

**COMMERCIALIZATION STRATEGIES ON PERFORMANCE OF DAIRY
ENTERPRISES IN NANDI COUNTY, KENYA**

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DECLARATION

This research project is my original work and has not been presented for a degree in any other University.

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DEDICATION

This research project is dedicated to my family, including my parents who were patient, caring and supportive of me throughout the course of my studies. Special appreciation goes to my husband Edward Boor, my children Trevor Kipkirui and Tracy Chesang for their encouragement and undiminishing support during the course; you always reminded me of the need to work hard and inspired me to keep on. I am greatly thankful to my family members: My dear parents Mr. & Mrs Gideon Chemis, my brothers and sisters Lenah, Lilian, Shadrach, Philip Chemis, Philip Saina, Silas, Rael, David, Rhodah and Jennifer Chemis for their continuous encouragement.

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ACRONYMS

EADD East Africa Dairy Development Project

FAO Food and Agriculture Organization

MOALD Ministry of Agriculture Livestock and Fisheries Development

SPSS Statistical Package for Social Services

USDA United States Development Agency

OPERATIONAL DEFINITION OF TERMS

Commercialization strategies: This refers to feeding, breeding or genetics, disease control and husbandry or management practices.

Performance in dairy enterprises: This is described in terms of level of production, value of dairy cows, cost of production and profitability.

Small scale dairy enterprises: A dairy enterprise that has one to five lactating cows and or the cows are producing an annual daily average of 3 – 5 liters of milk per cow per day through the lactation period. The scale could also relate to acreage under dairy farming and in this case a land size of less or equal to ten acres is considered small.

Medium scale dairy enterprises: A dairy enterprise that has six to ten lactating cows and or the cows are producing an annual daily average of 6 – 10 liters of milk per cow per day through the lactation period. The scale could also relate to acreage under dairy farming and in this case a land size of ten to fifteen acres is considered medium.

Large scale dairy enterprises: A dairy enterprise that has over fifteen lactating cows and or the cows are producing an annual daily average of over fifteen liters of milk per cow per day through the lactation period. The scale could also relate to acreage under dairy farming and in this case a land size of over fifteen acres is considered large.

Lelchego dairy company: This is a legally registered farmer owned producer organization that is bulking, chilling and collective marketing milk. It is also in the business of providing other hub services, that is, extension, inputs and financial services.

ABSTRACT

The study investigated the shortcomings of dairy entrepreneurs management practices strategies and the effect of these on performance of their dairy enterprises in Nandi County. The overall aim of the research was to investigate the influence of commercialization strategies on performance of dairy enterprises. The study sought to determine how commercialization strategies; that is feeding, breeding, disease control and husbandry, as they are currently practiced contribute to the performance of the various levels of dairy enterprises. The study will be important to farmers and key extension service and input providers who can promote and adopt the recommended strategies amidst emerging effects of climate change so as to improve the performance of the dairy business. This study was motivated by the resource based view theory, Churchill and Lewis grow model and anchored on the psychological field of inhibiting and driving forces model. Descriptive research design was used with the target population being 3,213 dairy entrepreneurs of Biribiriet location. Simple random sampling technique was used in selection, 184 respondents forming the study sample. Data was collected using structured questionnaires that were dropped and picked later while key informants were interviewed. Data was subjected to descriptive and inferential analysis to test hypotheses using SPSS version 23 software and presented using frequency tables, pie charts and bar graphs. Results indicated that: Feeding strategy had ($\beta = 0.040$, $p = 0.552$). Breeding strategy had ($\beta = 0.069$, $p = 0.000$). Disease control strategy had ($\beta = 0.023$, $p = 0.780$) and finally Husbandry strategy had ($\beta = 0.320$, $p = 0.000$). The null hypothesis HO_1 and HO_3 were accepted but HO_2 and HO_4 were rejected. The study concludes that breeding strategy of farmers in Biribiriet location directly influence the performance of their dairy animals; Feeding strategy adopted by farmers in Biribiriet location has no significant impact on the performance of their dairy animals; Disease control strategy has no significant impact on the performance by dairy animals and Husbandry strategy has a significant positive impact on the performance of dairy animals. The researcher recommends that famers should consider establishing effective strategies that will enhance the performance of their animals to increase the quality of their produce and their marketability. The government on the other hand should strive to build the capacity of the farmers with regards to agribusiness improvement.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The dairy industry in Kenya is dynamic and plays a major important economic role and source of nutrition for many households. It influences the lives of farmers, consumers, hawkers, transporters, employees and processors to various levels. Apart from milk, dairy animals also provide offspring, manure, meat, hides and skins at culling and other intangible benefits such as status symbol and insurance.

In countries that are developed, dairy farming is mainly by large-scale enterprises that engage high tech management systems accompanied by high uptake of technology. These enterprises invest high capital unlike in the developing countries where dairy production is mainly by small scale entrepreneurs who are limited in management and technical skills, constrained by capital and have minimal access to information. Due to these constraints in developing countries, the dairy sector has been unable to fully participate and compete in markets both domestic and regional. (Wambugu *et al.*, 2011).

The Food and Agriculture Organization (FAO) report of 2011, reported that in Kenya, the dairy cattle population contribute to over 70% of the total milk produced and marketed. It also showed that the dairy herd had grown from the year 1998 to 2007 by about 9%, at an annual rate of 0.96%. According to that report, the total cattle herd was composed of 50% cows, 10% heifers (aged over one year), 11% heifer aged below one year, 17% being bulls and bull calves and 12% steers. The main milk producing breeds were: Friesian, Ayrshire, Guernsey, Jersey and their crosses.

The milk production systems in Kenya can be divided into three broad categories: large, medium and small scale. The three systems of production are distinguished by their level of management, use of inputs and the sizes of operation. In Kenya, production of milk is mainly by small scale entrepreneurs, who are estimated to own one to three animals. They contribute up to 80% of the milk produced in the country. Over 1.8 million households are approximated to be involved in milk based enterprises; that is, as per the Kenya dairy master plan. In spite of this great role, the sector still suffers from low levels of productivity, profitability and sluggish enterprise development (GOK, 2010). This might be caused by small stages of commercialization likely stemming from poor business management skills and poor extension support services.

In order to enhance productivity, Barney (1991) stresses the significance of correct feeding and suitable balanced rations as the foundation of a prosperous dairy set-up. According to Barney, productivity per cow and the budget used for feed in order to produce milk have utmost effect on profitability in a dairy enterprise. The author further argues that for a dairy to be effective, the entrepreneurs and staff should continually endeavor to adopt practices that permit the highest output of milk at the most reasonable cost. In addition, the author emphasized that successful dairying depends on production of high amount of milk, getting rid of low producers, managing feed costs, using appropriate replacements and that cow identification and good records make appropriate feeding practices possible. According to the USDA, National Agricultural Statistics Service of 2012, the average milk production per cow in the United States was indicated to have increased to 14,213 lbs from 10,360lbs in 1975. Most of the increase in milk production was accredited to improved nutrition and feeding, all inclusive management

practices and the genetic enhancement of the cow population. However, this study was based in the United States.

According to an FAO report of 2012 on productivity of dairy animals in India, providing a balanced portion could increase net daily revenue by 10-15% through a rise of milk production and a reduction in the feed budget. The findings also indicated that by feeding a balanced ration, there was significant reduction in egg faecal counts of internal parasites, there was improved animal immunity shown by the increased levels of serum immunoglobulin and reduced enteric methane emissions by 15-20% per kg of milk produced. In this study, the National Dairy Development Board of India used computer software known as nutrition masters that provided advice to milk producers at their farms on how to balance the feed portions of their milking cows and buffaloes using the available feed resources and region specific mineral mixtures.

According to EADD annual survey report of 2015 dairy production in Kenya is still at an average of 5.4 liters per cow per day. Free range feeding systems remains the most widespread practice in Kenya with about 23 percent of the surveyed households practicing stall feeding alongside grazing. Seventy percent of the household grew fodder. Of these, 74% had grown napier grass and fodder trees (calliandra 2% and lucaena 3%). Of the 72% farmers that practiced feed conservation, 84% harvested and stored crop residues under a shade which poses a challenge of feed quality. The recommended feed conservation practices of silage and hay making were barely adopted at 10% and 5% respectively. Though most of the farmers supplemented their cows with dairy meal, the overall feeding strategies implemented by farmers are yet to maximize performance. Without concrete feed conservation strategies being adopted and the impending climate

variability, negative feeding practices will significantly affect performance of the dairy enterprises.

According to Oltenacu and Algers (2005) selective breeding for enhanced milk production is the basis of deteriorating longevity and unacceptably high levels of lameness, mastitis and metabolic ailments in the UK dairy herd. The authors argue that different breeding objectives are required as a matter of urgency so as to develop a generation of more robust cows with improved health, welfare, fertility and longevity. Rauw *et al.*, (1989) commented that the essential resolve is “to redefine the breeding objective in a comprehensive perspective”, which means “breeding cows with a long cost effective re-productive or productive life at a production level that is reasonable for example production in relation to veterinary costs, without exposing to any signs of distress”.

Chad Dechow (2016) also notes severe decline in cow fertility over the last five decades while the milk yield trends were on the rise. Oltenacu and Algers (2005) concluded that: “The commercial future of the dairy business is directly related to public approval of its breeding and production practices. It is vital to the dairy trade that wellbeing challenges be addressed before there is extensive condemnation of breeding and management practices. A different breeding goal intended to improve fitness and tolerance of metabolic stress is crucial to prevent the reduction in the quality of life of dairy cows and in its place, perhaps, boost it.” Therefore, in recent developments, breeding goals are economically driven and lifetime net merit index is used to simplify and guide the genetic selection process.

Mapiye *et al.*, (2006) alludes that the insufficient and low value feed resources are the main hindrance to improving yield of dairy animals in sub-Saharan Africa. Lukuyu *et al.*, (2012) compiled a manual on feeding dairy cattle in East Africa and indicated that the basic needs of a dairy cow for maximum production were: good feed and clean water, good health, comfortable environment for example temperature and clean floor, and friendly, loving, gentle and caring handler. The authors argue that to benefit from the cow's full genetic potential, there should be an appropriate nutrition program and activities that meet in entirety all the other needs stated above.

Findings from an EADD survey report of 2015 indicates that farmers are still struggling with implementation of good nutrition programs contributed by lack of knowledge, skills and resources thus the low production levels and high variance during dry and wet seasons. In addition, farmers are yet to advance their genetic potential by adopting better breeding technologies such as artificial insemination. Only 44% of farmers are using artificial insemination. Calves that are born from artificial insemination, managed well and bred to first time calving at 22-25 months of age fetch competitive pricing of over 2,500USD as in calf heifers. However, most of the entrepreneurs breed at over 15 months of age and are unable to attain the target of one calf per year per breeding cow. This is also largely contributed by poor feeding and management practices and dependence of free range grazing on unmanaged pastures.

Money is not only made from milk sales but from reduced input costs. Practices such as forced culling and improved reproduction and production help increase profits. According to the dairy farmers training manual produced by GOK in 2012, a Friesian cow has the potential of producing 40-60 liters of milk per day and gain an average live

weight of 500-550kg. The Ayrshire breed has a potential to produce 30 liters of milk per day and gain an average weight of 450kg at maturity. The Guernsey breeds have the potential of producing 25litres of milk per day and gaining 400-450kg per day whereas the jersey can produce up to 22litres of milk per day and gain an average of 350kg live weight. Such production is obtained when cattle are kept at optimum conditions; that is, provided with balanced sufficient feed in tandem with their weight and physiological status, clean adequate supply of water, good health, comfortable and clean environment, and have a friendly, loving, gentle and caring handler. Efforts to facilitate adoption of effective commercial strategies will enhance performance of the dairy industry, ensure increased household incomes, ensure food security and reduce rural poverty.

Okeyo (2013) argues that farmers in Kenya are yet to attain the desired genetic progress and are still struggling with high calf mortality rates, long calving intervals (>15 months), below standard milk production, mainly forage based diets and inadequate feeding. Dairy Genetics East Africa Project report of 2013 showed that the mean milk production around Nandi (Meteitei) and Bomet (Siongiroi) to be 4.5 – 5 liters per cow per day. Further reports from the East Africa Dairy Development (EADD) Project, currently working with dairy households in Kenya showed that the milk production was at a daily average of 5.4 liters per cow as reported by the annual survey of 2015.

Findings by Kirui (2014) indicated that there were increased incidences of tick borne and foot and mouth disease especially during the dry spell. The author further indicated the scarce feed resources including water available for dairy nutrition and reduced milk production. Although findings of an EADD report of 2015 indicated that 100% of

farmers practiced tick control measures, there could be challenges related with drug usage, frequency and techniques of application affecting effectiveness.

Dairy enterprise remains a major concern in rural households especially in Nandi County Kenya. Kirui (2014) conducted an assessment of the influence of climate change on dairy productivity using a cross-sectional survey research design. The research indicated that most farmers in Kosirai division, Biribiriet location included owned less than 5 dairy cows that produced a daily average of 5-8 liters per cow during the wet season and a mean of 2-5 liters during the dry season. This production level is considered low and unprofitable despite a potential average daily production of 19-26 liters per cow per day. Techno serve Kenya (2008) further noted great variance in milk production during the rainy and dry season which is characterized by reduction in feed supply and a general deficit in milk production. The low production levels might be caused by low levels of commercialization likely stemming from poor business management skills and poor extension support services. There have been extension programs by non-governmental organizations and government supporting dairy entrepreneurs make informed decisions to increase their dairy enterprise performance. This study therefore sought to determine the influence of commercial strategies on performance of the dairy enterprise amongst dairy entrepreneurs in Biribiriet location, Nandi County of Kenya.

1.2 Statement of the Problem

Milk production levels over the years has remained at an estimated average of between 4-5 liters of milk per cow per day during peak season and 2-3 liters per cow per day during dry season, against a potential daily average of 19 – 26 liters per cow per day. There are critical short comings and challenges affecting performance of dairy enterprises including; farmers' are reluctant to put behind traditional practices, limited resources by farmers thus little left for investment in better productivity enhancing technologies, lack of farmers' awareness on best and efficient practices. These have affected performance in terms of level of production, value of dairy cows, cost of production and profitability. According to Mudavadi *et al.*, (2001) farmers are faced with a myriad of problems ranging from insufficient and poor quality feeds; absence of appropriate dairy breeds; high levels of mortality due to illnesses and parasites; poor management and husbandry practices; disinclination by farmers to direct manual labor and management efforts from other farm activities to dairy production; lack of money for capital investment in basic infrastructure necessary for dairy production and marketing difficulties for milk and milk products which is reflected by poor and unstable milk prices, irregular payments and sometimes lack of market. The situation is made worse by farmers' failure to keep accurate records hence leading to uninformed decision making.

Just as other enterprises, farmers need to predict, adjust and or adopt to the changing context to remain competitive such as climatic changes which significantly affect rain fed dependent farms. Kirui, (2014) reported that Biribiriet location, located in the former Kosirai division, had experienced climatic changes over the past 10 years with declining trends in the amount of rainfall and increasing periods of dry spell which contributed to

increased incidences and prevalence of livestock diseases, shortage of feed resources and overall reduction in milk production. Nandi County is still considered milk deficit and therefore farmers are yet to adopt and adapt the correct combination of commercialization strategies to improve performance of their dairy enterprises amidst the existing and emerging constraints.

To this end, this study sought to establish the commercialization strategies adopted by dairy entrepreneurs' and as a result performance of the dairy enterprise in Biribiriet location, Nandi County so as to suggest solutions to enhance efficiency and improve performance of the industry.

1.3 Objectives of the study

The overall aim of the study was to determine the influence of commercialization strategies on performance of dairy enterprise by dairy entrepreneurs in Biribiriet location.

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

1. To determine the effect of feeding strategy on performance of dairy enterprise in Biribiriet location of Nandi County Kenya.
2. To assess the effect of breeding strategy on performance of dairy enterprise in Biribiriet location of Nandi County Kenya
3. To investigate the effect of disease control strategy on performance of dairy enterprise in Biribiriet location of Nandi County Kenya.
4. To analyze the effect of husbandry strategy on performance of dairy enterprise in Biribiriet location of Nandi County Kenya.

1.4 Hypothesis:

H₀₁: Feeding strategy has no effect on performance.

H₀₂: Breeding strategy has no effect on performance.

H₀₃: Disease control strategy has no effect on performance.

H₀₄: Husbandry strategy has no effect on performance.

1.5 Significance of the Study

The study explored with the aim of encouraging dairy entrepreneurs' in Biribiriet location and in the nation at large to adopt efficient and best practices in order to strike a balance among many regions of this nation as far as commercialization of dairy enterprise is concerned. The study recommends strategies that farmers can adopt amidst the effects of climate change so as to increase dairy production and household income. By understanding the farmers' level of awareness extension support services and inputs provided by various stakeholders' for example dairy cooperative societies, dairy companies, government, private sector, non-governmental organizations and other partners could be more sensitive to address existing gaps that constrain commercialization of dairy enterprise in Biribiriet location.

1.6 Assumptions of the study

This study was designed to understand the past and present dynamics affecting commercialization of dairy enterprise in Biribiriet location. The study was conducted under the following assumptions:

The farmers interviewed would be able to recall and give correct answers on the current farm management practices for example breeds, average production records, disease control measures, feeds and feeding systems and daily management decisions made on their farm. The farmers would give frank answers to the questions and in the event of a different respondent other than the household head has a good understanding of the routine farm management, their answers will be considered. The sample unit subjected to the study was an accurate representation of the population, and that the responses collected from them provided the essential data for a conclusive and up-to-date outcome.

Dynamics like infrastructure, technology except those relating to breeds, disease control and feeding, land sizes, market of milk, among others would be assumed to be constant and only breed of dairy animal, animal health management, feeds and feeding systems, husbandry and records of farmers in dairy enterprise would be taken to be the only dynamics that influence commercialization of dairy enterprise by small-scale farmers in the counties under the study. No major negative changes would take place in the dairy industry during the course of the study.

1.7 Scope of the study

The study was conducted in Biribiriet location of Nandi County in 2016. The human population is estimated at 4,017 households. The study focused on the strategic management decision and actions made by small scale dairy farms in Biribiriet location. Structured questionnaires, key informant interviews and observations were used for data collection. All other dynamics were held constant and only animal health management practices, dairy cattle breed variability, feeds and feeding systems and routine

management practices on dairy enterprise were studied as dynamics affecting the commercialization of dairy enterprise by farmers in Biribiriet location.

1.8 Limitations of the Study

The study was limited to Biribiriet location area where there was language barrier in some areas of Nandi County; in such areas the researcher used research assistants who are fluent in the residents' language to interpret the key and major issues related to the study. In addition, the researcher sought the help of a local person who is acquainted with the community so as to reduce bias. Suspicion and mistrust particularly with personal details got in the way of data collection and some respondents shied away from giving the information required by the researcher but this was solved by assuring the respondents that the information they would give will be treated with respect, professionalism and confidentiality. The researcher expected that there would be some uncooperative and unfriendly respondents, and this was reduced by motivating the respondents and by following up on the questionnaires. The questionnaire also factored in similarity in some questions to allow for triangulation of data collected.

CHAPTER TWO

LITERATURE REVIEW

2.1. Theoretical Review

This study was guided by three theories: resource based view theory, Churchill and Lewis growth model and the psychological field of inhibiting and driving forces theory. The study was anchored on the psychological field of inhibiting and driving forces which stipulates that the interaction of situational forces with the perceived environment can be described as a field of forces, a system in tension or a psychological field. The interaction of driving forces versus the inhibiting forces determine whether an equilibrium or disequilibrium is achieved.

2.1.1 Resource Based View

The resource based view model was developed by Hoffman in 2007. The model suggests that performance variances in businesses and why some companies achieve higher performance even under unfavorable circumstances or rapidly varying business conditions can be well explained on the basis of their core strengths. It is the firm's internal strength that is the true source of competitive advantage. Internal resources emerge from the firm's stock of resources and its capabilities to effectively employ them. As reported by Barney (1991), this theory was advanced by Wernerfelt, B through the publication entitled; 'The Resource Based View of the Firm.' Prahalad and Hamel also furthered this concept through a publication on "The Core Competence of the Corporation" and Barney, J. who published the "Firm resources and sustained Competitive Advantage"

The distinct choices that strategic managers make in their respective organizations create, over time disparities in the resources and capabilities of firms, giving some an ability to perform at higher levels. When a firm's resources are valuable, rare, and costly to imitate or substitute for a rival and the ability to employ them in competition is superior, its potential for above average performance is greater. When resources are uncommon and competences are exceptional and competitively significant, a firm is capable to endure its edge over competitors for a long time.

Just as the resource based view, the dairy enterprises can increase their competitive advantage by building it stock pile of assets that is, tangible and intangible over time. Tangible assets in the dairy enterprise can be equated to: land size, farm houses and structures, machinery, equipment, quality, affordable feeds and superior dairy breeds. The intangible and heterogeneous asset is the knowledge and skills to institute recommended disease control measures, improve the dairy genetics through selective and efficient breeding strategies, adopt effective and efficient husbandry practices and keep accurate records to guide routine and critical decision making about the enterprise. To gain competitive advantage, it is important that farmers have the requisite knowledge and skills, to efficiently and competitively feed, breed, control diseases and improve husbandry practices to increase their level of production, value of dairy cows and profitability.

2.1.2 Churchill and Lewis growth model

In 1983, Churchill and Lewis advanced a growth model which describes the anticipated evolution stages of a small to medium sized enterprise. This growth model notes that businesses go through five stages of growth for example, conception, survival, success,

take-off and maturity. The majority of the micro and small dairy enterprises remain at the conception and survival stages of growth and very little progress to the success status. This raises the question as to what factors contribute to this scenario and what can be done to have many more dairy businesses performing better to ensure success. There are interior and exterior influences on small business formation and endurance. The internal effects are owner/manager intentions, personal characteristics, technical skills, strategic organization capabilities, entrepreneurial management behavior whereas the external effects are macro and micro atmosphere.

Muriuki (2014) who conducted a study on the factors influencing growth in the dairy enterprise in Imenti South, Meru district used this theory. Churchill and Lewis growth model suggests that at the existence phase, the main focus is on winning customers and as such the level of formal structures is minimal and in certain cases non-existent. Furthermore, the organizational structure is level and as such the owner manager assumes a leadership style where there is direct control of those employed in the business.

According to Churchill and Lewis, (1983), as the firm progresses to second phase of survival, the business starts to develop some official systems as the managerial structure develops more stages and hence the owner supervisor begins to give out some tasks to other personnel or agents. The success phase is characterized by the owner director deciding either to retain the business at its existing operational stage or grow the business to upper growth stage. The resolution will be determined by the owner manager's inspiration, prospect recognition and resources. Practical managers are typically used in this phase since the firm would ordinarily have grown to considerable scopes and

additional management duties are required. Furthermore, the business has established basic functional structures such as marketing, finance and operations.

In the fourth phase of take-off, the main management concerns challenging the owner-manager comprise determining the speed of growth and funding of the anticipated growth (Churchill and Lewis, 1983). Entrenched in making these resolutions are matters of delegation, where the owner-director would have to consent for even larger delegation to functional leaders to advance organizational effectiveness, availability and access to monetary resources necessary to support the anticipated growth. The final phase is resource maturity. Here, the main worry for owner managers comprises managing the financial achievements resulting from growth and sustain the benefits related with small firms such as flexibility, responsiveness to clients' changing desires and entrepreneurial behavior (Muriuki, 2014). A firm at this phase would typically have sound-established organizational systems.

David Bradley, a business growth strategist who also used this theory indicated that when an entrepreneur is aware of the stage of his/her business, they can identify opportunities, issues and challenges thus able to forecast. Similarly, for dairy enterprises to be considered commercially viable and maximally performing, farmers must strive to progressively improve the organization systems at each of the stages. This includes progressively increasing the resource base such as skilled labor, knowledge, physical assets – land, cows, breed types, feed resources, machinery, equipment), type and quality of data to improve efficiency, delegation powers and supervision as well as market influence.

At each stage of growth, farmers should make informed decision that determines the performance of their enterprises. Dairy enterprises that demonstrate this growth pattern develop in scale, level of operations and profitability.

2.1.3 Psychological Field of Inhibiting and Driving Forces

The psychological field theory was developed by Kurt Lewin's in 1951. An individual in his subjectively supposed environment senses something is worth endeavoring for like adoption of Agricultural best practices (Kriesemer and Grötz, 2008). They then mobilize their personal powers to achieve this goal of adoption of the best practices in dairy enterprise. When something negative or undesirable occurs like a case of low production or poor quality, the person triggers his own powers a similar way to avoid the undesirable situation. Methods of reaching targets and side stepping undesirable situations can be obstructed or impeded by obstacles or inhibiting forces such as absence of awareness, risk or uncertainty around outcome, inadequate capital, traditional practices, absence of opportunities for scaling up of dairy enterprise innovation.

The inhibiting forces are forces negatively influencing behavioral change initiating the best practices in dairy enterprise e.g. lack of subsidies like artificial insemination, disease control measures, limited liquidity for labor hiring, buying concentrates, lack of machinery, establishment and conservation of nutritive feeds and inadequate knowledge. On the other hand, driving forces are the powers conducive to progressive changes such as financial support, technical guidance, training, providing inputs and connection with market outlets. The driving forces are likened to feeding, breeding, disease control and husbandry practices whereas the inhibiting forces are traditional dairy rearing practices which are not the focus of the study. Adoption of best enterprise practices is thus

perceived as a consequence from the psychological arena of inhibiting and driving forces. Therefore these forces are existing in a state of equilibrium or disequilibrium with variable degrees of pull between them. Once these forces are recognized in an enterprise decision making process, the probabilities of diffusion can be projected and consequences for advancement programs can be decided (Kriesemer and Grötz, 2008).

Rogers (2003), who used this theory, noted that the elements of adoption are: perceived attributes of the technology; comparative benefit; the grade to which an invention is perceived superior than the idea it supersedes; complexity - the point to which an exercise is seeming relatively challenging to understand and to embrace negatively associated to its degree of adoption; trial ability stage to which modernization like current dairy practices may be tried at a partial basis; compatibility grade to which maintainable practice is supposed as consistent with the present values, past know-how and needs of prospective adopters.

Rogers (2003), posited that the innovation decision process by which a person passes from are knowledge to attitude and lastly to adopting individual or collective, optional or authority. In many rural areas dairy enterprise is still carried out with simple tools by traditional methods, using practices based on trial and error. The production of food is slightly increased. There is little question that changes must be done in dairy enterprise methods, and new technologies are increasingly being viewed as the vehicle for solving agricultural problems. While the solutions seem to be simple, in practice it is not. Even where new technologies exist they may be inappropriate for particular agricultural settings, they cannot be transferred easily, or they collide with traditional cultural practices and preferences.

Developing agriculture by means of substituting new for existing technologies involves behavioral change on the part of the farmer. The amount of change involved will depend of the technologies and practices being promoted and the extent to which farmers' current behavior is inconsistent with them (Sofranko, 1984). Strategies for bringing about change have generally focused on altering the environment in which dairy enterprise is carried out, or in the direct transformation of farmers themselves (Rogers, 1969).

The study was guided by the psychological field of inhibiting and driving forces which specifies that the interface of circumstantial forces with the supposed environment can be defined as a field of forces, an organization in tension or a psychological field. The interactions of driving forces versus the inhibiting forces determine whether there an equilibrium or disequilibrium is achieved. Despite the changing climatic and environmental changes, emerging diseases and reduction in farm resources due to increasing demand, dairy entrepreneurs continue to produce through traditional methods without a focus on productivity trends. The study therefore intended to determine the extent of adoption of the core driving forces that promote commercialization of dairy enterprise and hence performance against the traditional, subsistence or cultural practices.

2.2. Empirical Review

Empirical review is a discussion on research or documentations conducted by other authors on similar or related topics (Dennis, 2013). According to UTAMU, 2014 empirical reviews demonstrate thoroughness in the field being investigated by critically reviewing empirical studies that have been done in the same or related study. This analysis should be critical clearly identifying where the studies were conducted, the sampling issues, the key findings and observed weaknesses in the studies.

Lukuyu *et al.*, (2012) emphasized that maximum production can be obtained when cattle are kept at optimum conditions; that is, provided with balanced sufficient feed in tandem with their weight and physiological status, clean adequate supply of water, good health, comfortable and clean environment, and have a friendly, loving, gentle and caring handler.

Dairy enterprise is economically viable and is reflected by level of milk produced, value of the cows, cost of production and profitability. Wambugu *et al.*, (2011), conducted an empirical review on productivity drifts and performance of small holder dairy enterprise in Kenya. Findings from the nationwide representative panel household data (2000-2010) and cross sectional data collected in 2010 in major milk producing areas showed that productivity was higher in high potential areas and increased up the income quintiles suggesting that dairy enterprise was a preserve of the relatively better off households. Gross margin analysis showed that dairying is an economically viable enterprise in the short run with the non-zero grazing system having higher gross margins and therefore, a financial advantage. The author concluded that better commercialization of the dairy sub sector and a proliferation in dairy revenues will come from enhanced technologies that will make prevailing resources more industrious, as well as policies and engagements that will address the seasonal intra-year fluctuations in production which comprise creation of a tactical milk reserve, financing in processing of long life dairy products and investment in infrastructure such as transportation and energy.

Muriuki *et al.*, (2014), who authored a paper on factors influencing growth of dairy enterprise business in Imenti South District of Meru County, reported that poor performance of dairy businesses stemmed from poor business growth caused by certain

business related factors. He established that business management skills influence growth in dairy enterprises and that interaction with extension service providers positively impacted on the earnings of dairy entrepreneurs.

Feed is known to contribute the largest portion of the production costs in market oriented dairy farming. As a best practice, dairy cows should have access to adequate, quality and balance feed and water. A FAO report by Muriuki (2011) indicated that the majority of feed resources available for dairy cattle in Kenya were natural forage, cultivated fodder mainly Napier grass and crop by products. The author noted that the low average milk production yields are attributable to poor or underfeeding of cows and poor quality feed. With good nutrition, dairy cattle are able to maximize their genetic potential attaining maturity weight at 12 months of age and fight off diseases.

Kirui (2014) documented an assessment of the influence of climate change on small holder dairy productivity in Kosirai, Kenya and Namayumba, Uganda. The findings indicated that limited dairy herd productivity was attributed to climate variability and changes that led to inadequate feeds and feeding from over reliance on rain fed forages. The study which was conducted in Kosirai division of Kenya, was guided by a cross-sectional study design.

A study conducted by EADD 2015 in Nandi, Kosirai division showed that the naturally occurring pasture and cultivated fodder is the main feed resource base. Natural pastures contribute the largest proportion of the feed on dry matter and metabolizable energy. Other feed resources include, crop residues, green forage and naturally occurring weed collected on farmlands during the wet season.

Farmers in the region reported that they collect process and store crop residues that are fed from August all through to October. Cultivated fodder contributes 29% dry matter (DM), 27% metabolizable energy (ME) and 57% crude protein (CP) to the total diet. Results indicated that Rhodes grass is the dominant fodder species planted across the region with each household having established an average of about 0.35 hectares. Other cultivated fodder include, Napier, Desmodium and fodder trees. The number of farmers that have adopted these practices and level of feed production and preservation is not yet commercially viable to meet the annual farm feed requirements for the year, hence the low levels of production still being reported at an annual average of 5.4 litres per cow per day (EADD annual survey report of 2015).

Ideally dairy cows should be bred successfully yearly to produce one calf per cow per year. Any delays in breeding and calving interval affects profitability of the enterprise. Chad (2016) notes that genetic selection should be informed by economic selection indexes, to prevent from the declining fertility rates with selection for milk yield trends. The scientist further shows that cross breeding of select pure breeds results in breed types with positive traits and highbred vigor. In light of recent developments, Chad demonstrates that faster genetic progress can be attained by adoption of technologies such as artificial insemination, use of sexed semen, invitro fertilization, embryo transfer or genomic selection technology. Farmers need to select the right breeds for the appropriate adapted environments.

Mudavadi *et al.*, (2001) documented the interventions of the small holder dairy competitiveness program whose objective was to increase milk yield in milk scarce areas, with a focus on western Kenya.

The main activity of the project was improvement of the indigenous cattle by usage of grade bulls through resident services, disease control, forage production and support of dairy cooperatives on milk handling, marketing and training. The author indicated that the program focused on three dairy commercialization strategies (Feeding, breeding and disease control) but there was no linkage of the strategies with performance of the enterprise. He further argues that the major constraints facing dairy entrepreneurs and thus affecting their performance were: Insufficiency and poor quality feeds; Inaccessibility of suitable dairy breeds; Extraordinary levels of deaths due to illnesses and parasites; Deprived management/husbandry practices; Disinclination by farmers to allocate labour and management personnel from other farm events to dairy production; Shortage of funds for capital investment in simple infrastructure essential for dairy production; Marketing hitches for milk and milk products (meager milk prices, late payments, lack of market).

Animal health and management is integral to livestock production and any deviation in comfort and wellbeing of animals is best expressed in lowered or reduced productivity. Animal health interventions have moved drastically from on farm curative/treatment to practices that seek to address all possible avenues that may introduce or bring about disease; thus herd health management as a biosecurity measure. Ideally all farms should seek to have programs that ensure control and prevention of all forms of disease from infectious, non-infectious, and dietary diseases while securing animal welfare. Such a program entails all protocols of disease prevention or control measures with focus on the following: vaccinations regimes, parasite control, development of herd health programs, management practices and timely access to quality inputs and services.

Kirui (2014) reported that climate change and variability had resulted in frequent drought and emergence of vector-borne parasites that affect milk production. Mudavadi *et al.*, (2001) also noted that farmers were faced with high levels of mortality due to diseases, poor management and husbandry practices. If farmers do not check their variable costs (veterinary included), they will increase their expenditures thus negatively affecting the enterprise profitability (Wambugu, 2011).

A survey that was conducted in Northeastern Spain revealed the significant effects of both stall convenience and stall maintenance on the production of dairy cows (Bach *et al.*, 2008). The outcomes reported by the mentioned author are comparable to those gathered at Miner Institute. The writer showed a positive association between stall availability specifying a unit change in proportion of stalls-to-cows improved milk production by 7.5 kg (16.5 lbs). For every hour increase in resting period resulted in an increase of 1.7 kg (3.7 lbs) of milk production. Animal well-being has been directly correlated with production. Cows that are kept in a comfortable environment, in good health, provided with adequate quality feed and water, handled in a gentle and friendly manner will produce maximally and have high immunity to resist infection.

Husbandry encompasses the routine and impromptu management decisions and farm protocols related to housing, milking, identification, management of structures, disbudding/dehorning, record keeping, weighing, body condition scoring, feeding decisions, breeding decisions, health checks, culling and replacements, identification and management of sick animals amongst others.

2.3 Conceptual framework

For this particular study, the performance indicators of dairy enterprise by small-scale dairy farmers in Biribiriet location is the dependent variable while the independent variables are the commercialization strategies that in one way or the other affect performance of this industry in the same regions. These strategies are feeding, breeding, disease control, husbandry and recording.

The commercialization strategies, either in isolation or a combination will cause or influence performance of dairy enterprise. Feeding is related to the level of milk production while breeding is linked with the value of dairy cows produced over time. Disease control is associated with the cost of production. However, the day to day husbandry and management practices determine the enterprise profitability.

Independent variables:
Commercialization strategies

Dependent variables:
Performance of the dairy enterprise

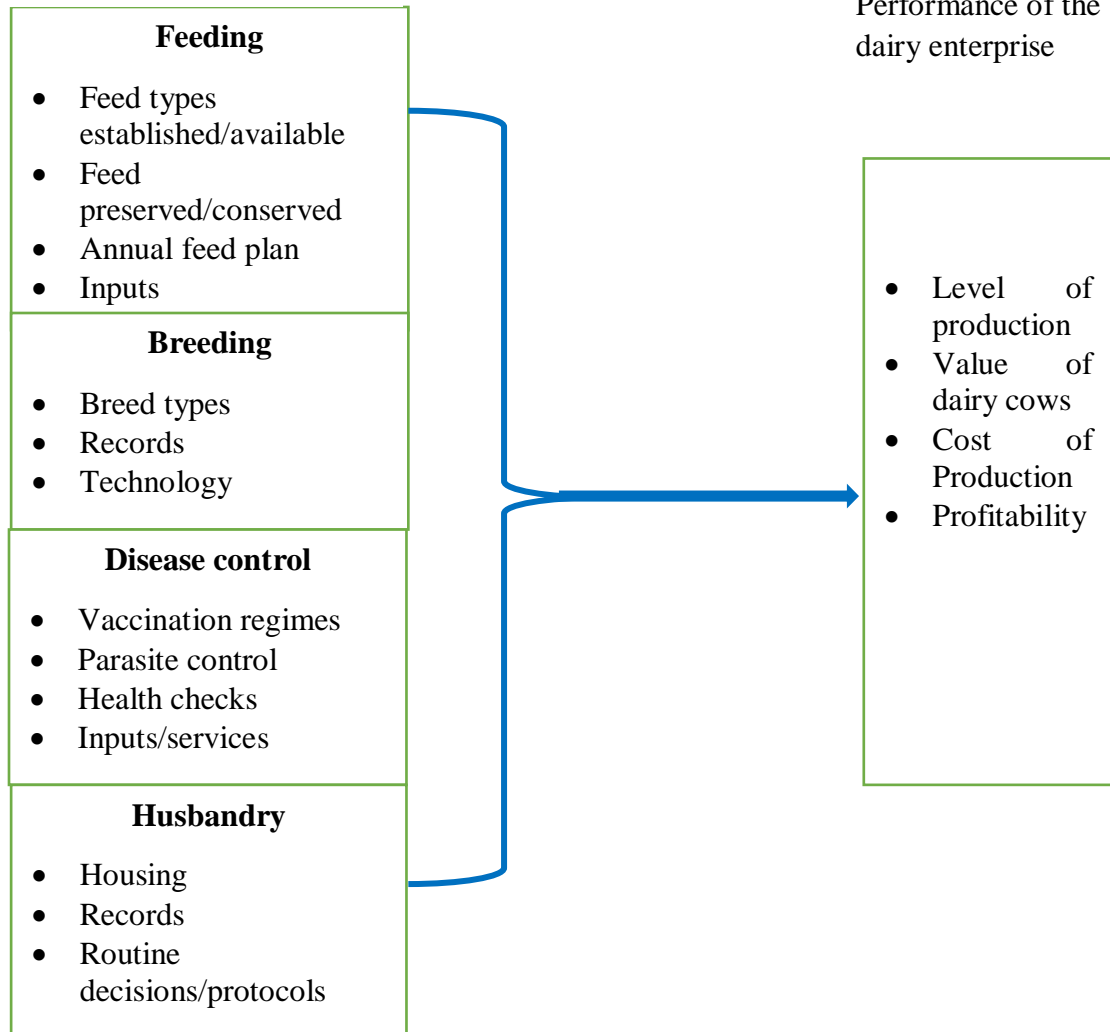


Figure i:

Conceptual framework of the study

Source: Researcher (2016)

Performance of the dairy enterprise was be measured by the following variables: level of milk production, value of the dairy cows, cost of production and profitability. Cost management determines the level of income and hence profitability of the dairy

enterprise. An enterprise needs to generate more money than it spends to remain in a viable business.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

The study employed descriptive survey design. This type of research determines and reports the status of events or phenomena without manipulation. Pinsonneault & Kraemer (1993) defined a survey as a “way for gathering data about the characteristics, activities, or views of a large group of individuals or groups.” Surveys can also be useful to assess necessities, evaluate demand, and study impact (Salant & Dillman, 1994). A survey design is inclusive in the types and number of variables that are studied, entails minimal investment to develop then administer, and is fairly easy for making generalizations (Bell, 1996). Likewise, surveys can elicit evidence about attitudes that are then difficult to quantify using observational techniques (McIntyre, 1999).

A descriptive survey design allows collection of data to be done at natural setting without manipulation (Mugenda & Mugenda, 2008). It's relatively quicker and cheaper to undertake and the results can be inferred to the larger population (Kirui, 2004). Its application allows for collection of both qualitative and quantitative data from dairy entrepreneurs whose productivity is affected by lack of adoption of commercialization strategies.

3.2 Target Population

Target population encompasses the definite units that are prospective members of a sample (Kothari, 2008; Mugenda, 2008). Steven (2004) argues that a population is a

theoretical concept. We can envision it, but when we get down to the nitty-gritty details, we can almost never actually measure it exactly.

The study targets dairy entrepreneurs who have been in the practice of dairy farming and have an aim of improving their performance through adoption of commercialization strategies. The target population of the study was 4,017 household dairy farmers. However, the dairy entrepreneurs were 3,213 as per the census conducted by the Ministry of Agriculture, Livestock and fisheries, Nandi County, in 2006. For purposes of the study, the dairy entrepreneurs were categorized as either small scale (estimated at 65%), the medium scale (estimated at 30%) while the large scale farmers are estimated at 5%.

Table 1: Distribution of target population

Categorization of dairy entrepreneurs	Target population
Large scale	161
Medium scale	964
Small scale	2088

Source: Research data (2016)

3.3 Sampling Design

Stratified and simple random sampling techniques were used in selection of the study sample because it provides an equal chance to every member of the population to be selected thus minimizing bias.

The sampling procedure involved randomly hand-picking of subjects on the basis of certain specific characteristics; for the purposes of this study the individual qualified to

be categorized as a dairy farmer and willingness to participate in the study. Steven elaborates sampling as the process by which we choose the individuals we will measure from the population (2004). He further notes that random sampling occurs when a sample is selected randomly meaning that each participant of the population has the same chance of being chosen as part of the sample. Kathuri and Pals (1993) observed that a sample of 100 respondents is ideal for a study of this kind. Dairy entrepreneurs categorized as either large, medium or small scale enterprises will be the focus of the study.

A sample is a small portion of a target population. Best and Khan (1988), say that the greater the sample, the lesser the degree of the sampling error and the more the chances that the sample is representative. Sample size is the description of the actual sample that will be studied and how it will be selected /computed/determined (UTAMU, 2014).

The sample size was determined using the following formula provided by Kothari (2004):

$$n = \frac{Z^2 \times p \cdot q \cdot N}{e^2 (N - 1) + Z^2 p \cdot q}$$

Where:

n = Sample size

N = Total population size; 3,213 households

e = margin of error; 5% or 0.05

Z = $\alpha / 2$ is the normal reduced variable at 0.05 (Confidence level; 95%), level of significance z is 1.96

p = population reliability (or frequency for a sample of size, n), which is 0.5

$$p + q = 1$$

Therefore:

$$n = \frac{1.96^2 \times 0.85 \times 0.15 \times 3213}{0.05^2 \times (3213 - 1) + 1.96^2(0.85 \times 0.15)}$$

$$n = 1529.66/8.29 = 184;$$

The target sample population entailed 184 dairy entrepreneurs in Biribiriet location distributed proportionally across the various levels of enterprises. With a sample size of 184, distributed proportionally to the three levels of production, this implies that 120 small scale farmers, 55 medium scale farmers and 9 large scaledairy entrepreneurs will be sampled.

Table 2: Distribution of sample size

Category of dairy entrepreneurs	Target population	Formula for sample size	Sample size
Large scale	161	$n = \frac{1.96^2 \times 0.85 \times 0.15 \times 161}{0.05^2 \times (161 - 1) + 1.96^2(0.85 \times 0.15)}$	9
Medium scale	964	$n = \frac{1.96^2 \times 0.85 \times 0.15 \times 964}{0.05^2 \times (964 - 1) + 1.96^2(0.85 \times 0.15)}$	55
Small scale	2088	$n = \frac{1.96^2 \times 0.85 \times 0.15 \times 2088}{0.05^2 \times (2088 - 1) + 1.96^2(0.85 \times 0.15)}$	120

Source: Research data (2016)

3.4 Data Collection procedures and instruments

Data collection is the process of gathering the vital information for every selected unit in the study. Questionnaires were administered to respondents and were preferred because

they are used to gather data quickly from a large sample population as well as reach many respondents easily (Borg & Gall, 1983). According to Cooper and Emory (2008), the questionnaire is conveniently used because it is cheaper and quicker to administer, it is above researcher's effect and variability, and is highly convenient for the respondents as they could fill them during free times or when workloads are manageable. Questionnaires, incorporating both open-ended and closed-ended items were used to gather the necessary data to conduct this study. These written questionnaires were administered to respondents face to face with the aid of an interpreter where necessary or provided to the respondents and then they were collected later.

With the aid of structured questionnaires, interviews were conducted to collect data. An interview is a data collection technique that involves oral questioning of the respondents, either individually or as a group (Chaleunvong, 2009).

While the structured questionnaires were largely administered to the small dairy farmers, in depth interviews using semi structured questionnaires were preferred for the ministry officials and staff from Lelchego dairy company, as they are deemed more knowledgeable and experienced. Responses to the questions posed during the interview were recorded as well as crossed from a checklist.

The data collection procedure was standardized with the research assistant through practical field testing and on the spot correction or adjustment. The physical location of the respondents was established for ease of delivery of the questionnaires. For illiterate respondents, a guided interview was done. With the help of the assistant researcher, all questionnaires were verified and collected for analysis.

3.4.1 Validity

Mugenda & Mugenda (1999) defines validity as the accuracy and meaningfulness of inferences, which are based on research results. It is the extent to which an instrument can measure what it is supposed to measure. The data obtained must accurately represent the variables of the study for it to be valid. Steven (2004) equated validity to accuracy; it is like minimizing biased errors, making sure things are centered at what they are pointed at.

The questionnaires were subjected to a critique by the supervisor and peers for comments which were incorporated to improve the tool. According to Mugenda & Mugenda (1999), incorporation of positive comments in the questionnaire to capture appropriate, useful and dependable data whose finding and inferences can be a true reflection of the study population. Validity was determined through piloting. A pilot study was conducted where the researcher sampled respondents from Biribiriet location that would not participate in the main study to measure the validity of the instruments used.

3.4.2 Reliability

Joppe (2000) defines reliability as the extent to which results are consistent over time and an accurate representation of the total population under study. According to Lee (1999), reliability is the consistency of measurements of a concept, using an identical measurement procedure, and the replicability of the findings. If the results of a study can be reproduced under a similar methodology, then the instrument is considered to be reliable. Cronbach's alpha was developed by Lee Cronbach in 1951 to provide a measure of internal consistency of a test or scale. Cronbach's alpha is an index of reliability associated with the variation accounted for by the true score of the 'underlying

construct.” Construct is the hypothetical variable that is being measured (Hatcher, 1994). Alpha coefficient ranges in value from 0 to 1 and may be used to describe the reliability of factors extracted from dichotomous that is, questions with two possible answers and or multi-point formatted questionnaires or scales (rating scale: 1 = poor, 5 = excellent). The higher the score, the more reliable the generated scale is. Nunnally (1978) indicated 0.7 to be an acceptable reliability coefficient.

Steven (2004) equated reliability to precision; it is about minimizing unbiased error, reducing spread. The instruments will be considered reliable if the responses won't be too far from the original response (Steven, 2004). Results from the study were subjected to analysis using Statistical Package for Social Services (SPSS) to test for reliability where the calculated Pearson Product-moment Correlation Coefficient was $r=0.787$. Therefore the reliability was acceptable.

3.5 Data Analysis

This is the process that starts immediately after data collection and concludes at the point of interpretation and processing data (Cooper & Schindler, 2003). Data collection is the process of gathering the vital information for each chosen unit in the study. As Mugenda, (2003) describes, it's a process of organizing, giving structure and significance of the mass evidence collected.

Data and information from the questionnaires and interviews was organized and grouped under appropriate categories and themes such as commercialization strategies, performance indicators. Data processing involved both manual tabulation and computer processing. Cleaned data was subjected to descriptive and then inferential analysis

(ANOVA) using SPSS computer software and presented using frequency tables, charts and coefficient table.

$$F = MST/MSE$$

$$y = a + bx_1 + bx_2 + bx_3 + bx_4$$

Where:

Y represents 6.097

X₁ represents 0.056

X₂ represents 0.279

X₃ represents 0.019

X₄ represents 0.309

$$y = 6.097 + 0.056X_1 + 0.279X_2 + 0.019X_3 + 0.309X_4$$

3.6 Ethical Considerations

Initial approval was secured from Kenyatta University and research permit sort from National Commission of Science and Technology (NACOSTI). The researcher sought permission from local leaders, the chief and assistant County Commissioner and an introductory letter sought from them. The respondents were assured that the information given is for the purpose of this research and were treated with utmost confidentiality. The respondents gave consent to proceed with interview and questionnaire before the actual process commenced.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION OF RESULTS AND DISCUSSION

4.1 Response Rate

The study examined a total of 184 respondents, where 184 questionnaires were issued. Of the 184, 184 questionnaires were returned of which 1 was incomplete. This narrowed down to 183 completed questionnaires indicating a response rate of 99.46% as summarized in the table 4.1 below;

Table 3: Response rate

Questionnaire issued	Questionnaire returned	Incomplete Questionnaires	Complete Questionnaires	Response Rate
184	184	1	183	99.46%

Source: Research data (2016)

4.2 Member Characteristics

They include gender, household lead, age, educational level, number of dairy animals owned and size of the farm.

Gender of the respondents

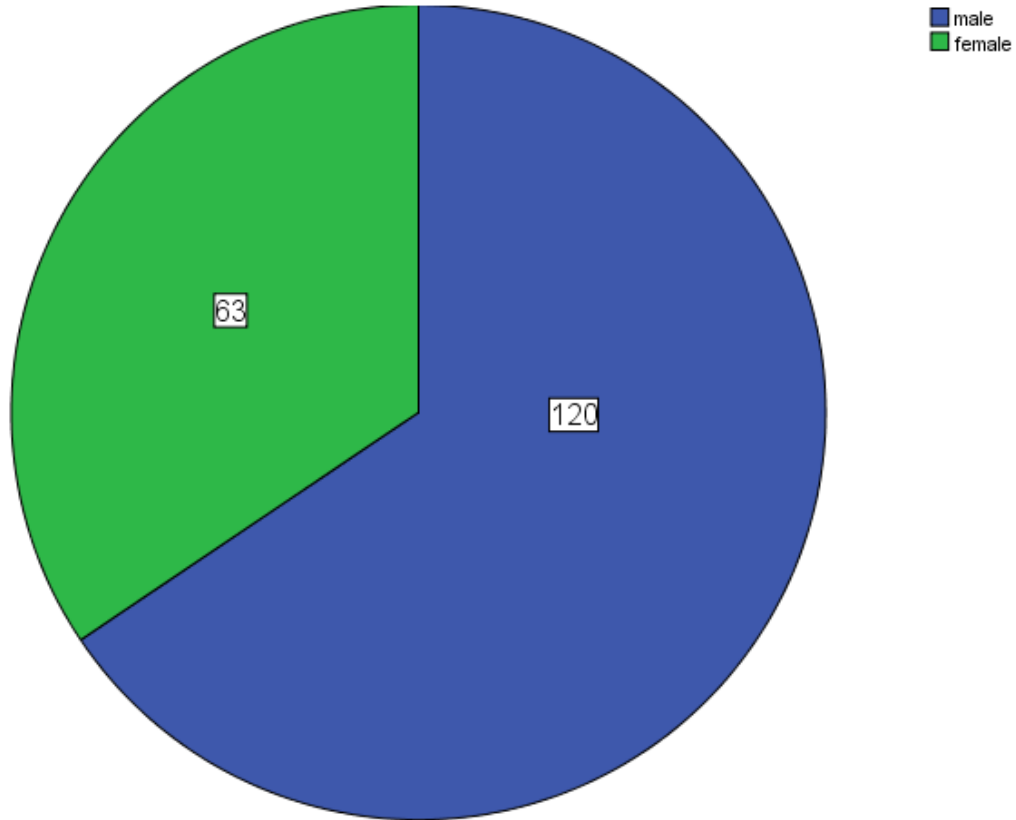


Figure ii:

Source: Research data (2016)

The above findings indicate that majority of the farmers were male at 120 (65.60%) and female farmers were 63 (34.40%). This was interpreted to mean that the selected sample was representative of either gender and thus there was no biasness in terms of gender. Hence, the information collected from the selected sample was valid for analysis in this study.

Household head of the Respondents

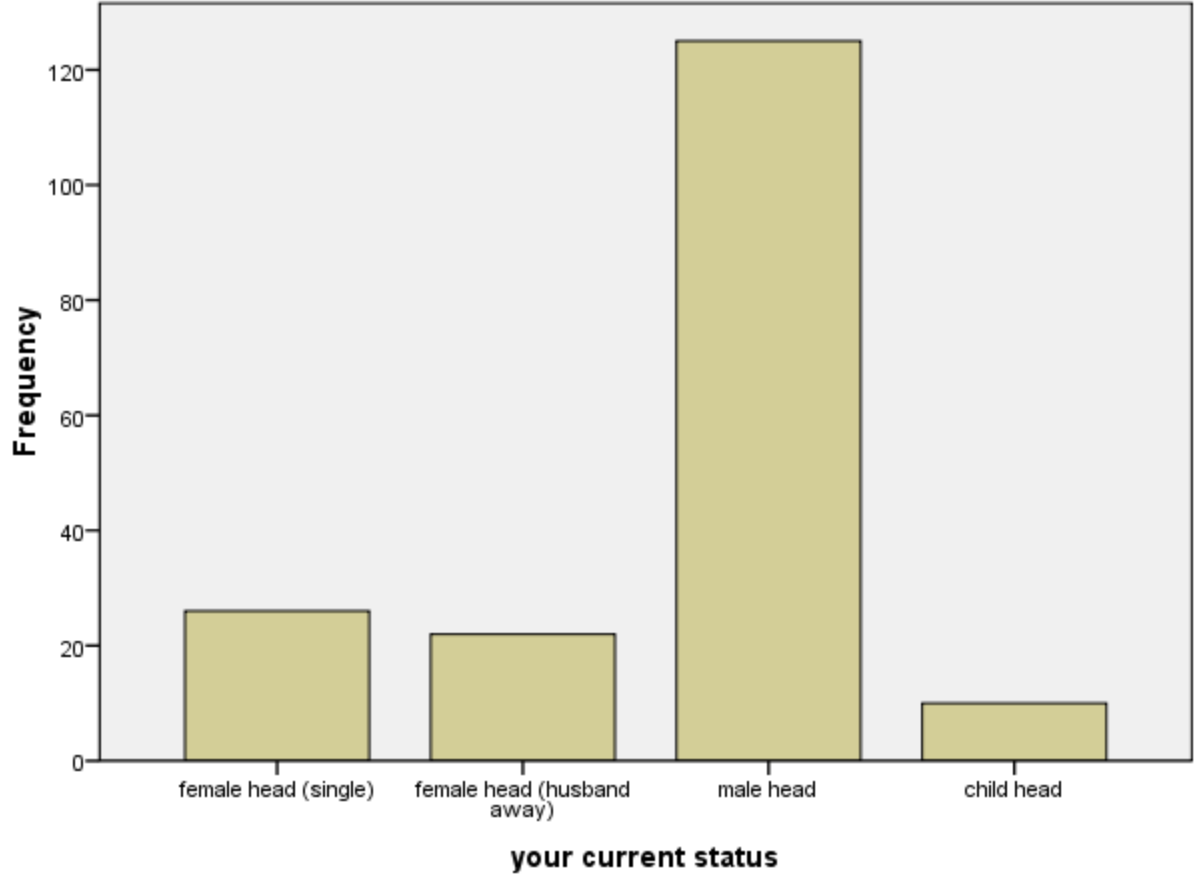


Figure iii:

Source: Research data (2016)

From the findings, 26 (14.20%) of the farmers were female head (single), 22 (12.00%) were female heads (husband away), while 125(68.30%) were male head and 10(5.50%) were child head. This was interpreted to mean that majority of the farmers were male head 125 (68.30%) and this indicated that the selected study sample was all inclusive in terms of gender and family set up.

Table 4: Age of the Respondents

Age	Frequency	Percentage
<20	0	0.00%
21-30	39	21.31%
31-40	113	61.75%
41-50	22	12.02%
51-60	8	4.37%
>60	1	0.55%
Total	183	100.00%

Source: Research data (2016)

From the findings, 113 (61.75%) farmers participating in the study were between the age of 31-40, 39 (21.31%) were below 30 years, 22 (12.02%) were between the ages of 41-50 and 8 farmers (4.37%) were over 50 years of age. This was interpreted to mean that majority of the farmers were below 40 years of age and this indicated that the selected study sample was all inclusive in terms of age. Majority of the farmers in the selected sample were mature and experienced enough to understand the effects of commercialization strategies on production of dairy animals.

Educational Level of the Respondents

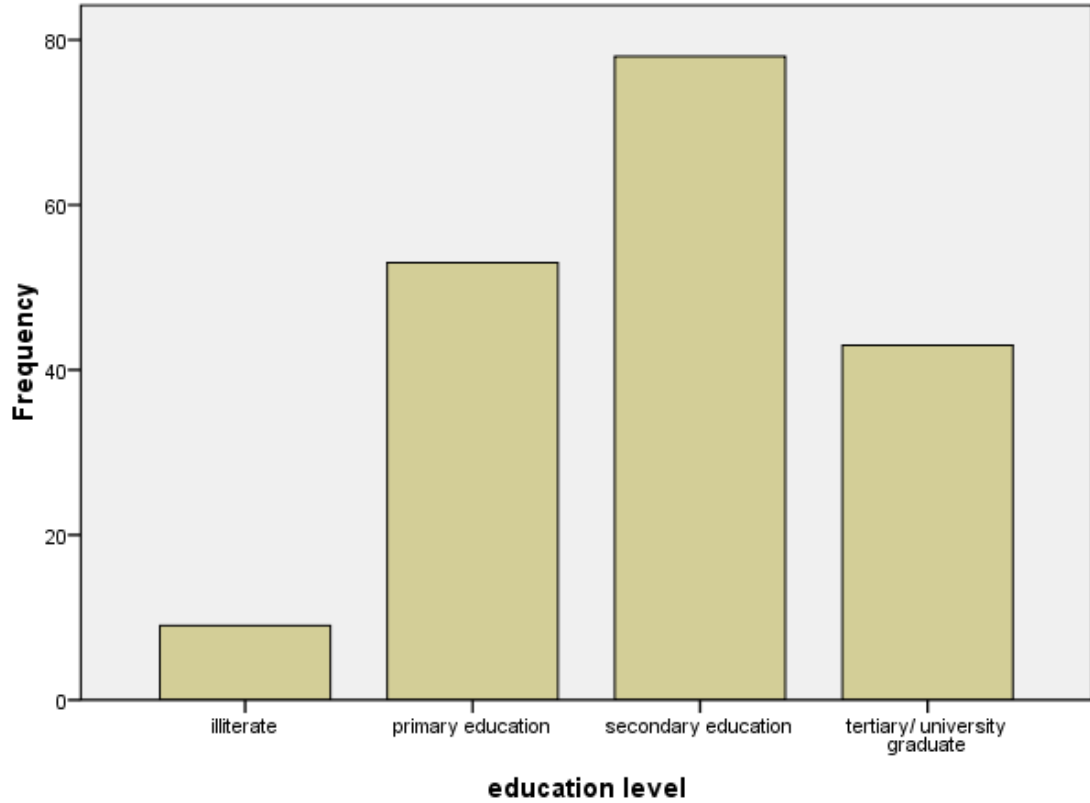


Figure iv:

Source: Research data (2016)

From the findings, 9 (4.90%) of the farmers were illiterate, 53 (29.00%) had primary education, 78 (42.60%) had secondary education and 43 (23.50%) were university or tertiary level graduates in the selected sample. This was interpreted to mean that the selected sample was almost equitably inclusive and the farmers were qualified enough to give their opinions.

Table 5: Number of Dairy Animals Owned by the Farmer

Number of dairy animals	Currently		10 Years ago	
	Frequency	Percentage	Frequency	Percentage
1 to 2	31	16.94%	16	9.14%
3 to 4	64	34.97%	20	11.43%
4 to 5	53	28.96%	49	28.00%
6 to 8	12	6.56%	35	20.00%
More than 8	23	12.57%	55	31.43%
Total	183	100.00%	175	100.00%

Source: Research data (2016)

It was established that 64 (34.97%) respondents that were sampled currently owned 3 to 4 cows and 20 (11.43%) noted that they owned 3 to 4 cows ten years ago. Another 53 (28.96%) presently owned 4 to 5 cows and ten years ago, 49 (28.08%) owned the same number of cows. 55 (31.43%) farmers owned more than 8 cows ten years ago but presently 23 (12.57%) owned more than 8 cows. 31 (16.94%) farmers on the other hand owned 1-2 cows while 16 (9.14%) owned 1-2 cows ten years ago. The changes in the number of cows owned by the farmers over the years is attributed to the changes in husbandry strategies adopted by the farmers. Overall, majority of the farmers have decreased the herd size to between 3 - 5 cows in the last 10 years. This could also be as a result of smaller land sizes and intention to commercialize the dairy enterprises.

Table 6: Farm Size

Farm Size	Frequency	Percentage
0.5 acres	6	3.47%
0.5-1 acre	27	15.61%
2-3 acres	83	47.98%
4-5acres	29	16.76%
5-10 acres	28	16.18%
>10 acres	0	0.00%
Total	183	100.00%

Source: Research data (2016)

Research findings indicate that 83(47.98%) of the farmers interviewed owned between 2 and 3 acres of land. It was necessary for the researcher to establish the land size of the farmers in order to understand if the farmers practiced effective farming by ensuring efficient utilization of available natural resources.

4.3 Commercialization strategies

They comprise feeding, breeding, disease control and husbandry practices. Some responses are based on rating of 5 = Strongly Agree; 4 = agree;3= neutral;2 = disagree;1 = Strongly Disagree and findings analyzed for F=Frequency; %= Percentage and M=Mean.

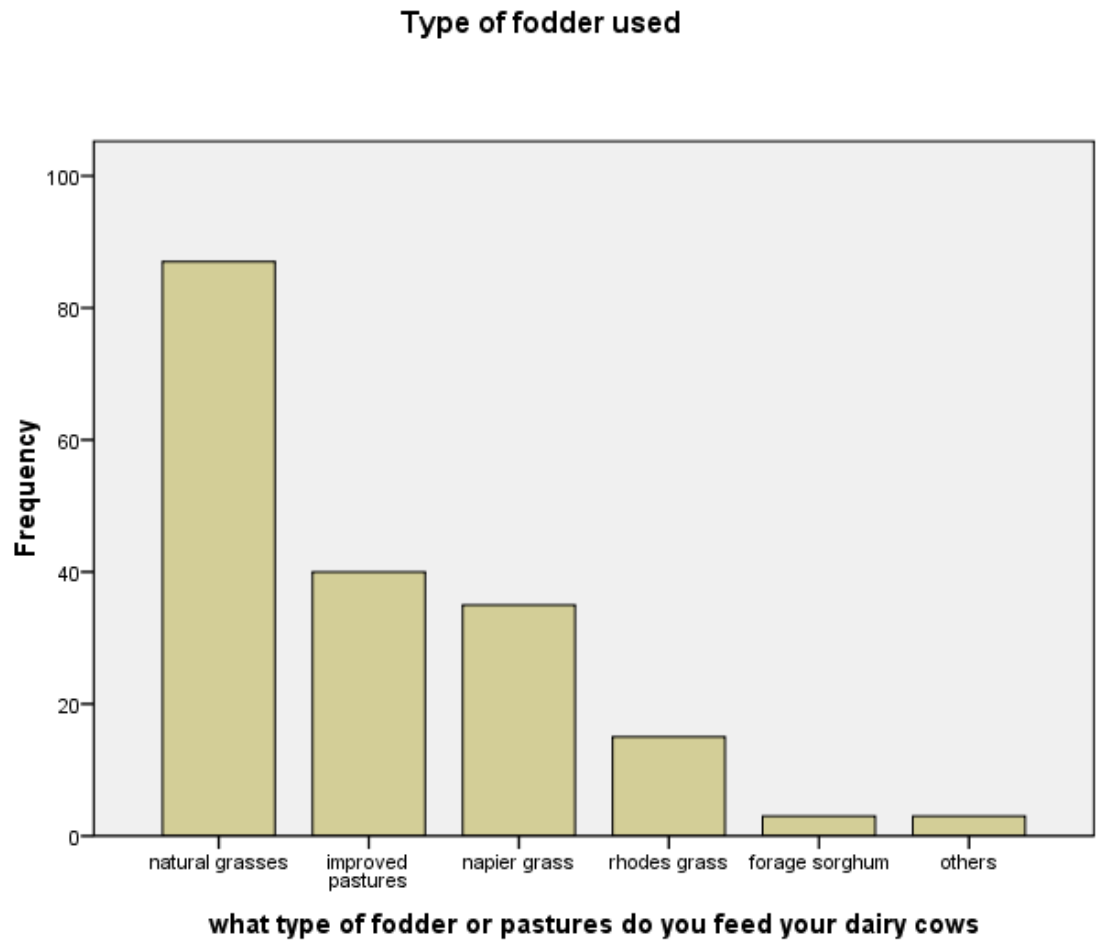


Figure v:

Source: Research data (2016)

Research findings indicated that a majority of the farmers 87(47. 50%) indicated that they used natural grass to feed their cows, 40(21.90%) used improved pastures, 35 (19.10%) used Napier grass whereas only 15 (8.20%) used Boma Rhodes (commercially improved pasture) to feed their cows. It was important to establish the type of fodder used by the farmers since empirical studies show that feed is known to contribute the largest portion of the production costs in market oriented dairy farming. Further findings indicated that nappier grass, boma rhodes and silage were the available feeds utilized by farmers in

Biribiriet location and that farmers determined the feed regimes for their various cattle types depending on the production/yields of an animal.

As a best practice, dairy cows should have access to adequate, quality and balance feed and water. The findings relate to studies by Muriuki (2011) who indicated that the majority of feed resources available for dairy cattle in Kenya were natural pasture, cultivated fodder (mainly Napier grass) and crop by products. However, this study shows that farmers are increasingly taking up use of improved pastures and natural grasses. This means that a large number farmers (66%) are yet to adopt commercial feeding systems that include planting improved pastures such as Boma Rhodes, maize silage, sudan grass, Columbus or forage sorghum. Further studies need to be conducted to determine factors hindering farmers from investing in improved fodder.

Table 7: Other Type of Cow Feed Used

Feed type	Frequency	Percentage
Legumes (Desmodium/Lucerne)	45	24.73%
Mineral supplements	66	36.26%
Sunflower/cotton seed cake	68	37.36%
Dairy meal	3	1.65%
Fodder trees	0	0.00%
Others	0	0.00%
Total	182	100.00%

Source: Research data (2016)

The research findings indicate that majority of the farmers used sunflower or cotton seed cake that is, 68(37.36%)as other type of feed for their cows, 66(36.26%) also prefer to use mineral supplement to feed their cows, 45 (24.73%) provide legumes (either desmodium or Lucerne) whereas very few; 3 respondents (1.65%) give dairy meal as supplementary feed. This was interpreted to mean that farmers in Nandi County rarely

provide supplementary feed for their dairy cows and the less than 40% who give opt to give mineral supplements or a protein source.

Lukuyu et al., (2012) emphasized the importance of providing sufficient balanced feed to dairy cattle in tandem with weight and physiological status. The findings indicate that dairy entrepreneurs have taken up better feeding practices by providing proteinous feed sources (sun flower, cotton seed cake and legumes) and mineral supplements thus supporting the mentioned study.

Table 8: How Farmers Cope with Feed Shortage

	Frequency	Percentage
Buy from neighbors	11	5.98%
Use conserved fodder and pasture	92	50.00%
Use preserved crop residue	69	37.50%
Graze on the road side	12	6.52%
N/A	0	0.00%
Others	0	0.00%
Total	184	100.00%

Source: Research data (2016)

During feed shortage periods in Biribiriet sub location, 92 (50.00%) farmers use conserved fodder and pasture whereas 69 (37.50%) use preserved crop residue as contingency stock feed. However 12 (6.52%) graze their animals by roadside and another 11 (5.98%) buy feed from their neighbors. This was necessary to establish so as to find out the existence of an all-round feeding strategy by the farmers.

Mudavadi *et al.*, (2001) documented that dairy faced challenges of insufficient and poor quality feeds. Considering that feed is a major contributor to productivity, some dairy entrepreneurs have embraced the practice of preserving and conserving feeds for the anticipated periods of shortages.

The study findings indicated that progressive farmers preserve fodder and crop residues so they have sufficient feeds throughout the seasons. On the contrary, there is still a number of farmers who are yet to adopt implementation of feed plans that ensure uninterrupted quality feed supply for their cows throughout the seasons.

Table 9: How Farmers Decide on the Amount of Daily Ration

Method	Frequency	Percentage
Calculate DM requirement and feed enough for each cow	56	30.94%
Just feed until the cow stops eating	41	22.65%
Provide feed depending on amount of feed available	70	38.67%
No criteria used	14	7.73%
Others	0	0.00%
Total	181	100.00%

Source: Research data (2016)

Research findings show that 56 (30.94%) calculated the dry matter requirement of the cow to determine the daily ration. Further, majority of the farmers 70 (38.67%) fed the cows depending on amount of feed available, 41 (22.65%) fed their cows ad libitum until the cows stop eating whereas 14 (7.73%) did not have a criteria to establish the daily ration..This was necessary to establish so as to find out the existence of an all-round feeding strategy by the farmers.

Majority of Dairy entrepreneurs provide feeds depending on the amount of feeds available. This is contrary to recommendations by Lukuyu et al., (2012) who emphasis the importance of providing feeds in tandem with the animal weight and physiological status.

Table 10: Quantity of water provided to the cows per day

Water Quantity	Frequency	Percentage
<10liters	11	6.01%
11-25liters	30	16.39%
26-35liters	21	11.48%
36-45liters	38	20.77%
46-55 liters	83	45.36%
>55 liters	0	0.00%

Source: Research data (2016)

Research findings indicated that a majority of the farmers, 83 (45.36%) indicated that they gave their cows 46-55 liters of water per day, 38 (20.77%) gave 36-45liters, 30 (16.39%) provided their cows with 11 – 25 liters a day, 21 (11.48%) provided 26 – 35 liters and the rest, 11 (6.01%) provided less than 10 liters of water a day. It was important to establish the amount of water provided by the farmers since empirical studies show that as a best practice, dairy cows should have access to adequate, quality and balance feed and water. The findings further supports the notion that the low average milk production yields are attributable to poor or underfeeding of cows and poor quality feed. With good nutrition, dairy cattle are able to maximize their genetic potential (attaining maturity weight at 12 months of age) and fight off diseases.

Water constitutes about 60 – 70% the body of the dairy cow. It also constitutes over 80% the milk produced by the dairy cow. Therefore water is major contributor to the diet of the dairy cow and should be provided ad libitum so as to satisfy 80-90 % of the cow water needs as documented by the Lukuyu *et al.*, (2012). The findings contradict the recommendations since most farmers provide less than 55 liters of water per day.

Breed of Dairy Cow Owned

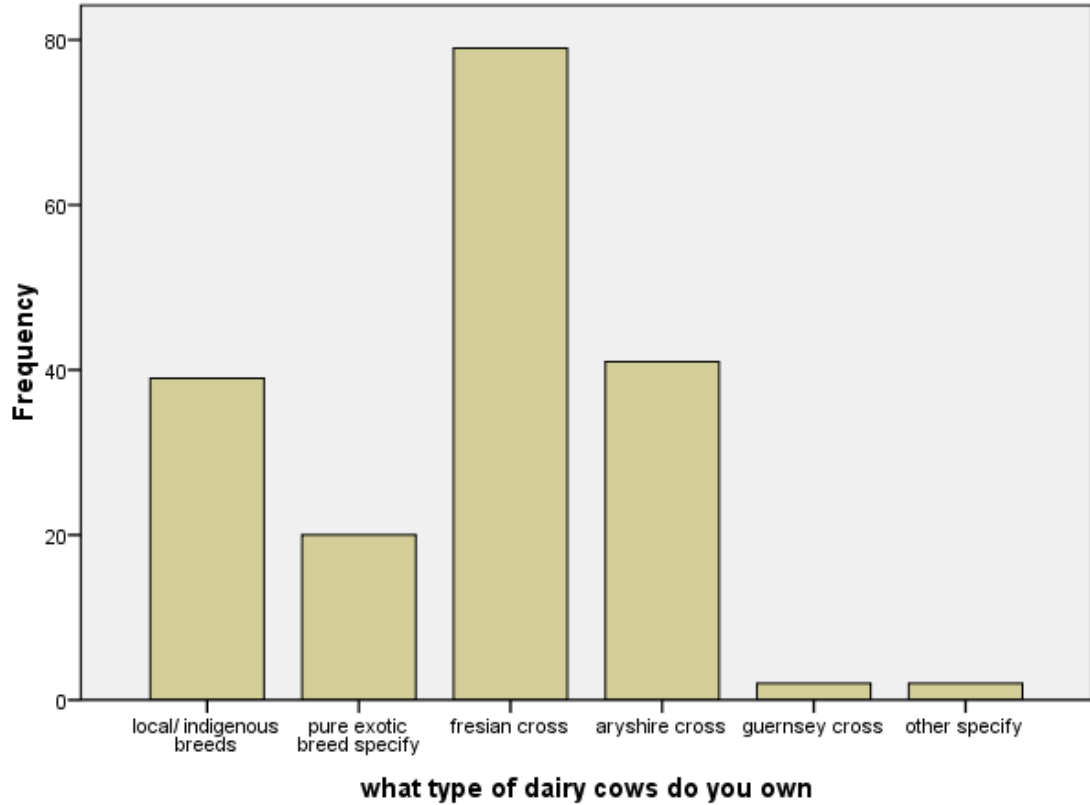


Figure vi:

Source: Research data (2016)

Majority of the farmers at 79 (43.20%) in Biribiriet owned Friesian crosses, another 41 (22.40%) owned Ayrshire crosses, 39 (21.30%) owned local/indigenous breeds while another 2 (1.10%) owned Guernsey or pure exotic breeds. These findings are similar to findings by FAO 2011 that the main milk producing breeds in Kenya were: Friesian, Ayrshire, Guernsey, Jersey and their crosses. However, crosses dominate the cow population in Nandi County followed by local indigenous breeds.

Table 11: Farmers' Breeding Strategy

	5		4		3		2		1		M
	F	%	F	%	F	%	F	%	F	%	
I keep accurate identification records for my dairy cows	3	20.65	2	15	3	19	2	14.67	9	4.89	2.8
My farm has a clear plan on how to improve the current breed types	8	%	8	%	5	%	7	%		%	0
My choice of bulls is based on evaluation of parent's characteristics and performance	2	14.13	3	16	2	16	5	29.89	2	1.09	3.0
I clearly understand the value that comes with improving my breed stock	6	%	0	%	9	%	5	%		%	2
My herd has improved through a genetic selection process over the last 5 years	4	23.37	3	16	1	9%	2	13.59	1	5.98	3.8
	3	%	0	%	7		5	%	1	%	2
	7	42.93	3	18	1	8%	9	4.89	1	7.61	3.9
	9	%	3	%	4			%	4	%	3
	4	25.54	3	20	3	20	1	8.15	1	7.61	2.0
	7	%	6	%	7	%	5	%	4	%	4

Source: Research data (2016)

From the above findings, 38 (20.55%) farmers strongly agreed that they keep accurate identification records of their dairy cows, 35 (19%) partially agreed that they keep accurate identification records of their dairy cows, 9 (4.89%) strongly disagreed that they keep accurate identification records of their dairy cows. 27(14.67%) disagreed with the observation and 28 (15%) were in total disagreement. This was interpreted to mean that most farmers in Nandi County keep accurate identification records for their dairy cows.

Majority of the farmers 55(29.89%) further disagreed that their farm has a clear plan on how to improve the current breed types .29 (16%) were in partial agreement, 2 (1.09%) strongly disagreed and 30 (16%) agreed while 26(14.13%) strongly agreed that the they had a clear plan on how to improve the current breeds types in their farm. This was

interpreted to mean that majority of the farmers in Nandi county had no clear plan on how to improve the current breeds in their farm.

process over the last 5 years, 15(8.15) disagreed with the observation 37 (20%) were in partial agreement and 14(7.61%), strongly disagreed that their herd had improved through a genetic selection process over the last 5 years, This implies that majority farmer's herds in Nandi county had improved through a generic selection process over the last 5 years.

The interviewees noted exotic cross breeds mainly fresians, aryshires and indigenous breeds as cattle breeds kept by farmers in Biribiriet location with an exotic breed such as fresians producing an average of 10-20 litres depending on the type of feed and indigenous breed producing an average of 2-5 litres of milk.

With regards to disease control practices, farmers in Biribiriet location conduct the following routinely: Vaccination (dependent on government services), dipping/spraying and quarantine were mostly mentioned with most interviewees noting that farmers accessed the services from the Kosirai Division livestock department; especially vaccination in case of any outbreak.

According to the interviewees, some farmers practice artificial insemination while others depend on natural mating (use of bulls). In addition, some farmers keep and breeding and milk production records.

The mean of 3.02, 3.82 and 3.93 show that most dairy entrepreneurs have a clear plan on how to improve the current breed types, their choice of bulls is based on evaluation of

parent characteristics and performance and that they clearly understand the value that comes with improving their breeding stock. The mean of 2.8 shows that an average number of farmers keep accurate identification records of their dairy cows.

These findings are related to the findings by FAO 2011 that the main milk producing breeds in Kenya were: Friesian, Ayrshire, Guernsey, Jersey and cross breeds of the same. From the study, the main breeds kept by dairy farmers in Nandi County were Friesian crosses, Ayrshire crosses and local indigenous breeds. Only 3 (1%) respondents had pure exotic dairy breeds.

Existence of a disease control strategy

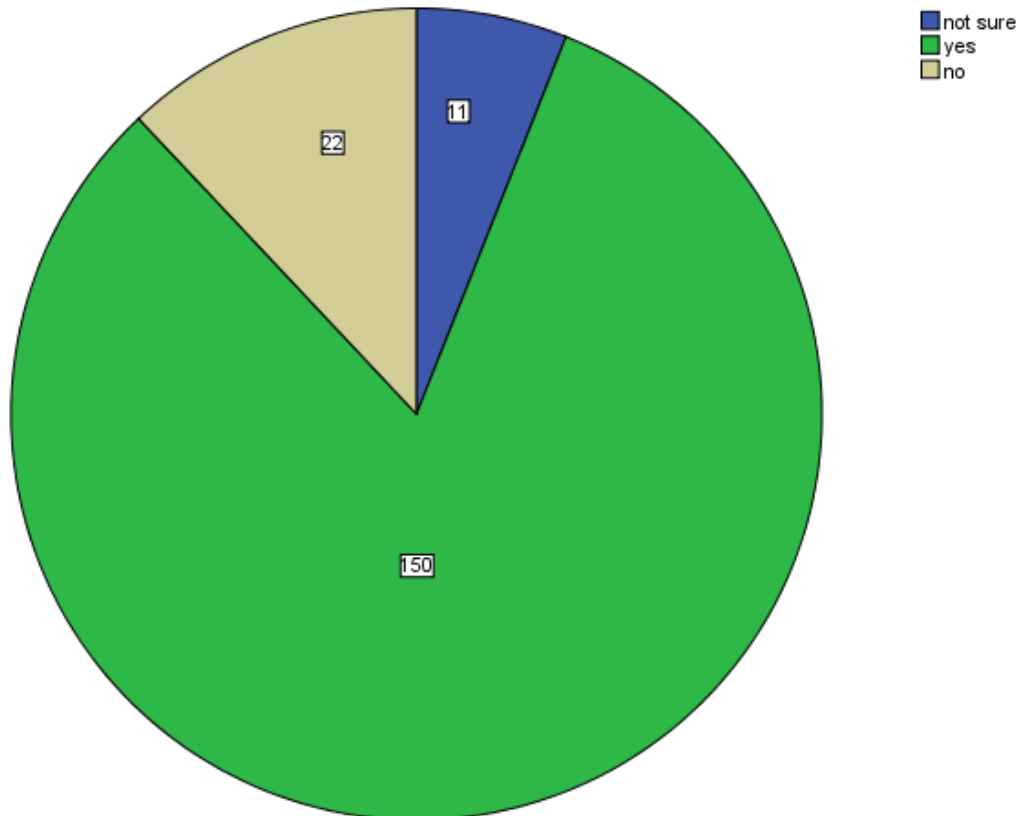


Figure vii:

Source: Research data (2016)

The above findings show that majority of the farmers, 150 had an existence of disease control in their farm, while 22 had no existence of disease control in their farm. 11 were not aware of the existence of disease control in their farm. This implies that majority of the farmers in Biribiriet Nandi County underscore the importance of a disease control strategy in establishing a healthy dairy farm.

Table 12: Common Diseases Encountered in the Farm in the Last One Year

Common disease/condition	Frequency	Percentage
Foot and mouth disease (FMD)	106	57.61%
East Coast Fever (ECF)	102	55.43%
Other tick-borne – Babesiosis/Anaplamosis/Heartwater	32	17.39%
Lumpy skin disease (LSD)	22	11.96%
Brucellosis	43	23.37%
Respiratory conditions	106	57.61%
Internal parasites	44	23.91%
Black quarter or anthrax (BQ)	27	14.67%
Other (specify)	106	57.61%

Source: Research data (2016)

From the findings, majority of the farmers, 106 (57.61%), encountered foot and mouth disease, respiratory conditions and other diseases majorly liver flukes as the most predominant diseases in their farms. Another 102 (55.43%) farmers encountered east coast fever as the next predominant condition they deal with. The other common conditions encountered on farms were: internal parasites 44 (23.91%), brucellosis 43

(23.37%), tick borne diseases 32 (17.39%), black quarter or anthrax 27 (14.67%), and lumpy skin disease 22 (11.96%). The findings are indicative of suspected diseases and conditions encountered by dairy entrepreneurs. The report reflects the findings by Mudavadi *et al.*, (2001) that farmers are faced by a myriad of problems among them are livestock illnesses, poor management and husbandry practices. This was important since animal health and management is integral to livestock production and any deviation in comfort and wellbeing of animals is best expressed in lowered or reduced productivity.

Table 13: Description of the Farmer's Disease Control Strategy

DISEASE CONTROL MEASURES	5		4		3		2		1		M
	F	%	F	%	F	%	F	%	F	%	
The cows are dipped/sprayed on a weekly basis or bi-weekly if vaccinated against ECF	90	48.91%	58	31.52%	21	11.41%	4	2.17%	36	19.57%	4.83
My cows are vaccinated annually against FMD, LSD,BQ	21	11.41%	55	29.89%	20	10.87%	34	18.48%	57	30.98%	4.78
My cows have been vaccinated against ECF	21	11.41%	18	9.78%	29	15.76%	44	23.91%	57	30.98%	4.78
My cows undergo regular deworming (every 3 months)	68	36.96%	75	40.76%	19	10.33%	14	7.61%	2	1.09%	4.88
I keenly follow manufacturer's/veget instructions in the choice of dips/dewormers I use	70	38.04%	61	33.15%	22	11.96%	6	3.26%	16	8.70%	4.87
I keep accurate records of all treatments and advices provided on my farm	36	19.57%	32	17.39%	37	20.11%	43	23.37%	13	7.07%	4.84
Entry of visitors and new animals on to my farm follows a biosecurity plan such as foot dipping, isolation of new animals, etc	30	16.30%	22	11.96%	36	19.57%	53	28.80%	31	16.85%	4.80

Source: Research data (2016)

The above findings show that 90 (48.91%) farmers strongly agreed that they spray/dip their cows on a weekly basis or bi-weekly if vaccinated against ECF,58(31.52%) agreed that they spray/dip their cows on a weekly basis or bi-weekly if vaccinated against ECF,

21 (11.41%) farmers partially agreed with the notion that they spray/dip their cows on a weekly basis or bi-weekly if vaccinated against ECF, 4 (2.17%) farmers sampled in this study disagree with this statement, 36 (19.5%) strongly disagreed that they spray/dip their cows on a weekly basis or bi-weekly if vaccinated against ECF.

On asking the farmers on their views on whether their cows are vaccinated annually against FMD, LSD, BQ, 21 (11.41%) interviewed farmers strongly agreed, 55 (28.9%) agreed, 20 (10.87%) partially agreed, 34 (18.48%) disagreed and 57 (30.98%) strongly disagreed. This implies that majority of the farmers in Nandi don't vaccinate their cows annually against FMD, LSD, BQ.

In regards to the views of the farmers on whether their cows have been vaccinated against ECF, 21 (11.41%) of the farmers strongly agreed, 18 (9.78%) agreed, 44 (23.91%) partially agreed, 44 (23.91%) disagreed and 57 (30.98%) farmers strongly disagreed. This means that majority of farmers in Nandi county don't vaccinate their cows against ECF.

On more findings on whether cows undergo regular deworming (every 3 months), 68 (39.96%) strongly agreed, 75 (40.76%) agreed, 19 (10.33%) partially agreed, 14 (7.61%) were in disagreement, 2 (1.09%) strongly disagreed. This implies that farmers in Nandi County deworm their cows after every three months as a disease control strategy and to improve their production.

Majority of the farmers 70 (38.74%) further strongly agreed on keenly following manufacturer's/vet instructions in the choice of dips/de-wormers, 61 (33.15%) agreed, 22 (11.96%) were in partial agreement, 6 (3.26%) were in disagreement, and 16 (8.70%) strongly disagreed with this statement. This was interpreted to mean that majority of the

farmers in Nandi are keen in reading instructions from manufacturer/veterinary in choice of dips and de-wormers before deciding on which to use and how to use.

Further, the findings indicate that 36(19.57%) sampled farmers strongly acknowledged that they keep accurate records of all treatments and advices provided on their farm, 32 (17.39%) agreed, 37 (20.11%) were in partial agreement that they keep accurate records of all treatments and advices provided on their farm, 43 (23.37%) were in disagreement, 13 (7.07%) strongly disagreed with the statement that they keep accurate records of all treatments and advices provided on their farm. This was interpreted to mean that majority of farmers in Nandi county don't keep accurate records of any treatment and advices provided in their farms due to ignorance.

The findings also shows that 30 (16.30%) farmers strongly agree that entry of visitors and new animals on their farm follows a biosecurity plan such as foot dipping, isolation of new animals, 22 (11.96%) were in agreement that entry of visitors and new animals on their farm follows a biosecurity plan such as foot dipping, isolation of new animals, 36(19.57%) were in partial agreement, 53 (28.80%) disagreed and 31 (16.85%) strongly disagreed that entry of visitors and new animals on their farm follows a biosecurity plan such as foot dipping, isolation of new animals.

The interviewees noted that the cows will not be easily affected by diseases if farmers followed the routine preventive measures of dipping or spraying, vaccination and early disease reporting. They emphasized that disease control as a strategy reduces costs of production and eases management of dairy animals whereas husbandry as a strategy

contribute to performance of the dairy enterprise as it helps farmers to choose the right breed and the right system of production based on available resources.

The mean of 4.78, 4.80, 4.83, 4.84, 4.87 and 4.88 shows that to a very great extent farmers follow recommended vaccination plans for their dairy cows, implement biosecurity measures, conduct weekly spraying or dipping, keep records of treatments and advices provided follow manufacturer's advice on use of medicines or pesticides and ensure their cows are dewormed routinely.

Lukuyu *et al.*, (2012) emphasized the importance of animals being kept in good health, comfortable and clean environment, and have a friendly, loving, gentle and caring handler. The study findings indicated that majority of the entrepreneurs underscore the importance of implementing biosecurity measure on their farms. Despite the biosecurity measures, there are still reports of diseases, mainly of foot and mouth disease, east coast fever, respiratory infections and internal parasites. These diseases can be prevented by vaccination, better housing, nutrition and implementing deworming strategies. Dairy entrepreneurs despite understanding the importance of disease control are yet to implement actual disease control measures thus good health is yet to be realized on these farms.

Table 14: Farmers' Description of Husbandry Practices

HUSBANDRY PRACTICES	5		4		3		2		1		M
	F	%	F	%	F	%	F	%	F	%	
My cows are housed in a comfortable and clean shade	29	15.76%	43	23.37%	28	15.22%	60	32.61%	10	5.43%	4.82
My cows are provided daily with sufficient amount of quality feed	24	13.04%	52	28.26%	54	29.35%	41	22.28%	4	2.17%	4.83
My cows are provided daily with sufficient amount of quality water	77	41.85%	67	36.41%	23	12.50%	2	1.09%	8	4.35%	4.88
My cows are handled in a friendly and humane manner	82	44.57%	67	36.41%	22	11.96%	4	2.17%	0	0.00%	4.89
I have a crush for use when handling the cows	90	48.91%	56	30.43%	11	5.98%	1	0.53%	1	0.53%	4.88
My vet regularly visit my farm for routine check up	25	13.59%	35	19.02%	51	27.72%	41	22.28%	2	1.08%	4.81

Source: Research data (2016)

The above findings show that 29 (15.76%) farmers strongly agreed that they house their cows in a comfortable and clean shade, 43 (23.37%) farmers agreed that that they house their cows in a comfortable and clean shade, 28 (15.22%) partially agreed with the notion that they house their cows in a comfortable and clean shades, 60 (32.61%) farmers

sampled in this study disagreed with this statement, 10 (4.35%) strongly disagreed that they house their cows in a comfortable and clean shade. This was interpreted to mean that farmers in Nandi County don't build proper houses for their cows.

In regards to the views of the farmers on whether their cows are provided daily with sufficient amount of quality feed, 24 (13.04%) farmers strongly agreed, 52 (28.26%) agreed, 54 (29.35) partially agreed, 41 (22.28%) disagreed, 4 (2.17%) strongly disagreed. This mean that most farmers in Nandi County are partially aware on whether their cows are provided daily with sufficient amount of quality feed.

Majority of the farmers 77 (41.85%) further strongly agreed that their cows are provided daily with sufficient amount of quality water, 67 (36.41%) agreed, 23 (12.50%) were in partial agreement, 2 (1.09%) were in disagreement, and 8 (4.35%) strongly disagreed with this statement. This was interpreted to mean that majority of farmers in Nandi County provide their cow with sufficient amount of quality water on daily basis.

More findings on whether cows were handled in a friendly and humane manner, 82 (44.57) strongly agreed, 67 (36.41%) agreed, 22 (11.96%) partially agreed, 4 (2.17%) disagreed and 0 (0.00%) strongly disagreed. This implies farmers in Nandi county handle their cows in a friendly and human manner thus increase their breeding and improve on milk production.

The results also indicate that 90 (48.91%) farmers strongly agreed that they have a crush for use when handling the cows, 56 (30.43%) were in agreement that they have a crush for use when handling the cows, 11 (5.198%) partially agreed that they have a crush for use when handling the cows, 10 (5.43%) disagreed with the observation that they have a

crush for use when handling the cows and 11 (5.98%) were strongly in disagreement with this statement. This implies that majority of the farmers in Nandi County have a crush for use when handling the cows.

In addition, 25 (13.59%) sampled farmers were strongly in agreement with the observation that vet regularly visit their farm for routine checkup, 35 (19.02%) farmers agreed that vet regularly visit their farm for routine checkup, 51 (27.72%) were partially in agreement with the notion that vet regularly visit their farm for routine checkup, 41 (22.28%) disagreed on whether vet regularly visit their farm for routine checkup and 20 (10.87%) strongly disagreed with the statement that vet regularly visit their farm for routine checkup,. This implied that vet partially visit farmers for routine checkup in Nandi County.

The mean of 4.81, 4.82, 4.83, 4.88 and 4.89 imply that farmers highly use husbandry practices like housing their cows in a comfortable clean shade or paddock, provide feed and water to their cows, have a vet or technician regularly visiting their farm, have a crush and humanely handle their cows. The study findings are similar to those by Bach (2008) who demonstrated the significance of stall availability and maintenance on productivity of dairy cows. Bach indicated that an increase of one hour rest period resulted in 1.7kg increase in milk production. Similarly, Lukuyu (2012) emphasized the importance of cow comfortable, friendly handling and care for enhanced production.

Table 15: Description of Farm Records

RECORDS	5		4		3		2		1		M
	F	%	F	%	F	%	F	%	F	%	
I have accurate and up to date animal identification records	30	16.30%	4	25.00%	40	21.74%	39	21.20%	16	8.70%	4.83
I have accurate and up to date milk production records	20	10.87%	5	29.89%	47	25.54%	43	23.37%	10	5.43%	4.82
I have accurate and up to date milk sale records	34	18.48%	5	28.26%	42	22.83%	37	20.11%	11	5.98%	4.83
I have accurate and up to date farm expenditure records	28	15.22%	4	22.83%	44	23.91%	38	20.65%	19	10.33%	4.82
I determine the amount of feed to be given to each animal based on weight and production records	37	20.11%	3	19.02%	37	20.11%	57	30.98%	11	5.98%	4.82
On monthly basis I can tell if I made losses or profits based on my documented records	56	30.43%	5	30.98%	14	7.61%	38	20.65%	3	1.63%	4.86
I plan with my vet his/her next visit based on my records	37	20.11%	2	11.41%	28	15.22%	50	27.17%	28	15.22%	4.82

Source: Research data (2016)

Research findings indicate that a majority of the farmers at 46 (25.0%) agreed that they have accurate and up to date animal identification records, 30(16.30%) farmers strongly agreed,40 (21.74%) partially agreed, 39 (21.20%) disagreed with the statement and 16 (8.70%) strongly disagreed on the idea that they keep accurate and up to date animal identification records. This was interpreted to mean that farmers in Nandi County were in agreement that they keep accurate information for their animal identification to be easier. Further, the findings indicate that 20(10.8%) farmers acknowledged strongly that they have accurate and up to date milk production records ,55 (29.89%) farmers noted that they were in agreement with the observation that they have accurate and up to date milk production records, 47 (25.54%) sampled farmers were in partial agreement on the same argument,43 (23.37%) were in a disagreement and 10 (5.43%) strongly disagreed with the notion that they have accurate and up to date milk production records. This was interpreted to imply that Nandi county farmers acknowledged the fact that keeping accurate and up to date milk production helps them know when the production is low and thus find the cause.

In addition, 28 (15.22%)sampled farmers were strongly in agreement with the observation that they have accurate and up to date farm expenditure records,42 (22.83%) farmers were in agreement with the notion that they have accurate and up to date farm expenditure records, 44 (23.91%) were partially in agreement with the statement,38 (20.65%) did not agree with the statement and 19 (10.33%) strongly disagreed with the

notion that they have accurate and up to date farm expenditure. This implies that farmers in Nandi County acknowledge partially belief in keeping farm expenditure records.

The results also indicate that 37(20.11%) farmers strongly agreed that they determine the amount of feed to be given to each animal based on weight and production records, 35 (19.02%) were in agreement that they determine the amount of feed to be given to each animal based on weight and production records, 37 (20.11%) were partially in agreement on determining the amount of feed to be given to each animal based on weight and production records, 57 (30.98%) disagreed with the observation on determining the amount of feed to be given to each animal based on weight and production records.

11 (5.98%) were strongly in disagreement with this statement. This implies that majority farmers in Nandi County don't find it important in determining the amount of feed to be given to each animal based on weight and production levels.

On asking the farmers on monthly basis whether they can tell if they made losses or profits based on documented records,56 (30.43%) interviewed farmers strongly agreed, 57 (30.98%) agreed, 14 (7.61%) partially agreed, 38 (20.65%) disagreed and 3 (1.63%) strongly disagreed. This implies that majority farmers in Nandi County can tell if they made losses or profits based on documented records because of keeping accurate and up to date daily records on milk production.

Further, the findings indicate that 37 (20.11%) farmers strongly agreed that they plan with veterinarian his/her next visit based on the farmers records,21 (11.41%) farmers noted that they were in agreement with the observation that they plan with veterinarian his/her next visit based on the farmers records, 28(15.22%) sampled farmers were in

partial agreement on the same argument, 50 (27.17%) were in a disagreement and 28 (15.22%) strongly disagreed with the notion that they plan with veterinarian his/her next visit based on the farmers records . This shows that most farmers in Nandi County don't make a plan with the veterinarian on his or her next visit.

The mean of 4.82, 4.83 and 4.86 shows that to a very great extent farmers keep accurate production records, farmers determine the amount of feed for each cow based on its weight and milk production information, that they plan the next veterinarian visit based on farm records and farmers keep up to date cow identification and milk sale records.

Keeping accurate records guide entrepreneurs to make informed decisions. If farmers do not check their variable costs, they will increase their expenditures thus negatively affecting the enterprise profitability (Wambugu, 2011). The findings of the current study indicated that a very large number of entrepreneurs' understand the importance of keeping accurate record so as to evade the risk of ruining profitability of their enterprises. There is need to determine whether farmers actually use the records they have to increase their enterprise performance.

4.4 Performance of dairy enterprises

These include the level of production, value of dairy cows, cost of production and profitability. Some responses are based on rating of 5 = Strongly Agree; 4 = agree; 3= neutral; 2 = disagree; 1 = Strongly Disagree and findings analyzed for F=Frequency; %= Percentage and M=Mean.

Table 16: Daily Production in Litres

Production	By your highest producing dairy cow		By your lowest producing dairy cow		Average production
	Frequency	Percentage	Frequency	Percentage	
0.2-2 lts	0	0.00%	49	26.92%	24.5
3-4 lts	40	21.98%	79	43.41%	39.7
4-5 lts	26	14.29%	37	20.33%	31.5
6-8 lts	85	46.70%	5	2.75%	45
>8 lts	31	17.03%	12	6.59%	12.5
Total	182	100.00%	182	100.00%	182

Source: Research data (2016)

Research findings indicated that a majority of the farmers 85 (44.60%) get 6-8 liters of milk per day from their cows and on the lowest side produced 43.41% which gave 3-4 litres. The findings further supports the notion that the low average milk production yields are attributable to poor or underfeeding of cows and poor quality feed.

Table 17: Respondent's Family's Livelihood Rating

	5		4		3		2		1	
	F	%	F	%	F	%	F	%	F	%
I can educate my children without any financial problem	62	33.70%	63	34.24%	34	18.48%	15	8.15%	5	2.72%
I am able to feed my family	71	38.59%	92	50.00%	4	2.17%	0	0.00%	2	1.09%
My family health is well catered for due to my dairy herd	63	34.24%	56	30.43%	45	24.46%	13	7.07%	0	0.00%
Am able to increase the number of dairy	76	41.30%	74	40.22%	19	10.33%	11	5.98%	2	1.09%

cows I have

Am able to assist my neighbors with any financial obligations the need from me	33	17.93	81	44.02	40	21.74	14	7.61	11	5.98
		%		%		%		%		%

Source: Research data (2016)

The above findings show that 62 (33.70%) of the farmers strongly agreed that they educate their children without any financial problem, 63 (34.24%) agreed that they educate their children without any financial problem, 34 (18.48%) farmers partially agreed that they educate their children without any financial problem, 15 (8.15%) of the farmers sampled in this study disagree with this statement, 5 (2.72%) strongly disagreed that they educate their children without any financial problem. This was interpreted to mean that farmers in Biribiriet location educate their children without any financial problem as they get income from their farm produce.

On asking the farmers on their views on whether they are able to feed their family, 71 (38.459%) of the interviewed farmers strongly agreed, 92 (50.00%) agreed, 4 (2.17%) partially agreed, none disagreed and 2 (1.09%) strongly disagreed. This implies that majority of the farmers in Nandi county are able to feed their families as they get income from selling their farm produce to the market.

On more findings on whether their family's health are well catered for due to the dairy herd, 63 (34.24%) strongly agreed, 56 (30.43) agreed, 45 (24.46%) partially agreed, 13 (7.07%) were in disagreement and none strongly disagreed. This implies that farmers in Nandi County are strongly in agreement that their family's health is well catered for due to my dairy herd.

Majority of the farmers 70 (41.30%) further strongly agreed if they are able to increase the number of dairy cows they have, 74 (40.22%) agreed, 19 (10.33%) were in partial agreement, 11(5.98%) were in disagreement, and 2 (1.09%) strongly disagreed with this statement. This was interpreted to mean that majority of the farmers in Nandi are able to increase the number of dairy cows they have due to proper feeding and breeding.

Further, the findings indicate that 33(17.93%) of the sampled farmers strongly acknowledged that they are able to assist their neighbors with any financial obligations they need from them 81(44.02%) agreed, 40 (27.04%) were in partial agreement that they keep accurate records of all treatments and advices provided on their farm, 14 (7.61%) were in disagreement, 11(5.98%) strongly disagreed with the statement that if they are able to assist their neighbors with any financial obligations they need from them this shows that majority of the farmers are willing to assist each other.

The mean of 4.85 to 4.90 shows that majority of dairy entrepreneurs have high ability to meet their financial obligations with ease. These include: feeding their families, taking care of the health of family members and educate their children. In addition, a great majority of farmers are able to increase the number of their dairy herd and assist their neighbors meet their financial obligations. Wambugu (2011) indicated that when farmers are able to manage their costs, only then can they realize profits. On the basis that farmers are able to meet their basic needs and support one another means that their enterprises are giving them sufficient income to live modest lives.

4.5 Commercialization strategies on performance of dairy enterprises

This covers feeding, breeding, disease control, husbandry practices on performance. The responses are based on rating of 5 = Strongly Agree; 4 = agree; 3= neutral; 2 = disagree; 1

= Strongly Disagree and findings analyzed for F=Frequency; %= Percentage and M=Mean.

Table 18: Commercialization strategies on performance of dairy enterprises

	5		4		3		2		1		M
	F	%	F	%	F	%	F	%	F	%	
Feeding the dairy herd a balanced and adequate diet (based on its weight and physiological needs) increases productivity and hence profits	7	41.85	5	29.35	2	12.50	1	7.61%	0	0.00	4.8
	7	%	4	%	3	%	4			%	9
On farm feed production reduces the input costs hence increases profitability	7	38.04	4	26.09	2	14.13	2	12.50	2	1.09	4.8
	0	%	8	%	6	%	3	%		%	7
Using AI and keeping accurate identification and production records increases the value of the dairy cows	9	51.63	4	26.09	1	7.61%	2	1.09%	1	6.52	4.8
	5	%	8	%	4				2	%	9
Implementation of consistent disease control measures i.e. vaccination, tick control and deworming reduces cost of production thus increases farm profitability	5	27.17	5	28.26	2	15.22	2	11.41	9	4.89	4.8
	0	%	2	%	8	%	1	%		%	7
Having routine farm protocols guided by accurate records such as check-up, replacement, culling, housing, herd grouping, diets, etc reduces unnecessary wastage of time and	7	39.13	8	47.83	7	3.80%	2	1.09%	0	0.00	4.9
	2	%	8	%						%	0

resources and
maximizes cows
output, thus
minimizing cost of
production and
increases farm
productivity/profitabil
ity

Source: Research data (2016)

Research findings indicate that a majority farmers at 77 (41.85%) strongly agreed that Feeding the dairy herd with a balanced and adequate diet (based on its weight and physiological needs) increases productivity and hence profit, they have accurate and up to date animal identification records, 54 (29.35%) farmers agreed, 23 (12.50%) partially agreed, 14 (7.61%) disagreed with the statement and none strongly disagreed on the Feeding the dairy herd a balanced and adequate diet (based on its weight and physiological needs) increases productivity and hence profit This was interpreted to mean that farmers in Nandi county were in agreement that they feed the dairy herd a balanced and adequate diet (based on its weight and physiological needs) increases productivity and hence profit

Further, the findings indicate that 70(38.04%) farmers acknowledged strongly that on farm feed production reduces the input costs hence increases profitability, 48 (26.09%) farmers noted that they were in agreement with the observation that On the farm feed production reduces the input costs hence increases profitability, 26 (145.13%) sampled farmers were in partial agreement on the same argument, 23 (12.50%) were in a disagreement and 2 (1.09%) strongly disagreed with the observation that On farm feed production reduces the input costs hence increases profitability This was interpreted to

imply that Nandi county farmers acknowledged strongly the fact that investing on farm feed production reduces the input costs hence increases profitability

In addition, 95 (51.63%) of the sampled farmers were strongly in agreement with the observation that Using AI and keeping accurate identification and production records increases the value of the dairy cows, 48 (26.09%) farmers were in agreement with using AI and keeping accurate identification and production records increases the value of the dairy cows, 14 (7.61%) were partially in agreement with the observation, 2 (1.09%) did not agree with the observation and 12 (6.52%) strongly disagreed with the notion that using AI and keeping accurate identification and production records increases the value of the dairy cows. This implies that farmers in Nandi County acknowledge that use of artificial insemination improves the value of their breed's thus increasing production.

The results also indicate that 72 (39.13%) farmers strongly agreed that implementation of consistent disease control measures i.e. vaccination, tick control and deworming reduces cost of production thus increases farm profitability, 52 (28.26%) were in agreement that implementation of consistent disease control measures i.e. vaccination, tick control and deworming reduces cost of production thus increases farm profitability, 28 (15.22%) were partially in agreement that implementation of consistent disease control measures i.e. vaccination, tick control and deworming reduces cost of production thus increases farm profitability 21 (11.41%) disagreed and 9 (4.89%) were strongly in disagreement with this statement. This implies that majority of the farmers in Nandi county find it important in implementation of consistent disease control measures for example

vaccination, tick control and deworming reduces cost of production thus increases farm profitability.

On asking the farmers if they have routine farm protocols guided by accurate records such as check-up, replacement, culling, housing, herd grouping, diets, etc reduces unnecessary wastage of time and resources and maximizes cows output, thus minimizing cost of production and increases farm productivity/profitability, 72(39.13%) interviewed farmers strongly agreed, 88 (47.83%) agreed, 7 (3.80%) partially agreed, 2 (1.09%) disagreed and none strongly disagreed. This implies that most of the farmers in Nandi County Have a routine farm protocols guided by accurate records such as check-up, replacement, culling, housing, herd grouping, diets, reduces unnecessary wastage of time and resources and maximizes cows output, thus minimizing cost of production and increases farm productivity/profitability.

Farmers have knowledge and skills on dairy enterprise commercialization strategies, the interviewees said farmers have knowledge and skills on dairy enterprise and what hinders them from practising what they know are: high cost of animal feeds and supplements; lack of government subsidy on farm inputs such as fertilizers and animal feeds; low prices offered for milk sales which demoralizes farmers and lack of support from the national and county government, for example linkages to a better market for milk and milk products.

However, it was noted that high cost of production, high capital cost, low milk pricing, government policies and insufficient skills were the major limitations to adoption of dairy enterprise commercialization strategies. Possible solutions to improving performance of

the dairy enterprise include: subsidizing animal feeds and other farm inputs; capacity building farmers, improve road infrastructure to enable access to market and milk marketing societies to invest in value addition so as to attract competitive prices for their dairy products. Government and stakeholders should put more efforts in training dairy entrepreneurs, improve access to markets and supporting farmers access inputs that increase efficiency and effectiveness of their enterprises.

The mean of 4.87 to 4.90 show that, to a high degree, feeding, breeding, disease control and husbandry practices greatly affect performance of dairy enterprises. The respondents agreed that these practices are critical for improved business performance. These include: feeding a dairy herd with balanced, adequate diet, producing more feed at the farm significantly reduces the cost of production, adoption of artificial insemination and keeping accurate records increases the value of the dairy cows, implementation of consistent disease control measures reduces cost of production thus increasing profitability and having routine farm protocols guided by accurate records increases efficiency and overall productivity. These findings are consistent with recommendation by Lukuyu *et al.*, (2012) and an FAO report of 2012 that indicated the importance of maintaining minimum standards on cow comfort, feeding, breeding, health management and husbandry practices in order to maximize production. However, farmers are yet to attain the recommended standards despite having some understanding.

Additional findings indicate that majority of the farmers acknowledged that feeding the dairy herd with a balanced and adequate diet enhances production and hence increase profits and improved quality productive dairy herd. Further, in order to improve dairy performance, the farmers noted that they need to feed the dairy herd with a balanced and

adequate diet for maximum production as well as using A.I services to breed the cows with implementation of consistent disease control measures such as vaccination, tick control and deworming.

The farmers indicated that they hadn't taken the desired measures due to lack of adequate capital to buy quality feeds; lack of information and techniques; lack of space in the farm to establish fodder feeds. However, they said that with improvement of dairy products prices and capacity building, they would be motivated to bring about the desired change to double their dairy performance.

4.6 Multiple regression analysis

Multiple regression analysis is a powerful technique used for predicting the unknown value of a variable from the known value of two or more variables- also called the predictors. In this case, multiple regression analysis will help predict firm performance from feeding strategy, breeding strategy, disease control strategy and husbandry strategy. It will also be used to analyze variations in performance caused by independent variables and whether predictors are significant coefficient of determinants.

Table 19: Coefficient of determination using SPSS version 20

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.505 ^a	.255	.239	3.17148
a. Predictors: (Constant), husbandrystrategy, feedingstrategy, breedingstrategy, diseasecontrolstrategy				

Source: Research data, 2016

From the table above, the value of R-square is 0.255 which indicates that the model explains 25.5% of performance from the predictor variables (husbandry strategy, feeding strategy, breeding strategy and disease control strategy). The other 74.5% of variation in performance is considered by other factors not considered in the study.

Table 20: ANOVA results on feeding strategy and performance using SPSS version 20

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	5.150	1	5.150	.640	.425 ^a
	Residual	1318.712	164	8.041		
	Total	1323.861	165			

a. Predictors: (Constant), feedingstrategy
b. Dependent Variable: performance

Source: Research data (2016)

The results of ANOVA shows that the F-ratio was .640 at 1 degree of freedom which is the variable factor. This represented the effect of size of the regression model and it is insignificant at 95% confidence level. Results of ANOVA show that $p = 0.425 > 0.05$ implying that feeding strategy is positively insignificant.

Table 21: ANOVA results on breeding strategy and performance using SPSS version 20

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	211.911	1	211.911	31.254	.000 ^a
	Residual	1111.951	164	6.780		
	Total	1323.861	165			

a. Predictors: (Constant), breeding strategy
b. Dependent Variable: performance

Research data (2016)

Breeding strategy on performance is shown in table 21. Result of ANOVA shows p (0.000) is < 0.05 and the F- test is 31.254. This implies that breeding strategy has a significant effect on the performance of dairy entrepreneurs.

Table 22: ANOVA results on disease control strategy and performance using SPSS version 20

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	102.779	1	102.779	13.804	.000 ^a
	Residual	1221.082	164	7.446		
	Total	1323.861	165			

a. Predictors: (Constant), disease control strategy
b. Dependent Variable: performance

Research data (2016)

The results of ANOVA shows that disease control strategy has F-test of 13.804 at 1 degree of freedom which is the variable factor p (0.000) < 0.05 . This implies that disease control strategy has a significant effect of the performance of dairy entrepreneurs as shown in table 22 above.

Table 23: ANOVA results on husbandry strategy and performance using SPSS version 20

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	127.504	1	127.504	20.245	.000 ^a
	Residual	604.618	96	6.298		
	Total	732.122	97			

a. Predictors: (Constant), husbandry strategy
b. Dependent Variable: performance

Source: Research data (2016)

Husbandry strategy on performance is shown in table 23. Result of ANOVA shows that the F test was 20.245 and p value (0.000) is < 0.05 . This implies that husbandry strategy has a significant effect of the performance of dairy entrepreneurs.

Table 24: Coefficient analysis using SPSS version 20

Model		Coefficients ^a			t	Sig.
		Unstandardized		Standardized		
		B	Std. Error	Beta		
1	(Constant)	6.097	2.190		2.783	.006
	Feedingstrategy	.056	.095	.040	.596	.552
	Breedingstrategy	.279	.069	.282	4.047	.000
	Diseasecontrolstrategy	.019	.070	.023	.280	.780
	Husbandrystrategy	.309	.084	.320	3.687	.000

a. Dependent Variable: performance

Source: Research data (2016)

4.7 Hypothesis Testing

H₀₁: Feeding strategy has no significant effect on performance.

The results in table 24 indicates p (0.552) > 0.05 . Thus the null hypothesis was accepted.

H₀₂: Breeding strategy has no significant effect on performance. The results in table 24 indicates p (0.000) < 0.05 , thus the null hypothesis was rejected.

H₀₃: Disease control strategy has no significant effect on performance. Results show p (0.780) was greater than 0.05 hence null hypothesis was accepted.

H₀: Husbandry strategy has no significant effect on performance. Findings indicate p (0.000) < 0.05 therefore null hypothesis was rejected.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 Summary

This will contain a summary of the findings, conclusions and recommendations to advance commercialization by dairy entrepreneurs.

5.1.1 Feeding strategy

The study shows that a majority of the farmers 87(47.50%) are feeding natural grasses and are yet to adopt improved pastures such as Rhodes grass, forage sorghum and maize silage. The research findings indicate that majority of the farmers 68 (37.36%) feed their cattle sunflower or cotton seed cake During periods of feed shortage 92 (50.00%) farmers use conserved fodder and pasture and 69 (37.50%) use preserved crop residue as contingency stock feed. Considering that feed is a major contributor to productivity, some dairy entrepreneurs have embraced the practice of preserving and conserving feeds for the anticipated periods of shortages. On the contrary, there is still a number of farmers who are yet to adopt implementation of feed planning that ensure uninterrupted quality feed supply for their cows throughout the seasons. The study findings further show that majority of the farmers 70 (38.67%) fed the cows depending on amount of feed available and 83 (45.36%). gave their cows 46-55 liters of water per day. This is contrary to the ideal practice of providing feeds in tandem with the animal weight and physiological status as well as provision of clean water ad libitum. Water constitutes about 60 – 70% the body of the dairy cow. It also constitutes over 80% the milk produced by the dairy cow. Therefore water is a major contributor to the diet of the dairy cow and

should be provided ad libitum so as to satisfy 80-90 % of the cow water. The feeding strategy had beta coefficient of 0.056 which implies that feeding strategy explained 5.6% change in performance of dairy entrepreneurs’.

5.1.2 Breeding strategy

A great number of the farmers, 89 (48.9%) in Biribiriet owned Friesian crosses. These findings are similar to findings by an FAO report that the main milk producing breeds in Kenya were: Friesian, Ayrshire, Guernsey, Jersey and their crosses. However, crosses dominate the cow population in Nandi County followed by local indigenous breeds. This means that the dairy population is of low potential and even with good management, would not be able to produce the maximum production that the pure breeds would, which is 40 – 60 liters for Friesian cows, up to 30 liters for Ayrshire and 25 liters for Guernsey. The breeding strategy had beta coefficient of 0.279 which implies that breeding strategy explained 27.9% change in performance of dairy entrepreneurs’. Therefore, there is need to invest in strategic use of Artificial Insemination (AI). The county government or other stakeholder can encourage adoption by introducing subsidy and availability of qualified skilled personnel.

5.1.3 Disease control strategy

A great majority of farmers follow recommended vaccination plans for their dairy cows, implement biosecurity measures, conduct weekly spraying or dipping, keep records of treatments and advices provided, follow manufacturer’s advice on use of medicines or pesticides and ensure their cows are dewormed routinely. However, the vaccination

schedules are dependent on government vaccination programs hence are implemented as and when the government schedules.

The study findings indicate that majority of the entrepreneurs underscore the importance of implementing biosecurity measure on their farms. The findings indicate that farmers house their cows in comfortable clean shade or paddock, provide feed and water to their cows, have a vet or technician regularly visiting their farm, have a crush and humanely handle their cows. The disease control strategy had beta coefficient of 0.019 which denotes that disease control strategy explained 1.90% change in performance of dairy farmers. Despite the biosecurity measures, there are still reports of diseases, mainly of foot and mouth disease, east coast fever, respiratory infections and internal parasites. These diseases can be prevented by vaccination, better housing, nutrition and implementing deworming strategies. Dairy entrepreneurs despite understanding the importance of disease control are yet to implement actual disease control measures thus good health is yet to be realized on these farms.

5.1.4 Husbandry strategy

The findings shows that to a very great extent farmers keep animal identification, milk production and sale records. Keeping accurate records guides entrepreneurs make informed decisions. If farmers do not check their variable costs, they will increase their expenditures thus negatively affecting the enterprise profitability. The husbandry strategy had beta coefficient of 0.309 which means that husbandry strategy explained 30.9% change in performance of dairy farmers. There is need to determine whether farmers actually use the records they have to increase their enterprise performance.

5.1.5 Effect of commercialization strategies on performance of dairy enterprises

From the findings, feeding and disease control strategies have no significant effect on performance whereas breeding and husbandry strategies have a significant effect on performance. The results emphasize importance of dairy entrepreneurs' improving their dairy herd through a progressive genetic selection process which can be achieved by use of artificial insemination. The findings also indicate that adoption of good farm management practices such as feeding the dairy herd with balanced, adequate diet, producing more feed at the farm to significantly reduce the cost of production, keeping accurate records to increase the value of the dairy cows, implementation of consistent disease control measures to reduce cost of production thus increasing profitability and having routine farm protocols guided by accurate records increases efficiency and overall productivity. To implement these, entrepreneurs' have to keep acquiring relevant knowledge and skills to guide their daily firm decisions.

There are barriers that affect implementation of commercialization strategies such as: high cost of production, high capital cost, low milk pricing, government policies and insufficient skills by dairy entrepreneurs. The possible solutions to improving performance of the dairy enterprise include: subsidizing animal feeds and other farm inputs; capacity building farmers, improve road infrastructure to enable access to market and milk marketing societies to invest in value addition so as to attract competitive prices for their dairy products. Government and stakeholders should put more efforts in training dairy entrepreneurs, improve access to markets and supporting farmers access inputs that increase efficiency and effectiveness of their enterprises.

The findings indicate that farmers have adopted some of the recommended practices in dairy farming which enhance production thus supporting the theory that this study was anchored on; that is the psychological field of inhibiting and driving forces. The study focused on the driving forces that increase adoption of commercialization strategies. Farmers have adopted some of the mentioned commercialization strategies such as on farm production of improved fodder and preventive disease control practices such as strategic deworming, dipping or spraying and record keeping.

On the basis of the findings, the research problem has been slightly narrowed since productivity has slightly increased. According to the findings, dairy entrepreneurs' are partly using the four mentioned strategies (feeding, breeding, disease control and husbandry strategies) and milk production by dairy entrepreneurs was on average 6 – 8 liters for high producing dairy cows and 3-4 litres for low producers which is slightly higher than the earlier registered productivity of between 4-5 litres and 2-3litres. The findings reveal that dairy entrepreneurs are yet to maximize the potential of their dairy firms and can utilize the information from this study findings to better invest in breeding and husbandry strategies so as to improve their performance so as to further narrow the statement of the problem. Dairy entrepreneurs driven by commercial perspective to their firms must adopt the driving forces, in this case effective commercialization strategies (breeding and husbandry strategies) so as to enhance their production, reduce their cost of production, increase the value of their dairy herd and improve profits

5.2 Conclusions

The research established that breeding and husbandry strategies significantly affect performance of a dairy enterprise and hence the need to advance them. There is need for

entrepreneurs to improve their cow breeds to pedigree and ensure their management practices provide comfort, sufficient balanced feed, disease free environment and minimal or no stress to their dairy herd. From the findings, entrepreneurs' have significant level of knowledge with regards to the commercialization strategies but are yet to fully adopt them for various reasons, such as costs involved and demoralization by dairy market challenges. However, they need to keep learning and improving as other external factors such as climate change can affect their firms' performance.

5.3 Recommendations

The research recommends that entrepreneurs should consider establishing effective low cost strategies that will enhance the performance of their animals to increase the quality of their produce and their marketability. They should invest in hybrid breeds for increased productivity through strategic use of artificial insemination and keep up to date cow identification records so as to increase the value of their dairy cows. Entrepreneurs should keep accurate records and continuously acquire new skills to guide their day to day decisions which are significant in keeping their herd comfortable and stress free and ensure the firm increases profit.

The government and stakeholders should strive to build the capacity of the entrepreneurs with regards to agribusiness improvement. Specific issues that will require action include: (i) Supporting dairy entrepreneurs develop on farm specific feed plans to ensure adequate supply of quality feed and water throughout the year for the dairy herd while reducing the costs of production, (ii) Supporting dairy entrepreneurs develop breeding goals and improve the value of their dairy cows through a progressive genetic selection using readily available but affordable technology such as artificial insemination or in

vitro fertilization,(iii) Support dairy entrepreneurs enhance on farm disease control measures. The latter will require support of county government especially with regards to disease surveillance and vaccination protocols, (iv) Training of dairy entrepreneurs to understand effective on farm management practices that reduce cost of production while increasing productivity and how to make informed decisions.

Farms that can afford technology for example, use of management information systems should be supported to access and to understand their applications. A multi-stakeholder approach is required to support farmers address challenges of high cost of inputs, access to capital, non competitive milk pricing and unfavorable government policies that do not protect entrepreneurs.

Government and stakeholders should also put more efforts in training dairy entrepreneurs, improve access to markets and supporting farmers access inputs that increase efficiency and effectiveness of their enterprises. The researcher recommends future studies on strategies for improving adoption of best practices by dairy entrepreneurs. Feasibility studies should also be conducted so as to inform entrepreneurs on dairy product marketing options.

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APPENDICES

APPENDIX I: QUESTIONNAIRE

Introduction

My name is Viola Researcher, a student at the Kenyatta University, Kericho Campus. As part of my MBA research project, I am conducting a survey on the “*Relationship between commercialization strategies and performance of dairy enterprise in Biribiriet location, Nandi County, Kenya*”. I would appreciate if you could complete the following questionnaire. Any information obtained in connection with this study that can be identified with you will remain confidential.

Kindly tick where appropriate

A: MEMBER CHARACTERISTICS

4 Kindly indicate your gender(*tick appropriate*)

Male

1

Female

2

5 What is the current status in the household (*tick appropriate*)

Female head(single)

1

Female head(husbandaway)

2

Male head

3

Childhead

4

6 What is your age? (in years)? (Tick as appropriate)

1<20	2=21-30	3=31-40	4=41-50	5=51-60	6>60
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7 What is the highest **educational level** attained by the farmer?

1=Illiterate,

2=Primaryeducation,

3=Secondaryeducation

4=Tertiary/University graduate

5=Other

(SPECIFY!)-----

8 How many dairy animals do you currently own?

1=1-2	2=3-4	3=4-5	4=6-8	5>8
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9 How many dairy animals did you or your family own 10 years ago?

1=1-2	2=3-4	3=4-5	4=6-8	5>8
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10 What is your total land holding in acres?

1=<0.5 acres	2=0.5-1 acre	3=2-3 acres	4=4-5acres	5=5-10 acres	5>10 acres
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B. FEEDING STRATEGY

11 What type of fodder/pastures do you feed your dairy cows?

1=Natural grasses; 2=Improved pastures; 3=Napier grass; 4=Rhodes grass; 5=Forage sorghum; 6=Others (Specify)_____

12 What other type of cow feed do you give your cows?

1=Legumes (Desmodium/Lucerne); 2=Mineral supplements; 3=Sunflower/cotton seed cake; 4=Dairy meal; 5=Fodder trees; 6=Others (Specify)_____

13 How do you cope with feed shortage if it ever happens?

1=Buy from neighbors; 2=Use conserved fodder and pasture; 3=Use preserved crop residue; 4=Graze on the road side; 5=NA; 6=Others (Specify)_____

14 How do you decide on the amount of daily ration to be fed to your cows?

1=Calculate DM requirement and feed enough for each cow; 2=Just feed until the cow stops eating; 3=Provide feed depending on amount of feed available; 4=No criteria used; 5=Others (Specify)_____

15 On average, how much water do you provide to your cows per day in litres?

1=<10litres	2=11-25litres	3=26-35litres	4=36-45litres	5=46-55 litres	5>55acres
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C. BREEDING STRATEGY

16 What type of dairy cows do you own?

1=Local/indigenous breeds; 2=Pure exotic breed specify_____

3=Fresian cross; 4=Aryshire cross; 5=Guernsey cross; 6=Jersey cross; 7=Other (specify)_____

17 Select one of the numbers below to indicate how well the statement describes your breeding strategy: 5 = Strongly Agree 4 = agree 3= neutral 2 = disagree 1 = Strongly Disagree

						5	4	3	2	1
--	--	--	--	--	--	---	---	---	---	---

I keep accurate identification records for my dairy cows					
My farm has a clear plan on how to improve the current breed types					
My choice of bulls is based on evaluation of parents characteristics and performance					
I clearly understand the value that comes with improving my breed stock					
My herd has improved through a genetic selection process over the last 5 years					

D: DISEASE CONTROL

18 Do you have a disease control strategy on your farm currently?

NOT SURE YES NO

19 Tick the common diseases you have encountered on your farm in the last one year

Common disease/condition	Tick (in last one year)
Foot and mouth	
ECF	
Other tickborne – Babesiosis/Anaplamosis/Heartwater	
Lumpy skin disease	
Brucellosis	
Pneumonia	
Endoparasites	
Blackquarter or anthrax	
Other (specify)	

20 Select one of the numbers below to indicate how well the statement describes your disease control strategy:

5 = Strongly Agree 4 = agree 3= neutral 2 = disagree 1 = Strongly Disagree

DISEASE CONTROL MEASURES	5	4	3	2	1
The cows are dipped/sprayed on a weekly basis or bi-weekly if vaccinated against ECF					
My cows are vaccinated annually against FMD, LSD, BQ					
My cows have been vaccinated against ECF					
My cows undergo regular deworming (every 3 months)					
I keenly follow manufacturer's/vet instructions in the choice of dips/dewormers I use					
I keep accurate records of all treatments and advices provided on my farm					
Entry of visitors and new animals on to my farm follows a biosecurity plan such as foot dipping, isolation of new animals, etc					

E: HUSBANDRY STRATEGY

21 How well do the following statements describe your husbandry practices?

5 = Strongly Agree 4 = agree 3= neutral 2 = disagree 1 = Strongly Disagree

HUSBANDRY PRACTICES	5	4	3	2	1
My cow are housed in a comfortable and clean shade					
My cows are provided daily with sufficient amount of quality feed					
My cows are provided daily with sufficient amount of quality water					
My cows are handled in a friendly and humane manner					
I have a crush for use when handling the cows					
My vet regularly visit my farm for routine check up					

22 How well do the following statements describe your farm records?

5 = Strongly Agree 4 = agree 3= neutral 2 = disagree 1 = Strongly Disagree

RECORDS	5	4	3	2	1
I have accurate and up to date animal identification records					
I have accurate and up to date milk production records					
I have accurate and up to date milk sale records					
I have accurate and up to date farm expenditure records					
I determine the amount of feed to be given to each animal based on weight and production records					
On monthly basis I can tell if I made losses or profits based on my documented records					

I plan with my vet his/her next visit based on my records					
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F: PERFORMANCE INDICATORS

23 What is your average daily production by your highest producing dairy cow in litres?

1=0.2-2	2=3-4	3=4-5	4=6-8	5>8
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24 What is your average daily production by your lowest producing dairy cow in litres?

1=0.2-2	2=3-4	3=4-5	4=6-8	5>8
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25 How well do the following statements describe a well-managed dairy farm?

5 = Strongly Agree 4 = Agree 3 = Neutral 2 = Disagree 1=Strongly Disagree

	5	4	3	2	1
Feeding the dairy herd a balanced and adequate diet (based on its weight and physiological needs) increases productivity and hence profits					
On farm feed production reduces the input costs hence increases profitability					
Using AI and keeping accurate identification and production records increases the value of the dairy cows					
Implementation of consistent disease control measures i.e. vaccination, tick control and deworming reduces cost of production thus increases farm profitability					
Having routine farm protocols guided by accurate records such as check-up, replacement, culling, housing, herd grouping, diets, etc reduces unnecessary wastage of time and resources and maximizes cows output, thus minimizing cost of production and increases farm productivity/profitability					

26 How would you rate the following on your family's livelihood?

5 = Strongly Agree 4 = Agree 3 = Neutral 2 = Disagree 1=Strongly Disagree

	5	4	3	2	1
I can educate my children without any financial problem					
I am able to feed my family					
My family health is well catered for due to my dairy herd					
Am able to increase the number of dairy cows I have					
Am able to assist my neighbors with any financial obligations the need from me					

27 If you were to change your enterprise strategies, what would you prioritize for improved performance and why?.....

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28 If you did the above, what changes do you expect to reflect on your dairy farm performance?.....

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APPENDIX II: KEY INFORMANT GUIDE

Dear Respondent,

My name is Viola Researcher, a student at the Kenyatta University, Kericho Campus. As part of my MBA research project, I am conducting a survey on the “*Relationship between commercialization strategies and performance of dairy enterprise in Biribiriet location, Nandi County, Kenya*”. I would appreciate if you could complete the following questionnaire. Any information obtained in connection with this study that can be identified with you will remain confidential.

Please answer the following questions concerning commercialization strategies by dairy entrepreneurs and the performance as experienced currently in Biribiriet location.

1. What is your name and role in the dairy industry in Nandi County
2. What type of feeds are available and utilized by farmers in Biribiriet location?
3. How do farmers determine the feed regimes for their various cattle types?
4. What type and numbers of the various cattle breeds are kept by farmers in Biribiriet location? Check for any available breed statistics
5. What is the average production per breed?
6. What disease control practices are practiced by farmers in Biribiriet location? Check for any schedules/regimes available?
7. How do farmers access the services listed in 6 above?
8. What husbandry practices are practiced by the dairy entrepreneurs of Biribiriet?
9. What kind of farm records do farmers keep and how do they use them?
10. Are there any policies that restrict the dairy strategies employed by farmers in Biribiriet?
11. Do farmers have knowledge and skills on dairy enterprise commercialization strategies? If yes, what is making them not put it into practices?
12. How does feeding as a strategy contribute to performance of the dairy enterprise?
13. How does breeding as a strategy contribute to performance of the dairy enterprise?
14. How does disease control as a strategy contribute to performance of the dairy enterprise?

15. How does husbandry as a strategy contribute to performance of the dairy enterprise?
16. What are the major limitations to adoption of dairy enterprise commercialization strategies?
17. What do you think are the possible solutions to improving performance of the dairy enterprise?
18. What roles do the various stakeholders have to play for the above performance to be realized?

APPENDIX III: RESEARCH PERMIT



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Internal Memo

FROM: Dean, Graduate School

DATE: 7th September 2016

TO: Viola Jelangat Chemis
C/o Business Administration Department.
Kenyatta University

REF: D53/OL/20236/12

SUBJECT: APPROVAL OF RESEARCH PROPOSAL
=====

We acknowledge receipt of your revised Research Proposal as per our recommendations raised by the Graduate School Board of 8th July 2016 entitled "Commercialization Strategies and Performance of Dairy Enterprises in Nandi County, Kenya".

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission for Science, Technology and Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking Forms per semester. The form has been developed to replace the Progress Report Forms. The Supervision Tracking Forms are available at the University's Website under Graduate School webpage downloads.

Thank you.

HARRIET ISABOKE
FOR: DEAN, GRADUATE SCHOOL

CC. Chairman, Business Administration Department

Supervisors:

1. Dr. Chris Kipkorir Sitienei
C/o Business Administration Department
Kenyatta University

HI/mn