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FACTORS AFFECTING DAIRY PRODUCTION AMONG DAIRY COOPERATIVE SOCIETIES IN KENYA

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Abstract

Purpose: Kenya's population has continued to increase both in the rural and urban areas, with the latest population estimates showing that Kenya's population is now over 39.8 million people. The high population creates market and price incentive for dairy production. This increased demand should trigger a corresponding increase in production. However, the gap still exists in regard to supply and demand. For this reason, the researcher therefore sought to carry out a study to determine the factors that influence dairy productivity

Methodology: The paper used a desk study review methodology where relevant empirical literature was reviewed to identify main themes and to extract knowledge gaps.

Results*:* The study found that various factors influenced dairy milk productivity such as the social economic, cattle breeds and breeding systems, availability and cost of inputs and the adoption of technology.

Unique Contribution to Theory and Practices: Sensitization should be carried out to increase the participation of youth and women in dairy farming. Farmers should be encouraged to have succession plans in place for continuity of the dairy industry by involving their children in dairy farming. The National government, county Government and Non-Governmental organizations should look for ways of subsidizing the cost of Artificial insemination Services.

Keywords: *Dairy cooperative society, raw milk, income, cattle breed*

1.0 INTRODUCTION

1.1 Background of the Study

The livestock sector is broad and covers highly diverse agro-ecological, social and political dimensions across continents, regions and countries. About 900 million of the world's 1.3 billion extremely poor people live in rural areas, most of them relying on agricultural activities for their food and income (IFAD, 2010). Nearly one billion head of livestock are raised by more than 800 million poor livestock keepers in marginal, rural and peri urban areas of developing countries. Livestock contribution to the agriculture sector is projected to reach about 30 percent of the value of global production output and directly and indirectly use 80 percent of the world 's agricultural land surface by 2020 (IFAD, 2010)

Kenya is an Agriculturally based economy with agricultural sector contributing about 25% of the GDP (GOK, 2008). The livestock sub-sector contributes 40% of the agricultural Gross Domestic Product (GDP) and about 10% of Kenya's total GDP (KARI 2009). The dairy industry is the single largest agricultural sub-sector in Kenya, larger even than tea (MoLD 2010). It contributes 14% of the agricultural GDP and 3.5% of total GDP (GOK 2008). According to the Agricultural Sector Development Strategy –ASDS (2009-2020) Animals are a source of food, more specifically protein for human diets, income, employment and foreign exchange. Livestock also provide draught power, organic fertilizers for crops production and a means of transport. (GOK 2009) The dairy sector plays a major role in food security, creating employment, generating income, and enhancing the livelihoods of dairy farmers, traders, processors and all participants in the entire milk supply chain (Kumar, V., Wankhede, K. G., & Gena, H. C. (2015)

Kenya is the leading milk producer in Eastern Africa and produces an estimated 4 to 5 billion liters of milk annually from a herd of about 4 million dairy cows (Odero-Waitituh, J. A. 2017). Much of this milk is produced by smallholder dairy farmers who account for 80% of the national milk production. Smallholder dairy production systems range from stall-fed cut-and-carry systems, supplemented with commercial concentrate, to free grazing on unimproved natural pastures in the more marginal areas. Upgraded (crossbred) dairy cow breeds are kept under the zero grazing system or under the semi-zero-grazing systems (Kitala, P. et al 2012). The production systems are influenced by the agroclimatic characteristics of the area, land productivity potential and prevalence of animal diseases.

At least 800,000 smallholder farmers in Kenya depend on dairy farming for their livelihood. Dairy production improves household nutrition and provides extra income. In addition to family labor, dairy farming generates jobs in wage labor and mobile milk trading for a further 365,000 people. These jobs benefit the poorest people in urban and rural areas (IFAD 2013). Kenya produced 3.8 billion liters of milk in 2007 (MoLD, 2008). Out of this, it is estimated that 36% is consumed on the farm and 64% offered on market to individuals and institutions. Kenya has one of the highest levels of per capita milk consumption in sub-Saharan Africa. There are wide discrepancies in milk consumption in rural and urban populations and across income groups. However, consumption at household level is higher in urban than in the rural regions. Statistics for 1999 indicate that the annual per capita consumption of milk in rural areas was 45 liters for "milk-producing" households and 19 liters for "milk-purchasing" households, while the urban per capita milk consumption was estimated at 125 liters (KDB, 2009). According to CGIAR (2008) the annual per capita milk consumption is 145 liters which is over five times the milk consumption in other countries in East Africa. On the other hand, the estimated per capita consumption in Central and Rift Valley provinces of Kenya is between 144 to 152 liters and between 38 to 54 liters in others provinces (SDP, 2009)

Most of Kenya's dairy cattle are kept by smallholders in crop -livestock systems in areas of high and medium cropping potential. Generally, 1-2 dairy cows (mostly Holstein Friesian or Ayrshire) comprise 50% of the herd, the other half consisting of female calves and heifers. In the high potential areas feeding is mainly cut -and-carry with planted Napier grass and crop residues, especially from maize and bananas, supplemented by forages gathered from common properties around the farm or purchased from neighbors (Orodho, A. B. 2019).). On average total daily milk output is 10 kg per farm, of which, a quarter is for home consumption and the rest sold. In the late 1980s, milk sales were mainly through local dairy co-operative societies, with some to neighbors. However, following market liberalization in 1992, marketing channels have diversified. It is estimated that approximately 85 -90% of marketed milk is not processed or packaged, but instead is bought by the consumer in raw form. The factors driving the continued importance of the informal market are traditional references for fresh raw milk (which is boiled before consumption), and consumers‟ unwillingness to pay the costs of processing and packaging. Raw milk markets

offer both higher prices to producers and lower prices to consumers. These markets also provide valuable opportunities for rural and urban employment.

Land has also been under exploited for agricultural production. Only 31% of land in the high and medium potential area is under production which represents only 5% of the land in the county, ASALs that represent 84% of the land also remains largely underutilized; much more can be done on this land to support livestock and crop production through Agriculture. The goal for 2017 is to increase productivity through raising yields of key crops and livestock towards levels recommended by Agricultural research institutions. To achieve this goal the county government of Machakos has committed to invest in mechanisms to ensure that small scale farmers can access extension services - current national ratio 1 extension officer to 1,250 farm household (MoLFD 2013); Private sector, NGOs, Farmer Associations, and other stakeholders will be drawn in to facilitate extension services.(Kenya mpya initiative and MCDF 2012)

1.2 Statement of the Problem

Kenya's population has continued to increase both in the rural and urban areas, with the latest population estimates showing that Kenya's population is now over 39.8 million people (Republic of Kenya 2011). The high population creates market and price incentive for dairy production. This increased demand should trigger a corresponding increase in production. However, gaps exist with regard to supply and demand of raw milk in Machakos County. Although dairy farming in the semi-arid region of Kenya is largely subsistence, the trend is gravitating towards commercialization. A recent study indicates that close to 15% of dairy cattle farmers produce between 11 - 20 liters of milk per day Fleming, A., & Farrell, L. J. et al 2015) implying that there is surplus milk available for direct sale and for processing into other milk derivatives. Further, the study revealed that 43% were unable to sell their milk during the milk glut period particularly in January and February. In other periods of the year the market is characterized by milk shortage prompting milk 'import' from other regions.

Supply of milk was dictated by rainfall pattern as this influence feed resources production and availability of feeds for livestock. As a result, higher milk supply was experienced following the rains and low milk supply was reported during the dry season. Over supply (surplus of marketable) of milk was highest in January, May and December although only about 40% of the dairies reported that they received excess milk during this period. During the rainy season there is surplus

production while during the dry period there is low production. Since the dairy organizations resolved to come together and establish a milk processing plant, there was need to ensure that there is consistent supply of milk to the factory throughout the year to ensure that the factory does not close its doors during the dry season. For this reason, the researcher therefore sought to carry out a study to determine the factors that influence dairy productivity.

1.3 Objectives of the Study

The main objective of this study is to establish and investigate the factors that influence milk dairy productivity among dairy cooperative societies in Kenya.

1.4 Significance of the Study

The findings and recommendations of the study will be useful to the dairy farmers and primary dairy co-operative societies and dairy farmers in ASAL regions in identifying gaps in their production systems. The findings of the study will be useful to the Kenya Dairy Board, county Government of Machakos and other County governments in the ASAL regions for Dairy policy formulation and choice of interventions to improve dairy productivity. The Board of Directors of the Lower Eastern Dairy Co-operatives will need the research findings and recommendations in the preparation of the Alliance's strategic and Business plans. NGO's such as UCCS, AMREF and USAID-KAVES will need the research findings and recommendations for planning and monitoring of current and future Dairy project interventions in ASAL areas. The findings and recommendations of the study will add on to the existing knowledge on dairy productivity and may form the basis for further research.

2.0 LITERATURE REVIEW

2.1 Dairy industry in Kenya

Kenyans are amongst the highest milk consumers in the developing world, consuming Estimated 145 liters per person per year, more than five times milk consumption in other East African countries (SDP, 2005). Among all developing countries, only Mongolians and Mauritanians consume more milk per dollar earned than do Kenyans (ILRI, 2007). Kenyans consumed about 3 billion liters of milk in 2005 with conservative milk demand estimates suggesting an increase of milk consumption of between 3 and 4 percent per annum, which is largely driven by increases in population, urbanization and incomes. At that time, it was expected that milk consumption would

rise to 3.5 billion liters by 2010 and 4.2 billion liters by the end of the Strategy for Revitalization Agriculture (SRA) plan period (Government of Kenya, 2006).

Kenya is self-sufficient in milk production. In 2005, the country produced approximately 3.5 billion liters of milk, against a consumption of about 3 billion liters. In addition, policies adopted accelerated pace and affects between 1 and 2 billion people (IFAD, 2009). Climate change will have a substantial effect on global water availability in the future. Not only will this affect livestock drinking water sources, but it will also have a bearing on livestock feed production systems and pasture yield. As climate changes and becomes more variable, niches for different by the government are expected to lead to significant increases in Dairy production. For instance, the Kenya dairy policy change of 2004, which incorporated Small-scale milk producers and traders into the milk value chain and liberalized informal milk Markets, has led to an increase in the amount of marketed milk, number of licensed milk vendors and a boost in demand for milk, leading to benefits for Kenyan milk producers, vendors and consumers. As a result of this policy change, milk production is targeted to increase to 4.2 and 5 billion liters by 2010 and 2014, respectively (Government of Kenya, 2006). In 2009, dairy industry statistics by the Kenya Dairy Board estimated the national milk production at 4 billion liters. Milk production in Kenya is predominantly by small scale farmers, who own one to three dairy animals, and produce about 80 percent of the milk in the country. Smallholder dairy production systems range from stall-fed cut-and-carry systems, supplemented with purchased concentrate feed, to free grazing on unimproved natural pasture in the more marginal areas.

Upgraded dairy breeds tend to be kept in stall-feeding units, cross-bred cattle in semi zero grazing systems, and zebu cattle in free-grazing systems. The production systems are influenced by the agro climatic characteristics of the area, land productivity potential and prevalence of animal diseases. The widespread adoption of dairy cattle in the country was stimulated by several interacting factors such as: the conducive policy and institutional environments provided by successive Governments; the presence of significant dairy populations (owned by settler farmers); a subtropical geography suitable for dairy cattle; and, smallholder communities who kept cattle and who had milk as an important part of their diet (Garrity, D., Dixon, J., & Boffa, J. M. 2012)

The dairy processing industry in Kenya comprises of large, medium and small-scale processors. Until the 1990s, the Kenya Creameries Corporation (KCC) processed all the milk in Kenya, but

its monopoly slowly decreased between 1993 and 1996 (Berut, Z. J. 2020). Despite liberalization and restructuring of the dairy sector, political interventions, inefficient management and political rent-seeking behavior led to the collapse of KCC as a state monopoly in the 1990s. Consequently, the end of government monopoly status of KCC encouraged private sector participation through other large-scale processors. Many private processors joined the dairy business in 1992, and have increased greatly since 1999. According to the industry statistics by the Kenya Dairy Board, in 2010, there were an estimated 27 processors, 64 mini dairies, 78 cottage industries and 1138 milk bars.

Over the last few years, milk processing in Kenya has been dominated by three major processors, namely, the New KCC, Brookside Dairy Limited and Githuguri Dairy Farmers Cooperative Society. Although Kenya's dairy sector has a significant contribution to the national economy, household incomes and food security, the industry faces a number of technical, economic and institutional problems in milk production, processing and marketing (Karanja, 2003). These constraints affect the ability of the sector to participate and compete in the domestic and regional markets. Specifically, some of the main constraints to increased milk production in Kenya have been Identified as seasonality in production, inadequate quantity and quality of feed, including limited use of manufactured cattle feeds, and lack of good quality animal husbandry and farming practices. Poor access to breeding, animal health and credit services and high cost of artificial insemination (AI) service are other constraining factors. In some areas, dairy producers are faced with the problem of poor infrastructure (roads, electricity), inadequate milk collection and marketing system, poor interaction and priority setting between research, extension and training, and limited farmers' involvement in the output market, hence reducing the incentives to increase milk production (SDP, 2005).

2.2 Dairy Cattle Breeds

A breed is a race or variety related by descent and similarity in certain distinguishable characteristics. More than 250 breeds of cattle are recognized throughout the World. In Africa there are two main races of Cattle: Bos indicus (cattle with humps) including the Boran, Sahiwal and Zebu cows (indigenous) and the Bos taurus (exotic or imported breeds). The two races can cross breed, and the crosses can be very productive both in terms of growth rates for beef, improved milk production as well as disease resistance.

Kenya is a home to a wide range of cattle genotypes. Within the East and Central Africa region, Kenya has the highest number of exotic dairy cattle. As for indigenous breeds, Kenya also ranks high with Ethiopia and Sudan topping the list of African countries with the highest population of indigenous cattle breeds. The dairy cows kept in Kenya are mainly crosses between exotic dairy breeds like Friesian, Ayrshire, Guernsey and Jersey and indigenous zebu (Anunda, F. O. 2012). The main purpose of dairy breeds of cattle is to produce milk, reproduce to provide replacement cows for the future and most of all to provide a means of living for farmers in the dairy business by providing the most milk at the least possible cost. All cows can produce milk but the most suitable for commercial milk production are few. The most important dairy breeds of cattle in Kenya are Friesian, Ayrshire, Guernsey and Jersey breeds. The rest are either good for beef or as dual-purpose animals (Anunda, F. O. 2012). Among the exotic high milk producing breeds introduced in the country during the colonial era were Friesians, Ayrshire, Guernsey and Jersey in the order of high milk volume production, some agro-ecological zones (AEZ's) are not suitable for pure breed high yielding milk cows, but can benefit from crossbreeding the local breeds of cattle with exotic breeds. However, this will only be useful if management practices such as improved feeding, plenty of fresh water available, and a reliable source of veterinary drugs are available. Without these conditions the survival rate of cross breeds is likely to be low.

2.3 Theoretical Framework

Human behavior is seen as a result of the inter play of diverse forces that create a set of circumstances through the dynamic interaction of man and his environment (Hogerwerf, L., & Slingenbergh, J. 2013). According to the psychological Field theory of Kurt Lewin, 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. Human behavior can be described as follows: A person in his subjectively perceived environment feels something is worth striving for like adoption of Agricultural best practices, selection of better dairy breeds and adoption of better breeding systems. They then mobilize their personal powers to achieve this goal of adoption of the best practices in dairy farming. When something negative or undesirable occurs like a case of low production or poor quality, the person activates his personal powers in the same way to avoid the negative situation. Ways of reaching targets and avoiding negative situations can be blocked or impeded by barriers or inhibiting forces like lack of awareness, risk or uncertainty about outcome,

insufficient capital, cultural practices and lack of opportunities for scaling up of Dairy farming innovation.

Inhibiting forces negatively influence behavioral change in initiating and adopting the best practices in dairy farming e.g., lack of subsidies like artificial insemination, limited liquidity for labor hiring, buying concentrates, lack of machinery, and limited knowledge. Driving forces- are forces conducive to positive target improvement e.g., financial assistance, technical advice, training, provision of inputs, financial assistance, linkage with market outlets. Adoption of best farming practices is thus seen as resulting from the psychological field of inhibiting and driving forces hence these forces are present in a state of equilibrium or dis-equilibrium with varying degrees of tension between them. Once such forces are identified in the farmers decision making process, the chances of diffusion can be estimated and consequences for promotion programs can be concluded (Ndah, H. T. 2014).

According to Mndzebele, N. (2013),the determinants of adoption are: perceived attributes of the technology; comparative advantage; the degree to which an innovation is perceived better than the idea it supersedes; complexity - the degree to which a practice is perceived as relatively difficult to understand and to adopt negatively related to its rate of adoption; trial ability -degree to which an innovation like modern dairy practices may be experimented at a limited basis; compatibility-degree to which sustainable practice is perceived as consistent with the existing values, past experience and needs of potential adopters.

Mndzebele, N. (2013), posited that the type of innovation decision process through which an individual pass from; knowledge to attitude and finally to adopting (individual or collective, optional or authority). With the communication channels being either interpersonal or by mass media, originating from specific or diverse source social system: norms, network interconnectedness socio-cultural practices and norms that can inhibit or drive adoption. In many rural areas milk production 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 milk production 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. Strategies for bringing about change have generally focused on altering the environment in which milk production is carried out, or in the direct transformation of farmers themselves.

2.4 Empirical review

Mbungu (2014), conducted a study investigating the challenges facing the implementation of enterprise resource planning in the dairy industry in Kenya. In recent years there has been an increase in using Enterprise Resource Planning (ERP) systems in large companies and government corporations mainly in developed countries. While there is wide adoption of ERP systems in Western economies, developing countries lag far behind. However, due to recent economic growth, developing countries such as Kenya are increasingly becoming major targets of ERP vendors. This study investigated the challenges facing ERP implementation in the dairy sector. The target population of the study was the senior staff in the leading milk processors in Kenya. The researcher sampled 50 respondents from the ICT, marketing, production and business development departments that are concerned with strategies formulation and implementation. Primary data was collected using a semi-structured questionnaire consisting of open and closed ended questions. The questionnaire was administered through drop and pick-later method to the target population. Secondary data was collected through reading the existing material like the brochures and books. The data was coded and entered into Statistical Package for Social Science (SPSS) and descriptive analysis. Measures of central tendency were applied on the data and the findings, conclusion and recommendations of the study derived. Data was presented using bar graphs, percentages and frequency tables. The results of the study showed that in regard to employee knowledge and skills, majority of the respondents had diploma and university level of education, therefore they reported that were able to utilize the ERP model in their organizations. Majority agreed that some preparation was done before implementing the modals. The study established that majority of the employees reported of the stakeholder's involvement in the ERP implementation, especially in offering technical expertise. On organization resources majority of

the respondents reported that their organization devoted resources to the Implementation process. The main resources provided were financial related. Majority of the respondents reported that their organization had adopted customer-oriented culture, majority cited poor data storage as a main organization cultural aspect the ERP implement ion was meant to address. Majority reported that ERP has helped in regulating production line and inventory database therefore improving the organization culture in terms of efficiency.

Githinji (2014), conducted a study on the evolution of cooperative societies in Nyandarua County, Kenya. The study examined the evolution of co-operative societies in Nyandarua County between 1965 to 2000 with particular emphasis on Karagoini Marketing Co-operative Society in Ndaragwa Sub- County. The primary objective of this research was to study the nature and characteristics of the co-operative societies in Nyandarua County from the early independence period. A number of co-operative societies were formed in the Sub- County from 1965. The societies formed included Ndaragwa (1965), Kanyagia (1966) and Karagoini (1967) co-operatives societies among others. The first African settlers were settled in Nyandarua County in 1963. This was advantageous to control sales and avoid exploitation by private traders. The study employed purposeful sampling in order to capture samples of informed respondents. A total of 40 informants between the age of 45 to 80 years were interviewed between 2008 to 2014. These included members of the society, management teams and co-operative officers in the county. They provided very important qualitative data as they were associated with Karagoini Co-operative Society in different periods from 1967. Some members from other societies within the Sub- County also provided important information which added value to the study. The study employed four types of data, namely archival data, oral and written interviews and library research. Question guides were provided to the informants. The interviews proved very useful in gathering specific information. They were able to provide answers to the reasons behind the formation of Karagoini Co-operative Society, the benefits acquired and challenges faced. The oral informants who were illiterate would be assisted to fill the question guide. The sources were compared in order to produce complete results. The study adopted an integrated theoretical approach comprising the dependency and underdevelopment approach, modernization and articulation of modes of production. The results of the study showed that t the government promoted the co-operative societies in Nyandarua County after independence. This was mainly done through education and training.

Njiru (2015), conducted a study on the effects of dairy cooperatives on incomes of smallholder farmers; a case study of Mkulima Bora dairy cooperative in Embu County, Kenya. Smallholder farmers produce the bulk of total milk marketed in the country. This study assessed how effective cooperatives were in increasing smallholder dairy farmers' incomes through the minimization of transaction costs. The objectives of this study were to determine socioeconomic factors influencing smallholder farmers to become cooperative members, how effective the cooperative was in minimizing transaction costs and the constraints and strategies for improving dairy cooperatives. Data for this study was collected through a cross-sectional survey in Embu County. Systematic random sampling was employed to select smallholder dairy farmers who are members of the dairy cooperative society while simple random sampling was used for non-cooperative members. The sampled farmers were interviewed using a structured questionnaire. Binomial logit model was used to analyze the socio-economic factors, descriptive statistics analyzed the transaction costs faced and two-stage Heckman model analyzed the effects of cooperatives in minimizing the transaction costs. Constraints affecting dairy cooperatives were analyzed using exploratory factor analysis. The results of the study showed that gender, age, herd size, distance to the market and the cost of transportation influenced farmers decision to participate in dairy cooperatives. Herd size, market satisfaction, amount of milk sold, household income, market access, price information, credit access and extension significantly affected the income received from milk sales thereby reducing the transaction costs faced by smallholder farmers. The study found critical constraints included delayed payments, lack of management skills, stiff competition from hawkers, inadequate milk testing, milk losses due to rejection, lack of target setting, low capital base, general insecurity a limited partnership.

2.5 Research Gaps

A knowledge gap occurs when desired research findings provide a different perspective on the issue discussed. For instance, Githinji (2014), conducted a study on the evolution of cooperative societies in Nyandarua County, Kenya. The primary objective of this research was to study the nature and characteristics of the co-operative societies in Nyandarua County from the early independence period. The study employed purposeful sampling in order to capture samples of informed respondents. A total of 40 informants between the age of 45 to 80 years were interviewed between 2008 to 2014. The results of the study showed that t the government promoted the co-

operative societies in Nyandarua County after independence. This was mainly done through education and training. On the other hand, our current study focuses on the factors affecting dairy production among cooperative societies in Kenya.

3.0 METHODOLOGY

The study adopted a desktop literature review method (desk study). This involved an in-depth review of studies related to the factors affecting dairy production among dairy cooperative societies in Kenya. Three sorting stages were implemented on the subject under study in order to determine the viability of the subject for research. This is the first stage that comprised the initial identification of all articles that were based on factors affecting dairy production among dairy cooperative societies in Kenya. The search was done generally by searching the articles in the article title, abstract, keywords. A second search involved fully available publications on the subject on factors affecting dairy production among dairy cooperative societies in Kenya. The third step involved the selection of fully accessible publications. Reduction of the literature to only fully accessible publications yielded specificity and allowed the researcher to focus on the articles that related to the factors affecting dairy production among dairy cooperative societies in Kenya which was split into top key words. After an in- depth search into the top key words (dairy cooperative society, raw milk, income, cattle breed), the researcher arrived at 3 articles that were suitable for analysis.

Mbungu (2014), conducted a study investigating the challenges facing the implementation of enterprise resource planning in the dairy industry in Kenya. The researcher sampled 50 respondents from the ICT, marketing, production and business development departments that are concerned with strategies formulation and implementation. Primary data was collected using a semi-structured questionnaire consisting of open and closed ended questions. The questionnaire was administered through drop and pick-later method to the target population. Secondary data was collected through reading the existing material like the brochures and books. The data was coded and entered into Statistical Package for Social Science (SPSS) and descriptive analysis. Measures of central tendency were applied on the data and the findings, conclusion and recommendations of the study derived. Data was presented using bar graphs, percentages and frequency tables. The results of the study showed that in regard to employee knowledge and skills, majority of the

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4.0 SUMMARY CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusion

The study found that various factors influenced dairy milk productivity. These factors included the social economic, cattle breeds and breeding systems, availability and cost of inputs and the adoption of technology. Dairy farming is an income generating activity that needs to be developed and the farmers need to be empowered and trained to increase productivity as it will lead to generation of income. The national government should therefore pay more attention to enhance farmers' accessibility to financial resources which will lead to adoption of modern technology which can improve herd quality and quantity hence increase dairy productivity.

4.2 Recommendations

Sensitization should be carried out to increase the participation of youth and women in dairy farming. Farmers should be encouraged to have succession plans in place for continuity of the dairy industry by involving their children in dairy farming. The National government, county Government and Non-Governmental organizations should look for ways of subsidizing the cost of Artificial insemination Services. Farmer groups should form alliances for centralized procurement of inputs to benefit from economies of scale and increased bargaining power. Farmers and farmer groups should form Savings and credit Co-operatives to increase their access to financial services. The government and other nongovernmental actors should continue sensitizing farmers on new technology and methods that can be adopted to improve dairy productivity and mitigate the effects of climate change. Farmers should be encouraged and motivated to make silage during the wet season to ensure that they have adequate nutritional feeds for their animals during the dry season. This will reduce fluctuations in milk production between the wet and dry seasons. The government should exempt silage making materials and other agricultural inputs from tax and increase the number of extension officers to increase their outreach.

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