	24	6
Widowed	4	1
Unmarried	12	3
Total	400	100

Of the participants who responded to the question, 90% were married and consisting of 360 persons. Marital status could contribute to difference in production between the married, single, widowed and unmarried respondents in that, a household with a married couple tends to have more labour capital for dairy farming, which is mostly a labour intensive activity when practiced in small scale in Kenya

4.4 Breed variability and milk production Project

Milk production of a cow is governed by the inherited genetic characteristic of a cow. Different breeds of cows have been shown to produce different quantities of milk when they are compared under the same environment (McDonald et al, 1998). In this study breed commonly found in the region, cost of production and skills used.

4.4.1 Breed of Cattle commonly found on farm by region

The availability and quality of breeding stock plays a key role in increasing the milk productivity of the livestock sector. Farmers were asked to state the common breed in their farms and this aimed at measuring the most common breeds in the regions and the breeding stage.

Table 4.6 Breed of Cattle commonly found on farm

Breed of Cattle commonly found on Farm	Frequency	Percentage
Friesian	80	20
Ayrshire	28	7
Gunsey	4	1
Jersey	8	2
Cross	280	70
Total	400	100

Farmers were asked what the most common breed on their farm is and an option of five breeds was given, where one of the options was “crosses”. As shown in Table 4.5, 280 (70%) farmers chose crosses, 80 (20%) chose Friesian, 28 (7%) chose Ayrshire and 4(1%) chose Gunsey. This is consistent with Muriuki & Thorpe (2004) who established that crossbreed cows are the most popular in Rift Valley province which includes Bomet East Sub County.

The study is similar to that of Ngigi (2004) in the study of smallholder dairy in Kenya. The researcher identified improved breeds as an important driver for change in milk production. According to researcher widespread introduction of highly productive breeds of dairy cows has been major source of increased productivity in dairy sector.



4.4.2 Cost production

Table 4.7: Cost production

Average sale of milk per day	Frequency	Percentage
Below 10 litres	320	80
10 litres- 15litres	48	12
15litres- 20litres	24	6
Above 20litres	8	2
Total	400	100

Majority of the respondent, 80% expressed that their cattle produced below 10 liters a day. About 12% said their cattle produce an average of 10-15 liters with less than 6% from the regions producing an average of 15-20 liters a day. About 2% of respondents produced an average of more than 20 litres.

4.4.3 Skills used for Mating

Table 4.8: Skills used for Mating Used region

Skills used for Mating	Frequency	Percentage
Natural Mating	300	75
Artificial Insemination	88	22
Not Yet	12	3
Total	400	100

Table 4.8 illustrates the skills used for mating that the respondents use for their animals. Natural mating was the most common type where 300 or 75% of the respondents used it. 22% of the respondents used Artificial Insemination (A.I) and 3% had not yet used any type. This explains the common types of the breeds found in the regions as natural mating mostly results in crosses as artificial insemination is the best method for improving the breeds. According to results of the study there is poor breeding and milk production is affected negatively by this fact.

4.5 Marketing structure and milk production Project

Marketing is defined as the performance of all business activities that are involved in the flow of milk and services from the point of initial production until they are in the hand asked to answer a few questions regarding the price, form of milk used and distance from nearest market. The results were presented in a series of frequency distribution tables.

4.5.1 Selling prices of milk/ litre

In well-functioning marketing systems, farmers are free to market their products through the outlets of their choice. The decision to market their milk through particular outlets is a function of production cost, transport cost, risk cost and promptness of payment among other factors.

Table 4.9: Selling price of milk/liter

Selling Price of a litre of milk	Frequency	Percentage
20-30 Ksh	344	86
30-40 Ksh	56	14
Total	400	100

Table 4.9 above has summarized the frequency of milk price the region. About 344 respondents (about 86%) named a price of between Ksh20 - 30 with the rest of respondents (56) naming Ksh30-40. The milk prices can be attributed to the milk marketing scheme where farmers who sell to consumers directly fetch higher prices than those who sell to middlemen. However milk like any other commodity follows rules of supply and demand where during dry season prices go up as supply is low. On the other hand during rainy season the prices go down due to increased production from farmers.



4.5.2 Milk marketing channel

Table 4.10: Milk marketing channel

Milk marketing channel/ option used	Frequency	Percentage
Sell to neighbors	144	36
Local Shops/ Hotels	152	38
Middlemen	84	21
Direct to processors	16	4
Dairy cooperative	4	1
Total	400	100

It is interesting to note that the channels most used by respondents in the region are: neighbors(36%)and local shops/hotels(38) and 1%use dairy cooperative .In terms of trust and management of dairy cooperatives and promptness of payment clearly show farmers prefer local shops and hotels. Reduced cost of transportation is another positive attributes favoring middlemen. Middlemen will collect milk from door step using motor bike which is an advantage to the farmer than cooperative who must charge some cost due to transport. The marketing channel farmers decide to use to market their milk either boost the morale or kills the morale of farmer affecting production of milk eventually.

4.5.3 Distance to nearest market

Table 4.11: Distance to nearest market

Distance of the nearest market in km where milk is sold	Frequency	Percentage
Less than 1km	180	45
1km-2km	144	36
3km-5km	24	6
Over 5km	52	13
Total	400	100

Most of respondents (about 45%) live less than a kilometer from the closest milk market with about 35% living between 1 and 2 kilometers from the milk market. It is shown that farmers lives at an average of 1-2 kilometers from the market. The closer the farmer is to the nearest market the easier it is to make quick sale especially during rainy seasons. This increases production and lower the transport cost hence encouraging more farmers to do dairy farming hence boost milk production. Most of the roads in the two region of study are weather roads and during rainy season are impassable. This affects the milk marketing and production.

4.5 Training and milk production

Farmers' training was measured by a number of factors, these include: whether or not they got training on dairy production, their main source of dairy information and the number of farmers they networked with.

4.5.1 Extension services offered by Government Officers on Dairy Production

Respondents were asked to rate services offered by got from government officers on dairy production project using a four point scale from 1-poor through to 4-very satisfactory.

Table 4.12: Extension services offered by Government Officers on Dairy Production project

Rating of services offered by Government Officers	Frequency	Percentage
Poor	184	46
Fair	92	23
Good	102	30
Very Satisfactory	4	1
Total	400	100



From table 4.12, most of farmers (46%) said it was poor. An average score of the rating was computed as 23% for fair service where as those who are satisfied are 4 respondent(1%).Result from the study reveals that for more production to be realized in this region's the Government services are needed. Services like disease control and animal nutrition among others are key factors to consider when doing dairy farming and these services are offered by Government cost of production of farmer goes down and this in one way or the other boost milk production project.

4.5.2 Institution offering training on dairy production project

Table 4.13: Institution offering training on dairy production

Institution offering training on dairy production	Frequency	Percentage
NGO	16	4
Government of Kenya	160	40
Private Sector	8	2
None	216	54
Total	400	100

Summary of institutions that trained farmers on dairy farming is illustrated in Table 4.13below. About 54% of respondents chose none. Government of Kenya was chosen by about 40%. About 4% get training from NGOs. Generally more farmers had not gotten any form of training from any organization. A small number of farmers (2%) got their training from the private sector which is an indicator of the weak private sector presence in the region.

From the study capacity building on farmer is an indication of increasing awareness among small scale dairy farmers and the trainings has an effect on milk production. New ideas on dairy farming receive better implementation when farmers are trained by extension staffs from either government or private sector. Result of the study reveals that a lot of farmers are on their own with no training services from either government or private sector. Milk production depends to some extent on farmers' awareness which is increased through capacity building among dairy farmers.

4.5.3 Source of dairy information

Table 4.14: Source of dairy information

Source of Dairy information on your Farm	Frequency	Percentage
Other Farmers	132	33
Leaders and farmers representative	24	6
Media	160	40
Workshops	56	14
All of the above	20	5
None	4	2
Total	400	100

Table 4.14 illustrates respondents' source of dairy information in five given categories plus "none" option. About 40% of farmers stated that the media is the better source of information. Approximately 33% of respondents chose other farmers. About 5% persons chose "all of the above". Approximately another 14% said they attended workshop and 6% chose leaders and farmers' representatives. Almost 2% of farmers chose none. The study most farmers in the two regions get important dairy information from the media; this can be explained by the low literacy levels. For most of the farmers cannot seek information from other sources like journals thus they turn to the media and vernacular radio stations for important information.



Summary of Findings, Discussion, Conclusion And recommendations of Findings

5.1 Introduction

This chapter contains a summary of the findings, discusses of the findings and conclusions based on the objectives of the research study. The chapter also contains some recommendations for consideration based on the study findings. It ends section deliberates on the suggestions for further research.

5.2 Summary of the Findings

The first objective of the study was to identify how demographic characteristic of small scale dairy farmers affects milk production project Bomet East Sub County. It was found that more male dominated sector, with an average of about 60% male against 40% female respondents. A larger portion of the respondents also affirmed to being married, 90%. It was perhaps the transition rates from one level of education to the from secondary school transition rate of about 96 %.

More than half of these farmers produced ten or more litres of milk on a daily basis, with a further 39.53% producing between 5 – 10 litres daily. Most dairy farmers here fell in the age bracket of 26 – 30 years and this came at a steep price as much as 60.0% of respondents having an experience in dairy farming of less than ten years.

The second objective of the study was to establish how cattle breeds variability affects the milk production project among small scale farmers. The dairy farmers (at about 70%) relied on cross breeds of dairy cattle most of which were as a result of in-breeding thus significantly dampening the potential for their milk production capacity. Perhaps attributable to the relatively low experience levels in dairy farming, about 80% of respondents had a daily output.

The third objective of the study was to identify how marketing structure of milk affects its production .The study found out that most of the milk output is sold almost entirely at the rates of Kshs 20 – 30 a litre (86%). This can be partly explained by the fact that almost 78% of dairy farmers sell their milk to neighbors and/ or local shops.

The fourth objective of the study was to establish how small scale dairy farmers training on dairy farming affects the milk production. The study found out that (40%) dairy farmers sourced most of their dairy farming related information from the media as well as other farmers.

5.3 Discussion of Findings

This section briefly cross-examines the findings of this study in light of its previously stated objectives. These objectives were to examine the demographic characteristic of Small-scale dairy farmers, variability of cattle breeds, the marketing factors of milk production, the farmers' training and how these four elements respectively influenced milk production project in Bomet East Sub-County.

5.3.1 Demographic Characteristic and Milk Production project

From the findings, there is a stark difference between the age structures and years of schooling, whereas male dominance seemed to cut across the sector and a majority of the respondents were married. The study concurs with Wambugu (2011) who argued that majority of farmers keeping dairy cows that are improved per household are male headed. The study also concurred with Baltenweek and Staal (2000) who strongly says that whereas the youthful population is generally believed to harbor the most production potential in any economy, in certain sectors such as dairy farming the contrary is true.

The study totally agrees with walker (1991) who says that dairy farming is a science that calls for patience, character and practical experiences in order to fully reap of the fruits therein. The greatest undoing of a youthful population involved in dairy farming in Bomet East Sub County would be attributable to their haste, relative inexperience in dairy farming and fairly fewer years of schooling .

5.3.2 Variability of Breeds and Milk Production project

From the study, the variability of cattle breeds stocked by different farmers was the most pronounced of the three elements being interrogated for their possible contributions to the milk production project. This is consistent with Muriuki &Thorpe (2004)who established that crossbreed cows are the most popular in Rift Valley province which includes Bomet East Sub County.

The researcher identified improved breeds as an important driver for change in milk production project. According to researcher widespread introduction of highly productive breeds of dairy cows has been major source of increased productivity in dairy sector



5.3.3 Marketing factors and Milk Production project

From the study, most of the dairy farmers lived less than two kilometers away from their nearest markets, their fair distribution inside that radius appeared to be more of default than design. There lacked that convincing concentration around markets to point to their commercial orientation as far as dairy farming is concerned. To the contrary, findings of this study pointed out to a more subsistence based dairy farming as would be indicated by the larger portion of respondents, about seventy eight percent, who affirmed to selling their daily dairy produce to either their neighbors and/or local shops.

The study concurs to Echessah (1994) who argues that any efforts to improve dairy cattle milk production should be accompanied by improvements in the milk marketing systems in order to ensure that there are sufficient outlets to cater for the increased outputs of dairy products and the marketing systems provides the right incentives to producers in order that they provide the goods and services that are required by consumers at acceptable prices.

The study also concurs with a similar study undertaken by Ruigu,(1978) who reviewed the opportunities and problems in smallholder milk production marketing in Kenya and found out that the price the farmers are paid is an important incentive for sustained and increased milk output. The researcher can therefore strongly conclude that the price of milk determine the production level of small scale farmers.

5.3.4 Training and milk production project

Though a significant number of dairy farmers had not received any training on dairy farming, standing at about 45% .However leaned towards the Government of Kenya for the same. They sourced most of their dairy farming related information from the media as well as other farmers. As would be pointed out later, an increased training in dairy farming by local farmers directly affects the output levels in milk production, breeding and proper utilization of land acreages.

The study concurs with Muriuki (2003) that the more the farmers network with other farmers the better for them since the interaction becomes an avenue for sharing challenges in dairy and experience as well as sharing ideas. Also the study agrees with

Walshe (1991) who urges that the lesson learnt in dairy farming exchange hands and this brings improvement and increases production of milk.

5.4 Conclusions of the study

Whereas major strides have been made, there is still a lot of room for improvement as far as the dairy sector goes. The concept of dairy farming, and commercialized agriculture as a whole, is yet to be fully sold to the youthful populace in Kenya. The levels of Government support in terms of trainings and other capacity building exercises, provision of extension services and raising awareness levels in dairy farming as far as breeding,. As much 69.6% rated the services received from Government officers as below par, either rating it as poor or fair. Only an accumulated average of about 34% rated the same services as good enough.

Though mechanization is possible, it has been established from this study that dairy farming particularly in Kenya is a largely labour intensive undertaking that calls for a certain level of attention and commitment from the farmers. It has also been established that whereas the age factor, levels of education and training on dairy farming were pertinent to improved dairy farming, the variability of good quality dairy breeds was seen to be the single largest determinant of milk production capacities.

The demographic characteristics of the respondents in light of their age, education, trainig and even marital status provided meaningful insight into the nature of dairy farming in Kenya. The dairy farming sector in Kenya is yet to realize significant input from the youthful, post-secondary educated generations in Kenya. A majority of dairy farmers are however married thus promptly positioning them as beneficiaries of otherwise cheap labour from their spouses, children or even grandchildren.

5.5 Recommendations of the study

Having looked at the theoretical framework, the conceptual framework, alongside the literature review, the study findings and the conclusions made, a series of recommendations are pointed out:-

1. That the Government of Kenya, through the relevant Ministry and State Departments, join hands with key stakeholders in the private sector to undertake anation wide campaign to promote commercial dairy farming, and more so promote the stocking of quality dairy breeds through easily accessible financial arrangements. Proper utilization of land to ensure its maximum utility is realized ,among other dairy farming best practices, should be inculcated to the farmers as well as would be dairy farmers in order to ensure there is a sustained consistency in the improvement of milk production.



2. Though cognizant of the fact that this study targeted small scale dairy farmers, the fragmentation of land witnessed was alarming as it did prohibit proper utilization of the land resource which is the backbone of any meaningful agricultural activities. This practice also stifled the efforts, and regressed the milestones achieved, in transforming agriculture from subsistence levels to a commercially lucrative engagement that would see the MDGs on poverty alleviation, improved health through proper nutrition and even improved environmental sustainability addressed
3. The government should strive to help the farmers improve their breeds by registering them and offering semen through the government veterinary doctors and extension officers at a considerable cost. This will ensure change of breeds and up grading of the cattle farmers have and eventually bring a change in milk production among small scale farmers.
4. Further there is need to employ more livestock extension officers as a measure of improving extension effectiveness. This is the only way the extension officers can be able to have more individual visits to the farmers. There is need also to adopt information and communication technologies in extension services.
5. Efforts should be made to reach more female farmers through developing gender sensitive extension packages and extension approaches that are gender friendly. This is to try and encourage more female to take frontline in dairy farming and increase the current production in dairy sector.

5.6 Suggestions for Further Research

Out of this research, the following areas were found to have deficiencies of information and further research on these areas might be of value.

1. Determine the policy interventions required in revitalizing, sustaining and making competitive the dairy cooperative sector in Bomet County and nationally, within a liberalized regional and global market economy.
2. Access the contribution of informal milk marketing groups to the dairy sector and their implications on the formal dairy cooperatives in Bomet County.
3. The contribution of the dairy sub sector on the quality of life for the dairy farmers in the post liberalization period. Case of Bomet East Sub County in Bomet County.

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