BUSITEMA UNIVERSITY
Pursuing Excellence

P.O. Box 236, Tororo, Uganda
Gen: +256 - 45 444 8838
Fax: +256 - 45 4436517
Email: info@adm.busitema.ac.ug

www.busitema.ac.ug

FACTORS LIMITING MILK PRODUCTION AMONG SMALL HOLDER DAIRY FARMERS IN BUMASHETII SUB-COUNTY, BUDUDA DISTRICT, UGANDA

BY

MUKOYA CEDRICK

BU/UP/2020/0703

A RESEARCH REPORT SUBMITTED IN PARTIAL FULFILMENT OF THE REUIREMENTS OF THE AWARD OF THE BACHELOR'S DEGREE OF SCIENCE EDUCATION OF BUSITEMA UNIVERSITY

JANUARY, 2024

DECLARATION

I, MUKOYA CEDRICK registration number BU/UP/2020/0703 declare that this research report has been done by me. I confirm that this work is my own and it has not been submitted for any degree or examination at any institution

Signature:..... Date: 29/01/2021

i

APPROVAL

This is to certify that this research report titled "Factors Responsible for Low Production among Small Holder Dairy Farmers in Bumasheti Sub-County in Bududa District" is the original and individual work of Mukoya Cedrick. It has been done under my supervision and for the award of the Bachelor's Degree of Science Education of Busitema University with my due approval

SUPERVISOR

..... Date.....22/07/2024.....

MR. Dramadri Gerald Afayo

SUPERVISOR

DEDICATION

My loving father Tiisi Lawrence deserves special recognition for his unwavering efforts, and I would like to dedicate this research to him in gratitude for his protection. May the Almighty God generously reward your efforts.

ACKNOLEDGEMENT

Sincerely, I would want to express my thankfulness to the Almighty God for giving me life, shielding me from many unforeseen events, and showing me mercy ever since I started my academic career. I am grateful to my supervisor, Prof. James Peter Egonyu, for lending me his time to ensure the effective completion of this project. I want to take this humble moment to express my gratitude to the entire agriculture department for their ongoing guidance and assistance in this academic endeavor. Research has been a troubling problem, but thanks to your helpful comments, I was able to think of a theme and an approach.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

AI	Artificial insemination
COMESA	Common market for eastern and south Africa
DFID	Department for international development
EADD	East Africa dairy development
FAO	Food and Agricultural Organization

GDP	Gross Domestic Product
GOU	Government of Uganda
ICT	Information and communication technology
IFAD	International funds for agriculture development
ILRI	International Livestock Research Institute
MDG	Millennium Development Goals
NARO	National Agriculture Research Institute
SDCP	Smallholder dairy commercialization program
SRA	Strategy for Revitalization of Agriculture
SSMV	Small Scale Milk Vendors
UDDA	Uganda Dairy Development Authority
UHT	Ultra heat treatment
USAID	United States Agency for international development

ABSTRACT

The study sought to assess the factors responsible for the low milk production among small holder dairy farmers in Bumasheti Sub-County in Bududa district. The study was guided by specific objectives which included establishing how marketing factors, affect the amount of milk produced by small-scale dairy farmers, determining the impact of farmer awareness on milk produced by small-scale dairy farmers and assessing the impact of cattle, breed variability on the amount of milk produced.

The study used descriptive research design and a case study was Bumasheti Sub-County in Bududa District. To achieve the set objectives the study used purposive sampling and simple

random sampling in sample selection. A sample of 55 respondents participated in study which included 34 dairy farmers, 6 advisor officers (Extensions), 8 local leaders and 7 production officers was sought from the 65 respondents. Dairy farmers filled the questionnaire because they were in constant engagement with dairy animals and introduction letter was obtained from the faculty of science education introducing the researcher to the field of research.

The findings on average monthly production of milk (in liters) indicated that respondents had milked between 1000-2000, market demand and supply, competitor prices, production costs, through social media advertising, print advertising, word of mouth referrals participation, sale of dairy products (e.g., cheese, yogurt, and butter), sale of animal feed, sale of breeding stock and tourism or recreation activities. In addition, the study showed respondents stated fluctuating demand, low prices, difficulty accessing markets, breed and genetics, feeding and nutrition, health and disease management, daily, weekly, monthly, rarely consulted, improved feed quality and nutrition, increased herd size, upgraded milking equipment and changed breeding practices. Besides, the field findings show that very positive, somewhat positive, mentioned neutral, somewhat negative, very negative, significantly higher, slightly higher, slightly lower, very important, somewhat important, not very important, not at all important, strong correlation, weak correlation, correlation, great extent and moderate extent.

The researcher recommends that extension workers should offer services to farmers at regular interval, government should allocate more funding, and farmers should seriously put in practice what the extension workers

CHAPTER ONE

INTRODUCTION

1.0. Introduction

Smallholder dairy is a farming system that encourages those who typically only have access to money once a season after the sale of harvested crops to make ongoing financial earnings (Tegegne, 2013). The consistent monthly income from the sale of milk and milk products helps rural homes' cash flow charts and enhances the quality of life for their residents. It facilitates Africans' integration into the formal economy and initiatives aimed at reducing poverty in their nations. Smallholder dairy boosts the nation's base of milk production, enhances household nutrition, and gives women and young people more confidence to pursue income-generating opportunities and agricultural development.

1.1. Background of the study

The livestock sector is one of the most important sectors in the agricultural economy contributing up to 40% of the global value of agricultural output and supports livelihoods and food security of almost a billion people worldwide (World Bank, 2019). Livestock are regarded as assets, serving as a store of wealth, collateral for credit, and an essential security net during calamitous times, (Hammar, 2014). Globally, the sector also contributes 15% of total food energy and 25% of dietary protein (Grovermann et al 2018). Milk and dairy products play an important role in a healthy balanced diet (Dror, & Allen, 2014). Normal cow's milk contains approximately 87.4% water and 12.6% milk solids, (Goff, 2017). The solid consists of 3.9% fat, 3.2% protein, 4.6% lactose quality, (Goff, 2017). This mineral, along with other nutrients present in dairy foods, such as protein, magnesium and phosphorus, is essential to build and maintain strong bones thus maintaining a healthy population to provide a productive labor force, (Manzato et al 2019). Milk is also good for the bones because it offers a rich source of calcium, a mineral essential for healthy bones and teeth. Cow milk is fortified with vitamin D which also benefits bone health. Vitamin D helps prevent osteoporosis, (Daginder, 2015).

The Food and Agricultural Organization (FAO) report that livestock production is growing rapidly and the growth is linked to increasing demand for animal products (Milk, meat), (FAO, 2019). Indeed, since 1960, milk production has nearly doubled, (Sasson, 2016). Population growth, changes in lifestyle, as well the increase in wealth in many countries are driving the growth, (Fengler, 2018). In Uganda, the dairy sub-sector contributes about 50% of total output from the livestock sector, 20% of the food processing industry, and 4.3% of the national Gross Domestic Product (National Development Plan, 2017). The dairy sector contributes to about 34% cattle in Uganda, giving a milk output of 14,000 million liters annually (Wozemba and Nsanja, 2016). The sector has been growing at a rate of 9% annually. This growth rate has been attributed to the favorable macroeconomic policy environment and institutional reforms including the privatization of the dairy sub-sector, increased demand for milk by both local and international milk consumers and milk processing plants, better herd management, adoption of improved breeds, and improved animal health and support services. (National Development Plan, 2017).

Over the last 24 years, total milk production in the world has increased by 32% whereas per capita world milk production has declined by 9%. This indicates that the world milk production has not kept pace with the increase in world population. Nonetheless, as opposed to the trend towards intensification of milk production in developed countries, production growth in developing countries is a large part due to increasing numbers of milk animals and dairy farms and only a small part due to productivity gains (Knips, 2019). India is the world largest producer of dairy products in the world while the world largest exporter of dairy products is New Zealand.

Milk production grew steadily in East Africa in the 1980s and 1990s. The pace of growth has since accelerated following recent high rates of income growths and urbanization, though the exact figure are not easy to verify. According to Ngigi (2004), milk production increased during the 1990s at an annual rate of 4.1% in Kenya and 2.6% in Uganda, (Uganda Investment 2002) suggests that the figure was higher in Uganda, with production having risen from 365 million litres in 1991 to 900 million litres in 200. One reason for such high growth is high domestic consumption. Milk consumption in Kenya is 145 litres per person per year, which is among the highest rates in developing world (SDP), spurring an estimated 4 billion litres of production in 2003 (Export Processing Zones Authority, 2015). Although only about 35% of milk produced is

marketed, at a retail price of US$0.75 or more per litre, The Kenyan dairy industry is estimated to generate $2billion litres per year (Strategic Business Partners 2018).

The growth in dairy sector in Uganda has been commensurate with growth in milk production. For instance, according to Uganda Dairy Development Authority milk production has been increasing with about 2.08 billion liters of milk produced in 2015 and 2.5 billion liters in 2017/2018 indicating annual milk production growth rate of 6%, (Jacky, 2018). In terms of consumption, it is shown that the per capita consumption of milk in Uganda has increased from 25 liters in 1986 to 62 liters in 2017, (Jacky, 2018). According to the government Dairy Development Authority (DDA), in October 2018, annual national milk output stood at 2.2 billion liters, up from 1.8 billion liters annually, as of July 2016. As of 2017, per capita milk consumption in Uganda stood at 62 liters, up from 25 liters in 1986. 80 percent of the milk produced is marketed while 20 % is consumed by the farming households. 33 percent of the marketed milk is processed, while 67 % is sold as raw milk. However, the current annual milk consumption is low at only 62 liters/person compared to the recommended milk consumption per person per annum by FAO of 200 litres indicating that there is an opportunity for growth of the dairy sector in Uganda, (Nakiganda & Ahmed, 2019).

Following liberalization of the dairy industry in 1993, the government owned Dairy Corporation lost monopoly and control over dairy processing and marketing activities in the country. The private sector established more than fifteen (15) new dairy processing plants in different parts of the country. However, five out of the ten plants established in the first decade of liberalization (1993-2003) collapsed/closed down owing to various company specific and general industry inefficiencies, (Balikowa, 2011). Today, the growth in milk production has been attributed to supportive environment by the government of Uganda (Nakiganda & Ahmed, 2019). other development partners such as Heifer International, Techno Serve, and DANIDA have initiated grants to support small-scale processors, institutional capacity building on value addition and support to foreign agro food processors (NDP 2017). As a result, an efficient dairy chain has been developed targeting Small-scale farmers who dominate Uganda's dairy production owning over 90% of the cattle population of Country. It is established that out of 96% of citizens who live in rural areas, approximately 60% of households keep mainly indigenous cattle, (Tijjani, & Yetişemiyen, 2015).

Wozemba & Nsanja, (2018) noted that the cattle population in Uganda today is 7.5 million with indigenous lot accounting for 95 percent while the exotic and crosses accounting the balance. Because of the high productivity associated with intensive dairy farming methods such as zero grazing of improved breeds. Most farmers have adopted modern farming techniques at various levels of production. The population of goats has also increased from 5.8 million in 1997 to over 7.8 million according to 2017/16 household survey (Kabi et al 2019). The number of the exotic dairy goats has proportionately increased with Kasese continuing to lead in this area. Most of the milk produced is however consumed at household level with minimal processing (Lukwago et al 2019). Within the livestock industry, dairy development continues to receive the greatest attention in the development of the animal industry in Uganda.

One of the most active subsectors in East Africa is dairy farming, with a high availability and consumption of milk per person in Uganda (Balikowa, 2011). With an estimated annual intake per person of 90 liters-more than five times the amount of milk consumed in other East African countries save Kenya-Ugandans, notably those from the Bumasheti Sub county, are among the world's biggest milk drinkers. 80% of all cattle in the nation and 70% of all milk produced are produced by the smallholder dairy subsector, making it an essential one. The majority of Uganda's dairy farming is done in its western and central regions. These areas are densely populated compared to the country's northern regions, and the population serves as a complementing market for the milk produced. Highlands offer a good agro-ecology for dairy farming, in addition to a population that supplies markets. It has been discovered that small-scale dairy farming is incredibly profitable. This is a result of the competitive milk prices. The industry is still thriving even after some government incentives, such as those for artificial insemination, were removed. The deregulation of the dairy industry led to the favorable market prices.

Dairy production in Uganda is separated into two categories: large and small scale. The dairy subsector is dominated by large scale farming, with small scale farming accounting for 70–80% of overall activity. Four sub-groups of smallholder dairy producers are identified by the International Food and Agricultural Organization resource-poor, small-scale intense, part-time, and crop-oriented. Because of their unique qualities, these groups are subject to various limitations. A multitude of systems, including extensive and intensive grazing, are used to

produce them. Where there is limited area, farmers utilize intensive grazing, often called zero grazing, to feed their livestock in stalls with very minimal movement. There are those who practice extensive production where mostly the animals graze and they are not stall fed

1.2. Statement of the Problem

Due to many players involved in milk marketing, the DDA, a dairy sector regulatory body in Uganda has found it difficult to enforce good milk marketing practices, (Kiggundu et al., 2019). This has exposed farmers to low milk prices, yet downstream retail prices are high (Reardon et al., 2019) despite offering substandard-quality milk products to consumers (Anjani and Steven 2017). Oppenkowski et al. (2019) noted that the best motivation for farmers to diversify and invest in dairying is the presence of safe and profitable market outlets. This justifies the need for efficient milk marketing channels in Uganda that are easily regulated and monitored.

Despite of the above, poor milk handling practices and marketing challenges remain a major hindrance to the dairy sector. Milk is marketed through formal and informal channels (Mbowa et al., 2016). The formal milk marketing channel handles only about 20% of the total national milk marketed operates an organized system of milk collection using well established bulking centers with coolers and transport infrastructure (milk tanks). On the other hand, the informal milk marketing channel that controls about 80% of the total milk marketed is characterized by lack of milk collection infrastructure and facilities for pasteurization and hygienic handling of milk, limited quality and safety control, and adulteration of milk with water and other chemicals (Kihoro et al., 2019).

1.3. Objectives of the research study

The study was guided by the objectives as stated below

1.3.1. Main Objective

To assess the factors responsible for the low milk production among small holder dairy farmers in Bumasheti Sub county in Bududa district

1.3.2. Specific Objectives

i. To establish how marketing factors, affect the amount of milk produced by small-scale dairy farmers in Bumasheti Sub-County.
ii. To determine the impact of farmer awareness on milk produced by small-scale dairy farmers in Bumasheti Sub-County.
iii. To assess the impact of cattle, breed variability on the amount of milk produced in Bumasheti Sub-County.

1.4. Research questions

i. How has marketing factors affected the amount of milk produced by small-scale dairy farmers in Bumasheti Sub-County?
ii. What is the impact of farmer awareness on milk produced by small-scale dairy farmers in Bumasheti Sub-County?
iii. What is the impact of cattle, breed variability on the amount of milk produced in Bumasheti Sub-County?

1.5. Justification

The purpose of this study was to establish the factors responsible for low milk production in Bumasheti Sub-County and therefore create a basis for remedies so as to improve the milk production levels in the area

1.6. Significance

The findings of this study are expected to generate evidence on the current economic value attached to milk. This will help farmers to evaluate and choose the most beneficial marketing channel under the current high demand of dairy products. It will as well help policy-makers and other stakeholders to best address challenges farmers are facing in different marketing channels through institutional and policy reforms.

The study will also help policy makers in designing and implementing of new policies that will have a positive impact on encouraging dairy farmers engage in efficient marketing of their milk so as to increase their profitability levels.

The study will also add on existing literature about milk marketing and profitability to help in identifying further research gaps.

The findings of this study can hopefully assist veterinary specialists' and agricultural extension officers in designing interventions that may benefit the farmers as the knowledge generated from this study may make them more aware of the farmers' knowledge on the nutritional requirement of dairy animals then make informed decisions on how to feed them.

The study is also expected to provide a better understanding of the farmers' choices and possibly feed into decision making processes, considering that dairy farming is very important for food security, asset accumulation and indeed, improvement of livelihoods.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews the literature by other researchers who have conducted research in the same field. It contains opinions, attributes, research outcomes and conclusions from previous research done by other people and organizations.

2.1. How marketing factors, affect the amount of milk produced by small-scale dairy farmers

Abafita, Tadesse and Strzepeck (2017) defined marketing as the set of human activities directed at facilitating and consummating exchanges. All business activities facilitating the exchange are included in marketing. Marketing involves all activities involved in the production, flow of goods and services from point of production to consumers. Marketing includes all activities of exchange conducted by producers and middlemen in commerce for the purpose of satisfying consumer demand.

Market accessibility: Small-scale dairy farmers who have easy access to markets for their milk produce more than those who face difficulties in reaching potential buyers. This is because market accessibility affects the price that farmers receive for their milk, which in turn influences their decision to invest in inputs such as feed, veterinary services, and breeding programs (Kumar et al., 2018).

Price fluctuations: Milk prices are subject to significant variations due to changes in demand and supply conditions. Fluctuations in milk prices can significantly impact the income of small-scale dairy farmers, leading them to adjust their production levels accordingly. For instance, during periods of low milk prices, farmers may reduce their herd size or cut back on feeding and other management practices, thereby reducing milk production (Makoni et al., 2016).

Marketing channels: The choice of marketing channel also has implications for milk production among small-scale dairy farmers. Farmers who sell their milk directly to consumers or through cooperatives tend to produce more than those who rely on intermediaries or middlemen. Direct

sales provide better pricing and ensure regular cash flow, while cooperatives offer additional benefits such as extension services, training, and access to credit (Gbetibouo and Ringler, 2019).

Quality standards: Stringent quality standards imposed by processors and retailers can be challenging for small-scale dairy farmers to meet, particularly if they lack access to appropriate technology and resources. Failure to comply with these standards can result in reduced payments or rejection of milk deliveries, discouraging farmers from investing further in their enterprises (Oladejo et al., 2017).

Competition: Intense competition among small-scale dairy farmers in local markets can lead to overproduction and subsequent price drops, negatively affecting the profitability of individual farms. Conversely, limited competition can create monopolistic situations where farmers have little bargaining power, resulting in lower prices for their milk (Rao et al., 2018).

2.2. The impact of farmer awareness on milk produced by small-scale dairy farmers

Bahta et.al (2016) stated that awareness is described as having knowledge or cognizance; aware of the difference between two or more versions (The free dictionary). Over the last decade, milk productivity growth has been positive. The increase in productivity may be attributed to a number of factors such as improved animal husbandry practices and veterinary care, better quality feeds, and adoption of more intensive grazing systems and improved cow breeds.

Chase and Dunklee (2016) observed that farmers should use good quality forage and improved pasture which may provide sufficient nutrients for maintenance and production of approximately 5.0 kg/d of milk. Concentrates are fed to supply energy and protein for increased milk production. In addition to the limited availability, the high cost of concentrates and the declining milk to concentrate price ratio makes it difficult to feed adequate concentrates regularly resulting in low productivity. The declining milk price to concentrate price ratio from 1985 through 1993 caused the decline in viability of dairying. It has been shown that unless the milk to concentrate price ratio is greater than one, the economics of feeding concentrates may be doubtful. The declining milk price to concentrate price ratio may be used as a guide to choose feeds and the optimum quantity of concentrate to be fed in a given situation.

Doss et.al (2018) said that farmers should have knowledge of these practices and how to apply them so as to be deemed aware therefore being aware entails knowing this potential production changing practices and whether they apply them or not is another issue. Awareness of the market dynamics by the farmer will also affect the amount of milk that reaches the market.

Ng'wena and Kang'ara (2017) found that training small-scale dairy farmers in Kenya on best practices, including proper feeding, breeding, and herd health management, resulted in significant improvements in milk production and quality. Similarly, Strydhorst et al. (2016) showed that providing extension services to smallholder dairy farmers in Tanzania improved their knowledge and adoption of better dairying practices, leading to increased milk yields and improved productivity.

Mwendwa et al. (2019) investigated the effect of information accessibility on dairy farming practices among small-scale farmers in Tanga, Tanzania. They discovered that farmers who received regular updates through mobile phones or community meetings had better knowledge of dairy farming techniques and recorded higher milk production compared to those without access to such information.

Omore et al. (2013) evaluated the impact of a technology package intervention on smallholder dairy farms in Kenya. The intervention included training on improved feeding and breeding practices, disease control, and marketing. The results indicated that farmers who adopted the technology package experienced a significant increase in milk production and income compared to those who did not adopt the package.

Hall et al. (2014) explored the potential of dairy hubs as an innovative approach to improving market access for small-scale dairy farmers in Africa. Their findings suggested that dairy hubs, which provide farmers with access to processing facilities, technical assistance, and market linkages, can improve milk quality, increase farm profitability, and enhance rural development.

Farmer field schools (FFS) are another approach to enhancing farmer awareness and skills. Mukankusi et al. (2018) conducted an FFS program in Rwanda, focusing on integrated pest management and sustainable agriculture practices. They reported that participating farmers

exhibited improved knowledge and adoption of sustainable practices, resulting in higher crop yields and reduced pesticide use.

Kjellén et al. (2017) examined gender differences in dairy farming practices and their implications for food security in rural Kenya. They found that women farmers were more likely than men to adopt conservation agriculture practices, which led to higher crop yields and improved household food security. This study highlights the importance of considering social factors when designing interventions aimed at improving farmer awareness.

Thorpe et al. (2017) discussed the role of government policies and institutional support in shaping the adoption of dairy technologies by smallholder farmers in India. They argued that effective institutions, coupled with targeted policy reforms, can encourage investment in dairy farming and enhance the adoption of new technologies, ultimately contributing to improved productivity and efficiency in the sector.

Akinnifesi et al. (2016) implemented a capacity-building program for small-scale dairy farmers in Nigeria, covering topics such as animal nutrition, reproduction, and herd health management. Participants demonstrated significant improvements in knowledge and skill levels, which translated into higher milk production and better animal welfare.

Farmer awareness also plays a crucial role in ensuring food safety and meeting regulatory standards. A study published in the Journal of Food Protection found that farmer awareness of food safety practices was associated with lower prevalence of foodborne pathogens in raw milk (Henson et al., 2017). The study surveyed small-scale dairy farmers in the United States and found that farmers who reported being aware of food safety practices, such as properly cooling and storing milk, had lower levels of E. coli and Listeria monocytogenes in their raw milk samples.

In addition to improving milk quality and food safety, farmer awareness can also help small-scale dairy farmers to access premium prices for their products. A study published in the International Journal of Agricultural Management found that farmer awareness of market opportunities and requirements was a key factor in accessing high-value markets (Reimer et al., 2017). The study analyzed data from 150 small-scale dairy farmers in Tanzania and found that

farmers who were aware of market opportunities and requirements were more likely to participate in high-value markets and receive premium prices for their products.

2.3. The impact of cattle, breed variability on the amount of milk produced

Genetic potential: The genetic makeup of different breeds plays a critical role in determining their milk-producing ability. Some breeds, such as Holstein-Friesians, have been specifically bred for high milk yields and can produce up to 50% more milk than other breeds like Jerseys or Guernseys (Berry et al., 2007; Mrode, 2019). According to Haile-Mariam et al. (2018), the top five dairy breeds worldwide based on average milk yield per lactation are Holstein, Jersey, Brown Swiss, Ayrshire, and Guernsey, respectively. This demonstrates that there is considerable variation in milk yield among different breeds due to differences in their genetic potential.

Management practices: Breed selection also influences management strategies employed by farmers to maximize milk production. For example, higher-yielding breeds like Holsteins typically require more feed, water, and veterinary care compared to lower-yielding breeds (De Vries and Veerkamp, 2000; Capper et al., 2019). Moreover, these intensive management practices may lead to increased environmental impacts, including greenhouse gas emissions and nutrient runoff from manure (Gerber et al., 2013). Conversely, lower-yielding breeds might be better suited to extensive grazing systems, reducing input costs while maintaining acceptable levels of productivity (Hayes et al., 2006). Therefore, understanding the interaction between breed choice and management practices is essential when aiming to optimize milk production while minimizing negative consequences.

Adaptation to local conditions: Certain breeds perform better under specific climatic, geographical, and cultural conditions. For instance, indigenous breeds adapted to harsh environments often exhibit greater resilience to diseases, parasites, and heat stress compared to exotic breeds (Rege and Tawah, 1999; Gwaze et al., 2004). These adaptations enable them to maintain reasonable milk production levels even in challenging circumstances where highly productive breeds would struggle. In addition, consumer preferences play a crucial role in shaping demand for particular breeds' products, affecting market prices and overall profitability (Bonanno et al., 2016). Thus, selecting appropriate breeds tailored to local contexts is vital for ensuring sustainable milk production systems.

Management practices: Farm management practices, such as housing, feeding, and health care, can also influence milk production across breeds. For instance, breeds that are better adapted to grazing systems may perform better under pasture-based management compared to those that are more suited to confinement systems (Enevoldsen et al., 2018).

Herd size and structure: The size and structure of the herd can also impact milk production. Larger herds may benefit from economies of scale and more efficient management practices, leading to higher milk yields per cow (Hadorn et al., 2017). However, smaller herds may provide more individualized attention and care to each animal, potentially resulting in higher milk quality (Luttik et al., 2019).

Parity and age: Milk production varies depending on the parity (number of lactations) and age of the cow. Older cows tend to produce less milk, while younger cows may have higher milk production potential (Knegsel et al., 2019). Certain breeds, such as Holsteins, have been found to have higher milk production at older ages compared to other breeds (De Vries et al., 2007).

CHAPTER THREE

RESEARCH MATERIALS AND METHODS

3.0. Introduction

The research design of the study is identified in this chapter. It also emphasizes the target population, sampling protocols, and data collection techniques. The steps used to guarantee the reliability and validity of the data gathered for this study. The operational variables are highlighted and their scaling is demonstrated in a summarized table at the end of the chapter.

3.1. Research design

Saunders, (2009) defines a research design as the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. The study employed a descriptive research design. Descriptive survey design according to Kothari (2003) is a powerful form of quantitative analysis. This design was preferred because it enabled the researcher describe the area of research and explain the collected data in order to investigate the differences and similarities with our frame of reference within a given period of time. In addition, the method permits gathering of data from the respondents in natural settings resulting in a description of the data, whether in words, pictures, charts, or tables and data collected was both qualitative and quantitative in nature.

3.2. The target population

The study involved a population of 65 respondents who participated in study which included 44 dairy farmers, 6 advisor officers (extensionist), 8 local leaders and 7 production officers. This number making it a good representation in line with the time limit of this research study.

3.3. Sample Size of the population

The study sample was chosen using stratified random sampling, a purposeful technique. The process of purposive sampling entails selecting people by hand based on predetermined attributes. The five respondents who were important informants fit this sampling approach the best. In order to guarantee representation among small-scale dairy farmers in Bumasheti Sub-

County, the target population was stratified, with each division being considered strata, and data was gathered by random sampling.

The Krejcie and Morgan method was used to determine the sample size. When the estimated target group was determined to be the estimated population N=65, a sample size of S=55 was deemed suitable.

3.4. Data collection methods

Interview schedules and questionnaires were used to gather data. A written questionnaire is a tool used to gather data in which respondents are given written questions to respond to in writing. Respondents were given these written questionnaires by hand delivery, and they were subsequently collected. The data required for this study was gathered using questionnaires that included both closed-ended and open-ended question items. Questionnaire is widely used because it was easier and less expensive to administer, it was independent of the effect and unpredictability of the researcher, and it was very handy for the respondents, who can complete it at their leisure or at periods of manageable workload.

An interview is a method of gathering data that entails asking respondent's questions verbally, either one-on-one or in a group. Although the small-scale farmers were primarily given structured questionnaires, officials, processors, and traders were given preference for in-depth interviews with semi-structured questionnaires due to their perceived greater knowledge and experience. Answers to the questions asked during the interview were noted on a checklist and were recorded.

Structured questions were designed and issued to various respondents especially farmers both women and men inclusive.

It was designed in a way that different alternatives are given to the respondents from which they can choose themselves appropriate answers.

3.5. Data presentation and interpretation

The collected was presented in form of tables, percentages, values and there after the data was interpreted in words in order to make it more understandable and give the meaning to the study and make a final report.

3.6. Data Analysis

After data collection, the researcher edited, encoded and analyzed the information. The data was also edited to check on the accuracy, reliability, consistency, and completeness. The researcher ensured the validity and reliability of the mentioned research instruments through field pre-test and supervisor's comments. The researcher used the concurrent data analysis method to analyze the data collected. Separate analysis and collection of qualitative and quantitative data was used in a more prudent way for the research. This was because of the different paradigm of data collection methods (qualitative and quantitative) that was used (Wilkinson and Mao, 2017).

3.7. Data Collection Procedure

After completing proposal, the researcher obtained a letter of introduction from the Head of department, which was then presented to the management of Bumashetii Sub-County, Bududa District, Uganda for approval or to be permitted to carry out research in their company. The acceptance letter was then presented to the respondents for data collection and reach to their office. The Management helped the researcher to identify rightful groups and other respondents. The researcher made arrangements with the respondents on the date and time of delivering questionnaires and interviews as well.

3.8. Data Quality Control

In order to test and improve on the validity of the instruments, the questionnaires were submitted to the supervisor for approval. This helped to assess the construction of the questionnaire, language clarity, and comprehensiveness in order to get information through the questionnaire in terms of length and privacy (confidentiality) of respondents and to determine whether the ethical standards were breached or not adjustments was made where necessary in the questionnaire in respect to the comments made by the supervisor.

3.8.1. Reliability

Reliability is an instrument used to describe the overall consistency of a measure. A measure is said to have a high reliability if it produces similar results under consistent conditions, (Gbetibouo and Ringler, 2019). The issue of reliability was ensured through the appropriate random sampling and a purposive sampling technique as another indication of reliability in this study.

3.8.2. Validity

Validity refers to the degree to which study accurately reflect or assesses the specific concepts the researcher is attempting to measure (Chase and Dunklee, 2016). The types of validity include internal validity which clearly indicates the principles of cause and effects in research, external validity which clearly focused on Factors limiting Milk Production among Small Holder Dairy Farmers in Bumashetii Sub-County, Bududa District, Uganda. Certainly was enhanced, this study validity as interview and questionnaires were clearly checked, these techniques were constructed basing on the objectives of the study. In confirming the validity of the instrument, face and content validities was ensured.

3.9. Ethical Considerations

For purposes of successful research, the researcher obtained an introduction letter from the head of department then he presented it to authorities of Bumashetii Sub-County, Bududa District, Uganda to be accepted to carry out research in their organization who in turn issued an acceptance or confirmation letter to the researcher allowing him to carry out research in their organization. Then he made arrangements with the concerned respondents about the date and time when to distribute questionnaires and arrangement for interviews assigned the guide or helper by the officer in charge for easy data collection and convenience.

Confidentiality: The participants guaranteed that the identifying information was made available to anyone who was not involved in the study and it remained confidential for the purposes it intended for.

Permission: The researcher sought permission to carry out the research from the University informed consent: The prospective research participants were fully informed about the procedures involved in the research and were asked to give their consent to participate.

Anonymity: The participant remained anonymous throughout the study and even to the researchers themselves to guarantee privacy.

3.10. Limitations and Delimitations of the Study

The researcher was given very limited time coupled with busy schedule as this kind of wok ordinarily required an extensive study of the issue and cases. The researcher utilized his time efficiently by engaging the management in distributing questionnaires and as a guide to different offices.

The Attitude of respondents as some of them at times were not ready to let out vital information as they were afraid of revealing official secret. The researcher pursued the respondents and informed them that the purpose of the study was for academic purpose only.

CHAPTER FOUR
PRESENTATION OF THE ANALYSIS AND DISCUSSION OF FINDINGS

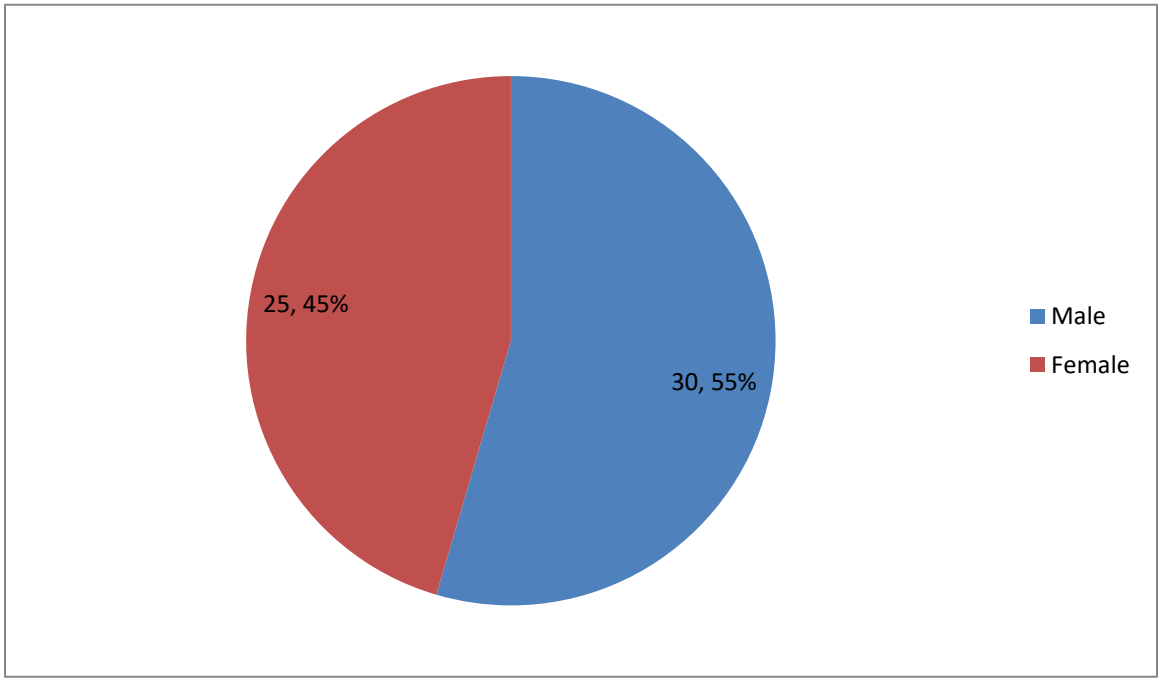
4.0. Introduction

This chapter presents the findings of the study, discussion and analysis of the different responses to some key questions was also done in this chapter following the research objectives as seen below;

4.1. Back ground information of respondents

This section shows the age, sex, marital status, and education level as explained below;

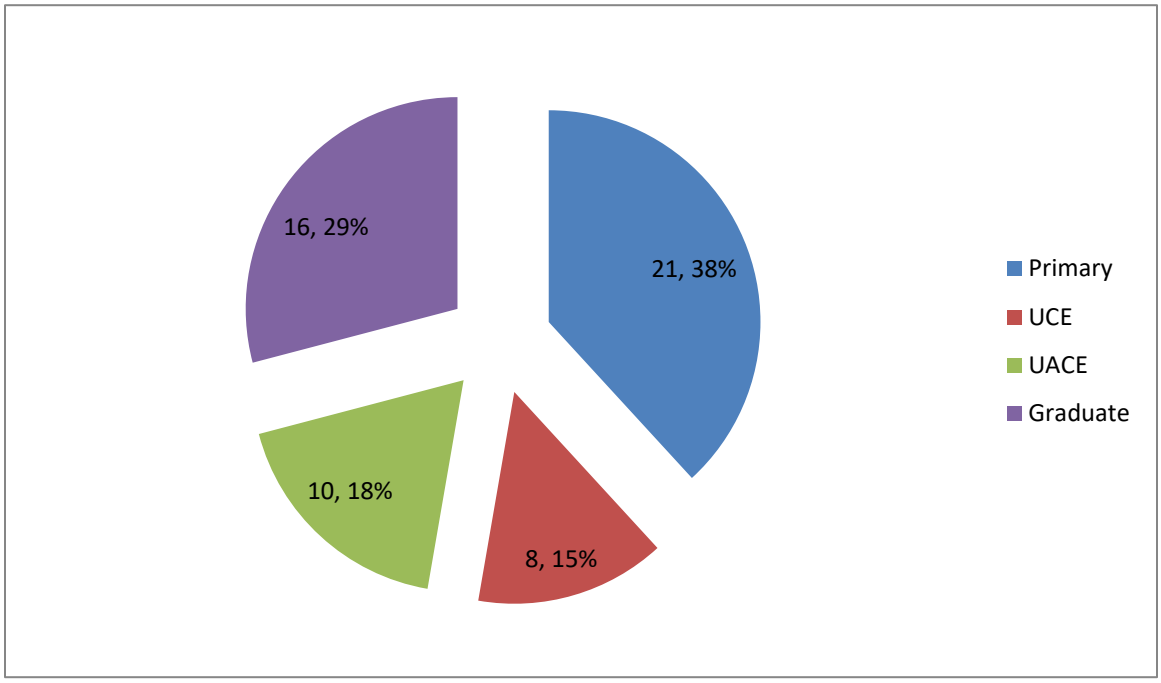
Figure 1: Gender of the respondents



Source: Primary Data, (2024)

The findings indicate that 55% of the respondents as male and 45% of the respondents as female.

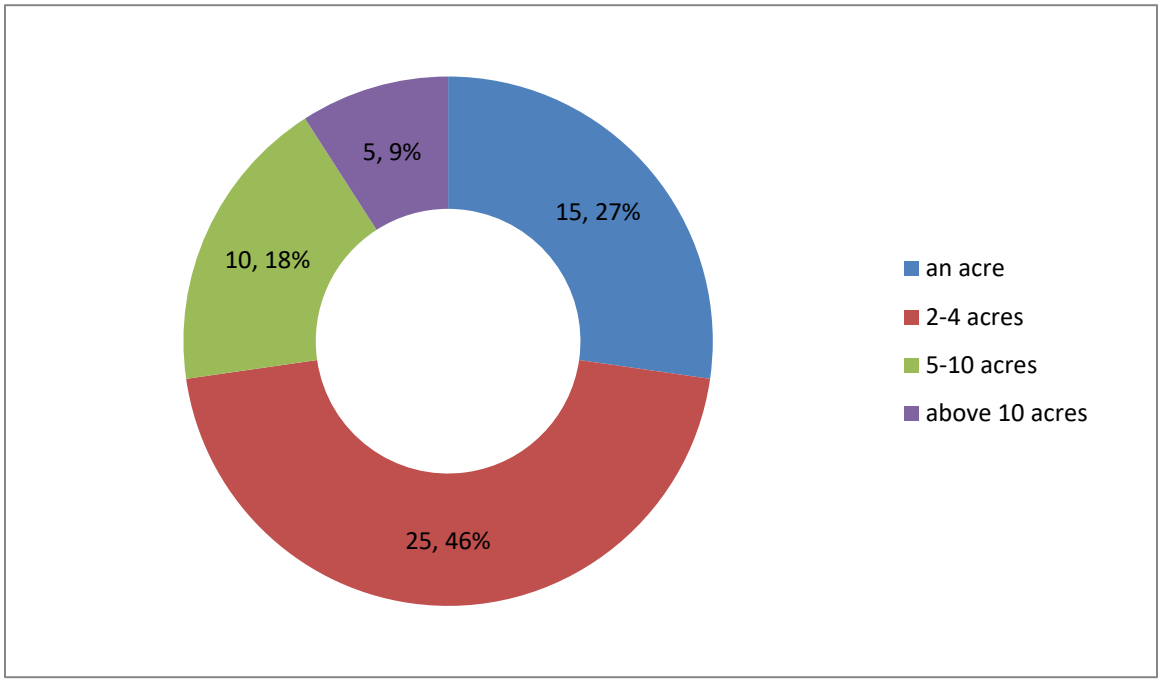
Figure 2: Education of the respondents



Source: Primary Data, (2024)

The findings show that 38% of the respondents had primary education, 15% of the respondents had “O” Level education, 18% of the respondents had “A” Level education and 29% of the respondents had graduated.

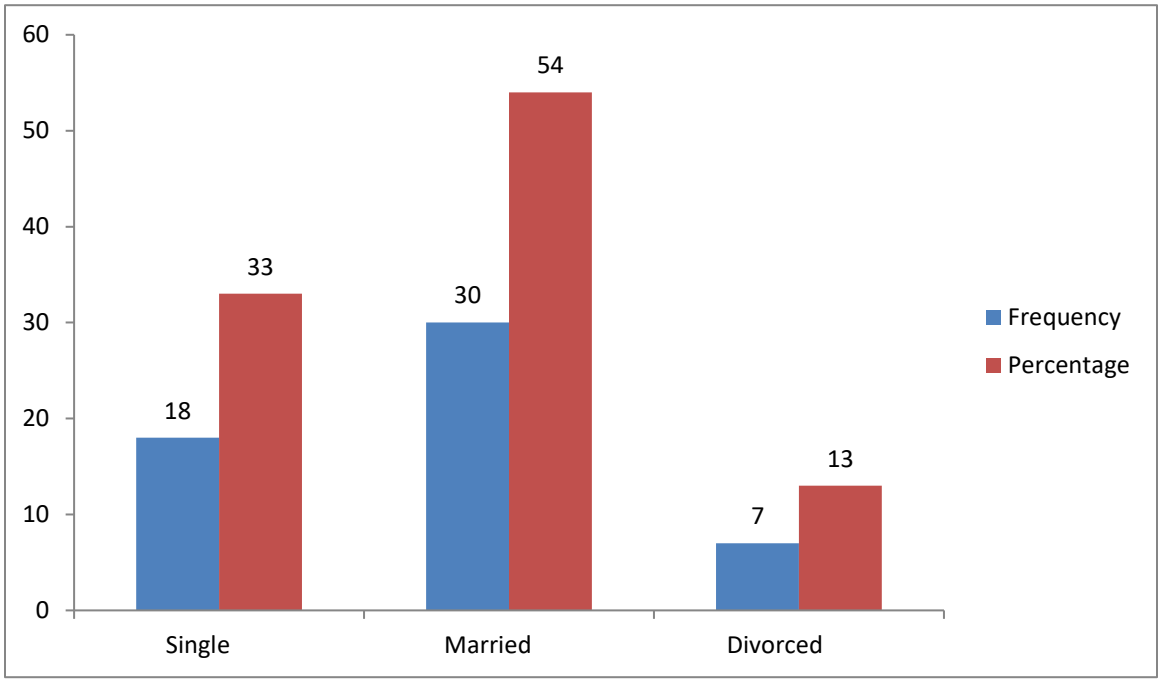
Figure 3: The size of farmland of the respondents



Source: Primary Data, (2024)

The study revealed that 27% of the respondents had one acre of land, 46% of the respondents heard 2-4 acres, 18% of the respondents heard 5-10 acres, and 9% of the respondents had above 10 acres.

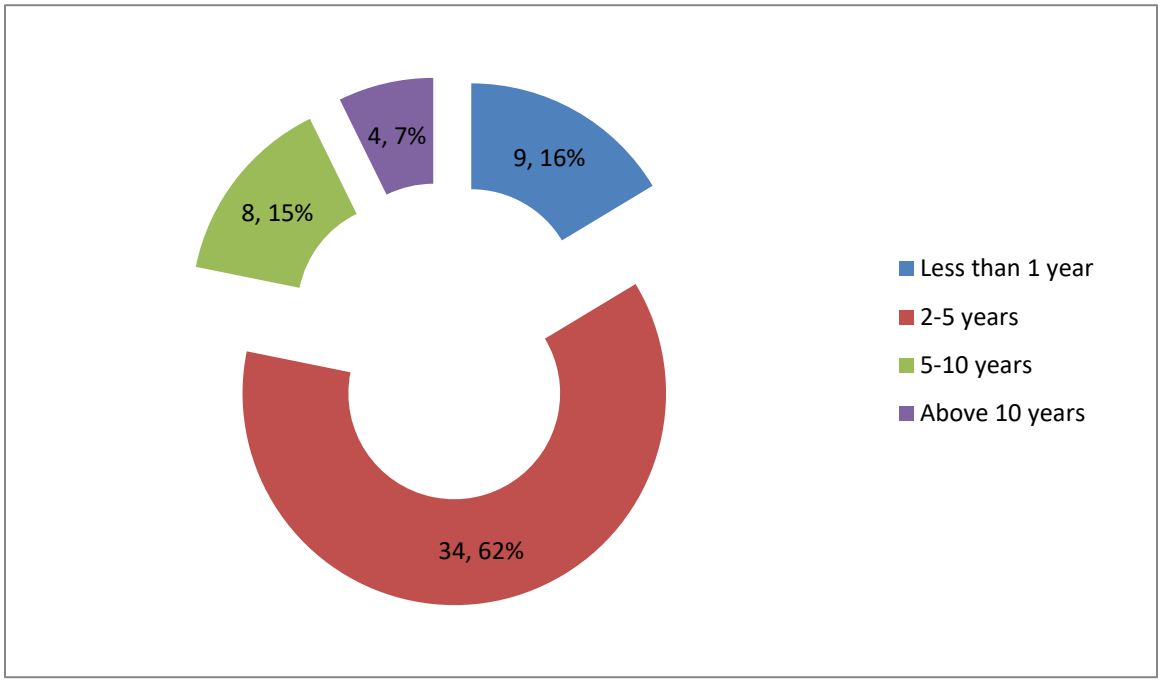
Figure 4: Marital status of the respondents



Source: Primary Data, (2024)

The findings indicate that 33% of the respondents as singles, 54% of the respondents as married, and 13% of the respondents had divorced.

Figure 5: Experience in dairy farming of the respondents



Source: Primary Data, (2024)

The study showed that 16% of the respondents had less than 0ne year experience, 62% of the respondents had experience of 2-5 years, 15% of the respondents had experience of 5-10 years and 7% of the respondents worked for above 10 years.

4.2. How marketing factors, affect the amount of milk produced by small-scale dairy farmers in Bumasheti

This was the first objective under study and responses obtained are explained below;

Table 4.1: How marketing factors, affect the amount of milk produced by small-scale dairy farmers in Bumasheti

Response	Frequency	Percentage
Average monthly production of milk (in liters)		
Less than 1000	16	29
1000-2000	25	45
2000-3000	9	16
More than 3000	5	10
Total	**55**	**100**
Do you typically market and sell your milk		
Directly to consumers	34	62
Through a cooperative society	5	9
To a middleman or broker	16	29
Total	**55**	**100**
Factors that influence pricing decisions for milk		
Market demand and supply	25	45
Competitor prices	16	29
Production costs	9	16
Government policies and regulations	5	10
Total	**55**	**100**
Marketing strategies that you use to promote your milk products		
Social media advertising	9	16
Print advertising	13	24
Word of mouth referrals	27	49
Participation in trade shows or events	6	11
Total	**55**	**100**
Income streams from dairy farm apart from milk sales		
Sale of dairy products (e.g., cheese, yogurt, butter)	32	58
Sale of animal feed	11	20
Sale of breeding stock	7	13
Tourism or recreation activities	5	9
Total	**44**	**100**

Source: Primary Data, (2024)

The findings on average monthly production of milk (in liters) indicated that 29% of the respondents said that had milk less than 1000 liters, 45% of the respondents milked between 1000-2000, 16% of the respondents milked between 2000-3000 liters and 10% of the respondents milked more than 3000 liters.

Besides, about market and sell your milk indicate that 62% of the respondents market and sell directly to consumers, 9% of the respondents through a cooperative society and 29% of the respondents through middleman or broker.

In addition, on factors that influence pricing decisions for milk indicate that 45% of the respondents stated that market demand and supply, 29% of the respondents said competitor prices, 16% of the respondents stated production costs and 10% of the respondents pointed out government policies and regulations.

Furthermore, marketing strategies that you use to promote milk products 16% of the respondents pointed out through social media advertising, 24% of the respondents said print advertising, 49% of the respondents indicated word of mouth referrals and 11% of the respondents noted participation in trade shows or events.

The study on income streams from dairy farm apart from milk sales indicated that 58% of the respondents report that sale of dairy products (e.g., cheese, yogurt, and butter), 20% of the respondents stated sale of animal feed, 13% of the respondents said sale of breeding stock and 9% of the respondents said tourism or recreation activities.

4.3. The impact of farmer awareness on milk produced by small-scale dairy farmers

The respondents were asked several questions and responses obtained are discussed below;

Table 4.2: The impact of farmer awareness on milk produced by small-scale dairy farmers

Response	Frequency	Percentage
Experienced any challenges in selling your milk		
Fluctuating demand	22	40
Low prices	19	35
Difficulty accessing markets	14	25
Total	**55**	**100**
Factors that affect the productivity of dairy cows		
Breed and genetics	13	24
Feeding and nutrition	26	47
Health and disease management	16	29
Total	**55**	**100**
Do you consult with other farmers or experts about best practices for dairy farming		
Daily	31	56
Weekly	10	18
Monthly	9	16
Rarely	5	10
Total	**55**	**100**
Milk production changed in the last 12 months compared to the previous year		
Increased significantly	27	49
Increased slightly	13	24
Remained the same	9	16
Decreased slightly	6	11
Total	**55**	**100**
Changes to your dairy farming practices in the last 12 months based on what you learned from trainings, extensions, or consultations		
Improved feed quality and nutrition	32	58
Increased herd size	11	20
Upgraded milking equipment	7	13
Changed breeding practices	5	9
Total	**44**	**100**

Source: Primary Data, (2024)

The study on experienced any challenges in selling your milk showed that 40% of the respondents stated fluctuating demand, 35% of the respondents said low prices, and 25% of the respondents stated difficulty accessing markets.

The findings about factors that affect the productivity of dairy cows revealed that 24% of the respondents said breed and genetics, 47% of the respondents stated feeding and nutrition and 29% of the respondents said health and disease management.

In addition, about consulting with other farmers or experts about best practices for dairy farming said 56% of the respondents agreed that daily, 18% of the respondents pointed weekly, 16% of the respondents said monthly and 10% of the respondents stated that they rarely consulted.

Besides, milk production changed in the last 12 months compared to the previous year indicated that 49% of the respondents reported that increased significantly, 24% of the respondents said increased slightly, 16% of the respondents noted remained the same, and 11% of the respondents said decreased slightly.

In addition, on changes to your dairy farming practices in the last 12 months based on what you learned from trainings, extensions, or consultations said that 58% of the respondents pointed out improved feed quality and nutrition, 20% of the respondents revealed increased herd size, 13% of the respondents said upgraded milking equipment and 9% of the respondents stated changed breeding practices.

4.4. The impact of cattle, breed variability on the amount of milk produced in Bumasheti Sub-County

The findings were obtained through questions asked to respondents as discussed in the table below;

Table 4.4: The impact of cattle, breed variability on the amount of milk produced in Bumasheti Sub-County

Response	Frequency	Percentage
Experience with different cattle breeds and their milk production		
Very positive	20	36
Somewhat positive	14	25
Neutral	10	18
Somewhat negative	9	16
Very negative	2	5
Total	**55**	**100**
The milk production of your current breed compare to others you have worked with in the past		
Significantly higher	26	47
Slightly higher	13	24
About the same	10	18
Slightly lower	6	11
Total	**55**	**100**
Breed selection is important in achieving high milk production levels		
Very important	31	56
Somewhat important	10	18
Not very important	9	16
Not at all important	5	10
Total	**55**	**100**
Any correlation between breed and milk quality (e.g., fat content, protein content, somatic cell count)		
Yes, strong correlation	27	49
Yes, weak correlation	19	35
No correlation	9	16
Total	**55**	**100**
The extent to which environmental factors (e.g., feed, housing, and management) can influence milk production in different breeds		
Great extent	32	58
Moderate extent	16	29
Limited extent	7	13
Total	**44**	**100**

Source: Primary Data, (2024)

The field findings on experience with different cattle breeds and their milk production show that 36% of the respondents very positive, 25% of the respondents indicated somewhat positive, 18% of the respondents mentioned neutral, 16% of the respondents indicated somewhat negative and 5% of the respondents stated very negative.

Besides, the milk production of your current breed compare to others you have worked with in the past 47% of the respondents agreed significantly higher, 24% of the respondents said slightly higher, 18% of the respondents stated about the same and 11% of the respondents said slightly lower.

In addition, breed selection is important in achieving high milk production levels show that 56% of the respondents stated that very important, 18% of the respondents said somewhat important, 16% of the respondents stated not very important and 10% of the respondents stated not at all important.

The findings on any correlation between breed and milk quality (e.g., fat content, protein content, somatic cell count) indicate that 49% of the respondents said that strong correlation, 35% of the respondents said weak correlation and 16% of the respondents stated no correlation.

The study on the extent to which environmental factors (e.g., feed, housing, and management) can influence milk production in different breeds indicate that 58% of the respondents said great extent, 29% of the respondents stated moderate extent.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0. Introduction

This chapter covers the summary of the findings, conclusions based on the findings, and recommendations based on the conclusions.

5.1. Summary of Findings

5.1.1. How marketing factors, affect the amount of milk produced by small-scale dairy farmers in Bumasheti Sub-County.

The findings on average monthly production of milk (in liters) indicated that 29% of the respondents said that had milk less than 1000 liters, 45% of the respondents milked between 1000-2000, 16% of the respondents milked between 2000-3000 liters and 10% of the respondents milked more than 3000 liters. Besides, about market and sell your milk indicate that 62% of the respondents market and sell directly to consumers, 9% of the respondents through a cooperative society and 29% of the respondents through middleman or broker. The study concur with Gbetibouo and Ringler, (2019) who said that the choice of marketing channel also has implications for milk production among small-scale dairy farmers. Farmers who sell their milk directly to consumers or through cooperatives tend to produce more than those who rely on intermediaries or middlemen. Direct sales provide better pricing and ensure regular cash flow, while cooperatives offer additional benefits such as extension services, training, and access to credit

In addition, on factors that influence pricing decisions for milk indicate that 45% of the respondents stated that market demand and supply, 29% of the respondents said competitor prices, 16% of the respondents stated production costs and 10% of the respondents pointed out government policies and regulations. Furthermore, marketing strategies that you use to promote milk products 16% of the respondents pointed out through social media advertising, 24% of the respondents said print advertising, 49% of the respondents indicated word of mouth referrals and 11% of the respondents noted participation in trade shows or events. In agreement with (Makoni

et al., 2016).Milk prices are subject to significant variations due to changes in demand and supply conditions. Fluctuations in milk prices can significantly impact the income of small-scale dairy farmers, leading them to adjust their production levels accordingly. For instance, during periods of low milk prices, farmers may reduce their herd size or cut back on feeding and other management practices, thereby reducing milk production.

The study on income streams from dairy farm apart from milk sales indicated that 58% of the respondents report that sale of dairy products (e.g., cheese, yogurt, and butter), 20% of the respondents stated sale of animal feed, 13% of the respondents said sale of breeding stock and 9% of the respondents said tourism or recreation activities.

5.1.2. The impact of farmer awareness on milk produced by small-scale dairy farmers in Bumasheti Sub-County.

The study on experienced any challenges in selling your milk showed that 40% of the respondents stated fluctuating demand, 35% of the respondents said low prices, and 25% of the respondents stated difficulty accessing markets. In addition, the findings about factors that affect the productivity of dairy cows revealed that 24% of the respondents said breed and genetics, 47% of the respondents stated feeding and nutrition and 29% of the respondents said health and disease management. In line with Ng'wena and Kang'ara (2017) found that training small-scale dairy farmers in Kenya on best practices, including proper feeding, breeding, and herd health management, resulted in significant improvements in milk production and quality. Similarly, Strydhorst et al. (2016) showed that providing extension services to smallholder dairy farmers in Tanzania improved their knowledge and adoption of better dairying practices, leading to increased milk yields and improved productivity.

In addition, about consulting with other farmers or experts about best practices for dairy farming said 56% of the respondents agreed that daily, 18% of the respondents pointed weekly, 16% of the respondents said monthly and 10% of the respondents stated that they rarely consulted. Besides, milk production changed in the last 12 months compared to the previous year indicated that 49% of the respondents reported that increased significantly, 24% of the respondents said increased slightly, 16% of the respondents noted remained the same, and 11% of the respondents

said decreased slightly. In support with Doss et.al (2018) said that farmers should have knowledge of these practices and how to apply them so as to be deemed aware therefore being aware entails knowing this potential production changing practices and whether they apply them or not is another issue. Awareness of the market dynamics by the farmer will also affect the amount of milk that reaches the market.

In addition, on changes to your dairy farming practices in the last 12 months based on what you learned from trainings, extensions, or consultations said that 58% of the respondents pointed out improved feed quality and nutrition, 20% of the respondents revealed increased herd size, 13% of the respondents said upgraded milking equipment and 9% of the respondents stated changed breeding practices. In relation to Ng'wena and Kang'ara (2017) found that training small-scale dairy farmers in Kenya on best practices, including proper feeding, breeding, and herd health management, resulted in significant improvements in milk production and quality. Similarly, Strydhorst et al. (2016) showed that providing extension services to smallholder dairy farmers in Tanzania improved their knowledge and adoption of better dairying practices, leading to increased milk yields and improved productivity.

5.1.3. The impact of cattle, breed variability on the amount of milk produced in Bumasheti Sub-County

The field findings on experience with different cattle breeds and their milk production show that 36% of the respondents very positive, 25% of the respondents indicated somewhat positive, 18% of the respondents mentioned neutral, 16% of the respondents indicated somewhat negative and 5% of the respondents stated very negative. Besides, the milk production of your current breed compare to others you have worked with in the past 47% of the respondents agreed significantly higher, 24% of the respondents said slightly higher, 18% of the respondents stated about the same and 11% of the respondents said slightly lower.

In addition, breed selection is important in achieving high milk production levels show that 56% of the respondents stated that very important, 18% of the respondents said somewhat important, 16% of the respondents stated not very important and 10% of the respondents stated not at all important. Besides, the findings on any correlation between breed and milk quality (e.g., fat

content, protein content, somatic cell count) indicate that 49% of the respondents said that strong correlation, 35% of the respondents said weak correlation and 16% of the respondents stated no correlation. In agreement with Breed selection also influences management strategies employed by farmers to maximize milk production. For example, higher-yielding breeds like Holsteins typically require more feed, water, and veterinary care compared to lower-yielding breeds (De Vries and Veerkamp, 2000; Capper et al., 2019). Moreover, these intensive management practices may lead to increased environmental impacts, including greenhouse gas emissions and nutrient runoff from manure (Gerber et al., 2013). Conversely, lower-yielding breeds might be better suited to extensive grazing systems, reducing input costs while maintaining acceptable levels of productivity (Hayes et al., 2006). Therefore, understanding the interaction between breed choice and management practices is essential when aiming to optimize milk production while minimizing negative consequences.

The study on the extent to which environmental factors (e.g., feed, housing, and management) can influence milk production in different breeds indicate that 58% of the respondents said great extent, 29% of the respondents stated moderate extent.

5.2. Conclusion

5.2.1. How marketing factors, affect the amount of milk produced by small-scale dairy farmers in Bumasheti Sub-County.

The findings on average monthly production of milk (in liters) indicated that respondents had milked between 1000-2000, market demand and supply, competitor prices, production costs, through social media advertising, print advertising, word of mouth referrals participation, sale of dairy products (e.g., cheese, yogurt, and butter), sale of animal feed, sale of breeding stock and tourism or recreation activities.

5.2.2. The impact of farmer awareness on milk produced by small-scale dairy farmers in Bumasheti Sub-County.

The study showed respondents stated fluctuating demand, low prices, difficulty accessing markets, breed and genetics, feeding and nutrition, health and disease management, daily,

weekly, monthly, rarely consulted, improved feed quality and nutrition, increased herd size, upgraded milking equipment and changed breeding practices.

5.2.3. The impact of cattle, breed variability on the amount of milk produced in Bumasheti Sub-County

The field findings show that very positive, somewhat positive, mentioned neutral, somewhat negative, very negative, significantly higher, slightly higher, slightly lower, very important, somewhat important, not very important, not at all important, strong correlation, weak correlation, correlation, great extent and moderate extent.

5.3. Recommendations

Extension workers should offer services to farmers at regular interval instead of annually as observed from the field study and should avoid selective training of farmers.

Government should allocate more funding to the extension sector to avoid understaffing and also meet their operational costs such as transport to the farmers and in addition it should scrap off the tax on livestock premixes for the farmers to afford making farming profitable which will in turn lower milk prices.

Farmers should seriously put in practice what the extension workers try to advise them on in order to improve their farming mostly on pasture preservation using hay and sillage.

Government should set up demonstration Centres on improved pasture management for farmers to adopt to properly feed their animals with the aim of enhancing milk production in their animals.

5.4: Area of further research

- Extension officers' knowledge on the nutritional requirement of dairy animals

REFERENCES

Abafita, A., Tadesse, H., & Strzepeck, K. (2017). Financial service use by smallholder dairy farmers in central rift valley of Ethiopia: Determinants and impacts. Agricultural Finance Review, 77(2), 195-214. <https://doi.org/10.1108/AFR-01-2016-0008>

Alvarez, S., Stirling, A., & White, B. (2016). Addressing climate risk in dairy value chains: Insights from Colombia and Peru. IIED Working paper. London: International Institute for Environment and Development. Retrieved from <https://pubs.iied.org/pdfs/16079IIED.pdf>

Assefa, B., Hailemariam, M., & Urge, M. (2016). Brand promotion strategy and its effect on organizational performance: Case study of Awassa Milk and Meat Share Company, Southern Nations Nationalities and Peoples Regional State, Ethiopia. Journal of Business Administration and Management Studies, 3(1), 1-14. <https://doi.org/10.21523/jbams.v3i1.11034>

Bahta, S., Gebremedhin, B., Asmelash, M., & Tegegn, W. (2016). Analysis of factors determining milk market participation among rural households in Tigray region, Ethiopia. Journal of Applied Animal Research, 40(3), 432–438. <https://doi.org/10.1080/09712119.2016.718843>

Berglund, B., Strandberg, E., & Emanuelson, U. (2002). Genotype interactions and heterosis effects on production traits in Nordic red cattle. Livestock Production Science, 78(1), 1–10. doi: 10.1016/S0301-6226(02)00044-1

Challa, V. R., Karanja, F. K., & Omwamba, R. M. (2018). Factors influencing smallholder dairy farmers' adoption of contractual arrangements with dairy processors in Nakuru county, Kenya. International Journal of Business Management and Social Sciences Research, 4(1), 1-18. <http://ijbmssr.com/wp-content/uploads/IJBMSSR_Volume-4_Issue-1_Article-1.pdf>

Chase, L.E., & Dunklee, D.L. (2016). Review: Comparative genomics in livestock species identifies candidate genes associated with complex traits and provides insights into

evolutionary processes. Journal of Animal Science, 94(3), 1125–1144. doi: 10.2527/jas.2015-9354

Cooper TL, Erickson P, VanRaden PM, Null DA, Cole JB. Comparison of first lactation records from Holstein and Jersey heifers managed similarly within herd. Journal of Dairy Science. 2002;85(11):2943-2950. doi:10.3168/jds.S0022-0302(02)74373-X

Doss, C. R., McPeak, J. G., Okello, J. A., Place, F., Pretty, J., ...& Thorpe, A. (2018). Women's empowerment in agriculture index: Technical report. IFPRI Discussion Paper No. 1650. Washington, DC: International Food Policy Research Institute. <https://doi.org/10.2499/dp1650>

Feleke, T. G., Berhanu, M. T., & Petros, G. B. (2016). Market oriented milk production and marketing activities of smallholder dairy farmers in and around Addis Ababa city, Ethiopia. Global Veterinaria, 14(3), e4. <https://doi.org/10.1590/1984-47032016143e4>

Gbetibouo, G. A., & Ringler, C. (2019). Determinants of farmer participation in formal versus informal milk marketing channels: Evidence from South Africa. Agrekon, 48(3), 298-314. doi:10.1080/03031853.2019.9675318

Getnet, A., Kebebew, A., & Melaku, D. (2017). Evaluation of export trading companies performance in horticulture exports: case of Hawassa Export Trading Enterprise. Journal of Commerce and Management Thought, 8(1), 25-33. <https://doi.org/10.4172/2151-6220.1000284>

Hailu, D., Getachew, A., & Tamiru, S. (2016). Factors affecting participation of smallholder dairy farmers in formal milk market in western Wollega zone, Ethiopia. Journal of Development and Agricultural Economics, 8(1), 1-12. <http://www.ccsenet.org/journal/index.php/jdae/article/viewFile/53233/33635>

Höjer, U., Gustafsson, H., & Strandén, I. (2003). Genetic analysis of survival in first-lactation Swedish red cattle with emphasis on somatic cell score and days open. Journal of Dairy Science, 86(8), 2518–2526. doi: 10.3168/jds.S0022-0302(03)73859-6

Kearney JP, Fuerst-Waltl B, Coffey MP, McParland S, Lewis E, Berry DP. Invited review: Genetics and genomics of health traits in dairy cows. Journal of Dairy Science. 2018;101(2):1255-1272. doi:10.3168/jds.2017-12944

Kolver, E.S., & Muller, L.D. (1998). Effects of pasture allowance and concentrate supplementation on intake, digestion, milk production, and body weight change in spring-calving Friesian cows. Journal of Dairy Science, 81(3), 595–607. doi: 10.3168/jds.S0022-0302(98)75588-X

Kumar, R., Singh, A., & Sharma, S. K. (2018). Factors Influencing Milk Production Among Smallholder Dairy Farmers in India. Journal of Agricultural Science and Technology, B(4), 200-210. doi:10.17265/2161-6256/2018.04.010

Lemessa, D., Van Der Wal, E., Zeelenberg, M., & Boogaard, H. (2015). Value Chain Integration and Performance of Small Scale Dairy Enterprises in East Shoa Zone, Central Highlands of Ethiopia. Journal of Agricultural Science, 7(7), 234-242. <https://doi.org/10.5539/jas.v7n7p234>

Lund MS. Dairy cow breeds—differences in origin, performance, and adaptation. Animal Frontiers. 2018;8(2):37-44. doi:10.1093/af/vfy022

Makoni, T. C., Murwira, H. K., Chimonyo, M., Ndiweni, P., & Maposa, L. (2016). Effects of seasonality and price fluctuation on milk production performance of smallholder dairy farming systems in Zimbabwe. International Journal of Livestock Production, 7(1), 1-8. doi:10.5897/ijlp2015.0259

Muriithi, D. M., Were, O. N., Gitau, C. M., & Kimani, S. (2017). Challenges faced by smallholder dairy farmers participating in organized milk marketing chains in Kiambu County, Kenya. American Journal of Experimental Agriculture, 11(3), 138-146. <http://dx.doi.org/10.9734/AJEA/2017/34823>

Mutua, J. K., Onono, M., & Nyikal, P. K. (2018). Policy frameworks shaping the Kenyan dairy industry. Journal of Entrepreneurship and Public Policy, 7(2), 175-194. <https://doi.org/10.1108/JEPP-03-2017-0021>

Ngongi, P., Abegaz, B., Tesfaye, K., Belachew, T., Ayana, E., & Alemu, T. (2017). Factors associated with market participation decisions and intensity of commercialisation amongst smallholder dairy farmers in Eastern Amhara Region, Ethiopia. Agriculture and Food Security, 6(1). <https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-017-0100-y>

Oladejo, J. O., Falola, O. A., Adedeji, E. A., & Babayemi, O. O. (2017). Assessment of the constraints facing small scale dairy farmers' participation in organised milk marketing system in Nigeria. African Journal of Food Sciences, 11(6), 361-370. doi:10.5897/AJFS2016.11179

Scholten, J., Verkaart, S., & De Vries, M. (2015). Innovative business models for sustainable smallholder dairy value chains. Renewable Agriculture and Food Systems, 30(2), 161-174. <https://doi.org/10.1017/S1742170514000279>

Senaji, N. M., van Rooyen, A. F., Nel, D., & Basson, M. (2016). Facilitators and inhibitors of collective action in smallholder irrigation schemes in South Africa. Water SA, 42(1), 55-64. <https://watersa.net/article/view/8760>

Shiferaw, B., Arnold, J. E., & Whiting, M. D. (2016). Building resilience into pastoralist food systems through private-sector led initiatives: Lessons learned from three cases studies in eastern Africa. Ecology and Society, 21(1), 12. <https://doi.org/10.5751/ES-08199-210112>

Tambulwar, Y. D., Wate, S. R., Bhosale, S. S., & Khobragade, S. U. (2016). An analysis of determinants influencing milk production by small holder dairy farmers under contractual arrangement in Maharashtra state of India. Indian Journal of Hill Farming, 29(1), 1-5. <https://doi.org/10.5958/0972-893X.2016.00001.x>

Thomas, M. M., Baltenwechter, I., & Thiele, G. (2017). What determines engagement in professional training? Empirical evidence from smallholder dairy farmers in southern Ethiopia. Agricultural Systems, 152, 122-130. <https://doi.org/10.1016/j.agsy.2016.12.005>

Twiza, J. M., Kamugisha, R., & Nampindo, J. (2018). Analysis of challenges faced by smallholder dairy farmers in supplying milk to processors in southwestern Uganda. Journal of Economic Cooperation and Development, 39(1), 15-33.

Were, O. N., Gitau, C. M., Muriithi, D. M., & Muchina, J. (2016). Impact of Participation in Organized Markets on Smallholder Dairy Farms in Meru County, Kenya. Agricultural Economics - Romanian Section, 10(1), 14-23. <http://ageconsearch.umn.edu/record/243839/>

Wilkinson, R.G., & Mao, Il. (2017). A comparison of New Zealand crossbreeds and purebreds using random regression models. Proceedings of the New Zealand Society of Animal Production, 77, 120–123.

APPENDICES

APPENDIX 1: DAIRY FARMERS'S QUESTIOARE

QUESTIONNAIRE ON FACTORS RESPONSIBLE FOR LOW MILK PRODUCTION AMONG SMALLHOLDER FARMERS IN BUMASHETIMSUB COUNTY, BUDUDA DISTRICT

Dear respondent,

I am MUKOYA CEDRICK a student of Busitema University pursuing a Bachelor's degree in science education (Agriculture double main). The purpose of this study is to find out the factors responsible for low milk production in Bumasheti Sub-County, Bududa District.

You have been chosen by the researcher to voluntarily participate in this study. All information given shall be treated with utmost confidentiality. It shall be used for academic purpose only and the findings will guide the government and other development partners to find ways of improving milk production in the community. The information got will also be used for compiling report leading to the award of a bachelor's degree of science education in Agriculture

So please let me know if you have consented to participate in the study.

(Tick the most appropriate answer in this section)

☐ ☐

Yes No

Date.....

Parish.....

Village.....

Demographic data

(Tick the appropriate answer in this section)

1. What is your gender?

A. Male ☐ A. Female ☐

2. What is your highest level of Education?

A. Primary ☐ B. UCE ☐ C. UACE ☐ D. Graduate ☐ E. Others (Specify).....

3. What is the size of your farmland?

A. an acre ☐ B.2-4 acres ☐ C.5-10 acres ☐ D. above 10 acres ☐

4. Marital status

A. single ☐ B. Married ☐ C. Divorced ☐ D. Others (specify).....

5. What is your experience in dairy farming?

A. Less than 1 year ☐ B.2-5 years ☐ C. 5-10 years ☐ D. above 10 years ☐

Section B: To establish how marketing factors, affect the amount of milk produced by small-scale dairy farmers in Bumasheti Sub-County.

6. What is your average monthly production of milk (in liters)?
   a) Less than 1000 ☐
   b) 1000-2000 ☐
   c) 2000-3000 ☐
   d) More than 3000
7. How do you typically market and sell your milk? (Select all that apply)
   a) Directly to consumers
   b) Through a cooperative society
   c) To a middleman or broker
   d) Other (please specify) _____
8. What are the most important factors that influence your pricing decisions for milk? (Select all that apply)
   a) Market demand and supply ☐

b) Competitor prices
c) Production costs ☐
d) Government policies and regulations ☐
e) Other (please specify): _____

9. Are there any specific marketing strategies that you use to promote your milk products? (Select all that apply)
a) Social media advertising ☐
b) Print advertising ☐
c) Word of mouth referrals ☐
d) Participation in trade shows or events ☐
e) Other (please specify): _____

10. In your opinion, what are the major challenges faced by small-scale dairy farmers in terms of marketing their products? (Select all that apply)
a) Limited access to finance ☐
b) Lack of market information ☐
c) Difficulty in reaching consumers ☐
d) High competition from larger producers ☐
e) Other (please specify): _____

11. How often do you review and adjust your pricing strategy?
a) Daily ☐
b) Weekly ☐
c) Monthly ☐
d) Quarterly ☐

12. Are there any other income streams from your dairy farm apart from milk sales? (Select all that apply)
a) Sale of dairy products (e.g., cheese, yogurt, butter) ☐
b) Sale of animal feed ☐
c) Sale of breeding stock ☐
d) Tourism or recreation activities ☐

SECTION C: To determine the impact of farmer awareness on milk produced by small-scale dairy farmers in Bumasheti Sub-County.

13. Do you currently use any technology or tools to monitor the health and productivity of your dairy cows? (Select all that apply)
    a) Cow monitoring apps ☐
    b) Pedometers or activity trackers ☐
    c) Milk yield monitoring systems ☐
14. Have you experienced any challenges in selling your milk? (Select all that apply)
    a) Fluctuating demand ☐
    b) Low prices ☐
    c) Difficulty accessing markets ☐
    d) Other (please specify) _____
15. Are there any specific factors that you believe affect the productivity of your dairy cows? (Select all that apply)
    a) Breed and genetics ☐
    b) Feeding and nutrition ☐
    c) Health and disease management ☐
    d) Housing and infrastructure ☐
    e) Other (please specify) _____
16. How often do you consult with other farmers or experts about best practices for dairy farming?
    a) Daily ☐
    b) Weekly ☐
    c) Monthly ☐
    d) Rarely ☐
17. Have you implemented any changes to your dairy farming practices in the last 12 months based on what you learned from trainings, extensions, or consultations? (Select all that apply)
    a) Improved feed quality and nutrition ☐
    b) Increased herd size ☐
    c) Upgraded milking equipment ☐
    d) Changed breeding practices ☐

e) Other (please specify) _____

18. How has your milk production changed in the last 12 months compared to the previous year?
    a) Increased significantly ☐
    b) Increased slightly ☐
    c) Remained the same ☐
    d) Decreased slightly ☐
    e) Decreased significantly ☐

SECTION D: To assess the impact of cattle, breed variability on the amount of milk produced in Bumasheti Sub-County.

19. What is your experience with different cattle breeds and their milk production?
    a) Very positive ☐
    b) Somewhat positive ☐
    c) Neutral ☐
    d) Somewhat negative ☐
    e) Very negative ☐
20. How does the milk production of your current breed compare to others you have worked with in the past?
    a) Significantly higher ☐
    b) Slightly higher ☐
    c) About the same ☐
    d) Slightly lower ☐
    e) Significantly lower ☐
21. How important do you think breed selection is in achieving high milk production levels?
    a) Very important ☐
    b) Somewhat important ☐
    c) Not very important ☐
    d) Not at all important ☐
22. Have you observed any correlation between breed and milk quality (e.g., fat content, protein content, somatic cell count)?
    a) Yes, strong correlation ☐

b) Yes, weak correlation ☐

c) No correlation ☐

23. How much do you think genetics play a role in determining milk production potential?

a) Major factor ☐

b) Moderate factor ☐

c) Minor factor ☐

24. To what extent do you think environmental factors (e.g., feed, housing, and management) can influence milk production in different breeds?

a) Great extent ☐

b) Moderate extent ☐

c) Limited extent ☐