An Examination of the Impediments to Profitability of Smallholder Dairy Farmers in Palabana Dairy Cooperative

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ABSTRACT

Smallholder dairy farming holds critical importance in most developing economies, Zambia included, as it contributes significantly to livelihoods through food security, income, and employment opportunities. The research aimed to identify and examine the factors constraining the profitability of smallholder dairy farm operations in Palabana dairy cooperative. The study used the mixed method approach and the two-stage sampling procedure which included purposive sampling procedure and simple random sampling to collect data by utilizing closed and open-ended questionnaires from 73 smallholder dairy farmers. The data was analyzed using descriptive statistics and regression methods. The majority of the smallholder dairy farmers were males (67.1%), possessed tertiary education (79.5%) with vast dairy farming experience of 16 years and above (39.7%), and had an age distribution of 36-50 years skewed towards the middle-aged to elderly (46.6%). Slightly above half of the respondents (56.2%) practiced livestock farming only, and the majority (60.3%) boasted of having attended livestock training. The study revealed that socio-economic factors, production costs and production methods had a significant impact (p = .001) on the profitability of the dairy farming business and they explained 61.2% of the change in dairy farming profitability. Using the Likert scale measurement, the key constraints to dairy farming profitability identified under socio-economic factors (p = .023) included; not enough grazing land, lack of access to credit facilities and nonparticipation in milk price determination. The constraints under production costs (p = .000) were the high cost of feed, the cost of breeding (artificial insemination) and the cost of disease prevention and control. For the items under Production methods (p = .031), the key challenges identified with high ratings included low knowledge of best husbandry practices and poor breeding methods. Based on the findings of the study, the research strongly recommends that farmers lease nearby farmlands to deal with the shortage of grazing land, Government and financial institutions to come up with various credit packages with reduced interest rates tailored for smallholder dairy farmers, smallholder dairy farmers to form organized unions to enable them bargain for better milk prices, the cooperative to organize targeted training and capacity building programs where demonstration farms will be established to showcase the best husbandry practices and farmers to engage more in mixed farming methods which will enable them grow own fodder thus reduce feed expense.

Keywords: smallholder dairy farmer, profitability, socio-economic factors, production cost, production method, constraints

I. INTRODUCTION

The dairy industry in Africa is relatively underdeveloped compared to other regions, with the majority of milk production coming from smallholder dairy farmers (World Bank, 2020). The structure of the dairy industry in Southern Africa can be categorized into three groupings i.e large-scale, small scale and traditional farmers. Livestock farming, especially dairy farming is a fundamental factor in Zambia's agricultural development. Dairy production in smallholder systems is regarded as a market-oriented enterprise that contributes to community food and nutritional security while also providing a steady source of revenue for farming households and employment opportunities for many individuals (Ojango, et al., 2017). Mumba et al., (2012) assert that the dairy industry is capable of creating 200 jobs for every 1 million liters of milk produced and distributed annually.

In recognition of the significant role that dairy farming plays in many parts of Zambia, the smallholder dairy farmers are frequently confronted with a myriad of questions; What sort of financial and managerial attributes would increase their output? What are the possible factors that hinder dairy farming profitability and to what extent? To what scale would their living conditions improve with increased productivity and profitability? It is in light of this recognition that the foregoing questions and more arise because dairy farming has proved to be a key livelihood strategy for smallholder farmers in many

parts of Zambia as it is an instrument through which the socio-economic conditions of smallholder farmers are being improved. It is not only a valuable source of nutrition and income but also an avenue for asset accumulation. Kawambwa, et al., (2014) state that smallholder dairy farmers ought to be clear on key issues about the viability of their dairy farming enterprises such as the minimum investment required to venture into it, the minimum number of dairy animals required for production to break even, socio-economic factors affecting the dairy profitability, business and entrepreneurial skills required to succeed in dairy farming.

Sustainable profitability in smallholder dairy farming encourages farmers to venture more into the dairy business. Despite the strides being taken to thrive the dairy farming industry in Zambia, profitability in smallholder dairy farming faces several obstacles. The milk yield for smallholder dairy farmers is characterized by low output due to poor feeding regimes and also the challenge of poor access to formal markets (Mugweni, 2014). Unstable feed prices, as well as animal disease prevention and control expenditures, are also among the challenges faced by smallholder dairy farmers. Milk production expenses are relatively high for the money received per liter of milk sold, resulting in lower profit margins for dairy producers. Even though there is a market for milk in Zambia, the milk production rate is low, which is attributable to high production costs (Hofer, 2015).

The study mainly focused on examining the factors that constrain the profitability and development of smallholder dairy farming in one of Lusaka province's vibrant dairy cooperative. Palabana Dairy Cooperative has smallholder dairy farmers that rank among the most active in Zambia and offer a big untapped dairying potential. The research examined specific socioeconomic characteristics of these smallholder dairy farmers in order to highlight unique aspects of the industry and also study the methods and cost of production that constrain the profitability of the dairy farmers in Palabana dairy cooperative.

II.   STATEMENT OF THE PROBLEM

The Zambian dairy industry is grappling with low productivity and slow growth, leading to dairy processors operating below their full capacity (Nilsson & Chuzu, 2020; Agricultural Consultative Forum, 2012). Despite the growing demand for livestock products, particularly milk and other dairy products due to the current high urbanization in Zambia, smallholder dairy farmers face significant challenges in achieving optimal productivity which negatively impacts their profitability. The average milk production per cow per day among smallholder dairy farmers is notably lower compared to emergent and commercial producers (Nilsson & Chuzu, 2020). This productivity gap poses a hindrance to the profitability potential of smallholder dairy farmers which limits the upward scaling of the dairy business and making it difficult in terms of planning purposes thus the farmers not experiencing the complete benefits of dairy farming.

Investigating the factors contributing to the low productivity that hinder the profitability of the Palabana smallholder dairy farmers was imperative to identify targeted interventions that can enhance production efficiency and empower these farmers to capitalize on the increasing demand for dairy products, ultimately improving their profitability and economic well-being.

III.   LITERATURE REVIEW

Dianne, S. et al., (2008) identify 15 measures that are instrumental in assessing the profitability of dairy farms. These indicators are distributed across ten fundamental categories: the rate of production, effective management of expenses, the prudent use of capital, earning capacity, liquidity, adherence to debt repayment, financial stability, enterprise purpose, the ability to support the household's economic needs, and having a dedicated workforce. Furthermore, these categories help in evaluating dairy farming's overall health and potential for growth, ensuring that the business is profitable, repay obligations, and maintain a competitive stance, all of which contribute to the farm's long-term viability and success.

Adigun G. T., et al., (2023) asserts that profitability is widely regarded by scholars as a critical element for the long-term viability of dairy farms. The market value of milk plays a significant role in determining profitability, alongside factors such as feed expenses, veterinary services, labour costs, herd size, and the average fixed cost per cow or per unit of milk sold. Achieving profitability in smallholder dairy farming requires addressing a myriad of challenges that span various dimensions. High production costs constitute a significant barrier to profitability for smallholder dairy farmers. Costs associated with inputs such as feed, veterinary services, and labour can be prohibitively expensive. Additionally, inefficiencies in production practices, such as poor feeding regimes or inadequate disease management, further inflate costs and thus erode potential profits. Dairy production requires various resources of land, labour and capital. If indeed there is poor access to these assets, then it follows without saying that production costs will be high as compared to situations where such factor inputs are readily available. Smallholder dairy farmers are likely to suffer from inconsistency, especially in terms of producing for the wider markets as a result of insufficient access to factors of production thus impending profitability (Wainaina, 2013).

Constrained access to credit is a frequent problem for smallholder dairy farmers and significantly impacts their profitability and contribution to the agricultural economy (International Finance Corporation, 2014). Swinnen & Kuijpers (2020) emphasize the vital role of financing smallholder dairy farmers in promoting inclusive economic growth and poverty alleviation. The low access to financing, with limited access to banking services and credit, makes it difficult to invest in improvements or expand dairy farming operations (Wainaina, 2013). Louw (2013) further noted that lack of access to funding makes it difficult for smallholder dairy farmers to invest in milking parlous and good breeding practices, thereby hindering their profitability potential. This entails that credit-constrained smallholder dairy farmers show substantially lower financial performance compared to their unconstrained counterparts.

The challenges faced by smallholder dairy farmers in developing countries regarding the poor market engagements that lead to unsustainable profitability are extensively discussed in literature. Musitini et al., (2019) highlighted the difficulties smallholder dairy farmers encounter when trying to enter the traditional agricultural markets which are competitive and offering good prices for the milk sold. Obi et al., (2012) advances that access to markets significantly influences whether smallholder dairy farmers transition into commercial farming. Meissner et al., (2013) observed that while commercial farmers actively participate in formal marketing channels, smallholder dairy farmers often operate at the fringes of traditional marketing channels due to a limited understanding of market dynamics, pricing structures, and marketing opportunities. The low levels of commercialization among smallholder dairy producers in developing countries are attributed to a lack of access to efficient, competitive and inclusive markets, with Khapayi et al., (2016) identifying this as a hindrance to their expansion and profitability. Wiggins & Keats (2013) identify remoteness, low productivity, low pricing, and lack of market information as the primary obstacles to smallholder dairy farmer participation in markets that offer competitive prices to achieve a profitable dairy business, as evidenced in their study on linking smallholder dairy farmers in Sub-Saharan Africa to markets.

The importation of dairy products results in low producer pricing, making it difficult for smallholder dairy farmers to make sustainable profitability. Louw (2013) highlighted that dairy imports threaten the profitability and livelihoods of smallholder dairy businesses in Zambia, with dairy products from the European Union nations and South Africa flooding the market at prices lower than those achievable by Zambian dairy farmers. However, Louw (2013) noted the evolution of agricultural policies over the past decade aimed at bolstering trade barriers, thereby impeding the entry of inexpensive dairy products into Zambia.

IV.   THEORETICAL AND CONCEPTUAL FRAMEWORK

4.1 Theoretical Framework

The study was based on two theories namely; Managerial efficiency theory of profits and Utility maximization theory. The Managerial efficiency theory of profits sometimes called the Compensatory theory of profits states that some enterprises are more efficient than others at managing their productive operations and effectively satisfying their customer needs (Sanyal, 2019). This theory postulates that enterprises that have average efficiency tend to generate average rates of return and those that have above-average efficiency will generate higher rates of return. It emphasizes the importance of good management practices, which include planning, organization, controlling, and decision-making, in achieving profitability in dairy farming. In this regard, the profitability of a dairy farming enterprise is influenced by the managerial efficiency of the farmer. According to this theory, the success of a dairy farming enterprise depends on the ability of the farmer to optimize the use of resources such as land, labor, capital, and technology, and to minimize costs while maximizing production.

The study was also based on the theory of Utility maximization. This theory states that a farmer maximizes his utility by trying to get the highest profit possible given certain constraints (Kinambuga, 2010). The Utility maximization theory in dairy farming profitability suggests that farmers seek to maximize their satisfaction or well-being from their profits. This theory postulates that farmers are rational decision-makers who seek to achieve the highest level of utility or satisfaction from their resources. According to this theory, the profit decisions of dairy farmers are influenced by the level of satisfaction they expect to derive from their production activities. The dairy farmers face a profit frontier, which represents the maximum level of profit that can be achieved from a given set of resources. Farmers seek to operate on this frontier by choosing the optimal combination of inputs such as land, labor, capital, and technology, to maximize their profit and overall utility.

4.2 Conceptual Framework

Svinicki (2010) defines a conceptual framework as an interconnected collection of ideas explaining how a specific phenomenon operates or relates to its parts. The main aim of a conceptual framework is to ensure concepts and relationships between study variables are clear and give an interpretation and explanation of the study's findings and observations. It provides evidence of the link between dependent and independent variables i.e a platform for establishing the relationship between profitability, social economic factors, methods and costs of production.

The Profitability of smallholder dairy farmers is impacted by the interactions between social economic factors, production methods and costs of production. These variables directly impact the profitability of dairy farmers. For instance, the choice of production methods used by the dairy farmers has a direct effect on both the quantity and quality of dairy products, thereby influencing their profitability. Higher production costs can hinder dairy farmers from achieving higher incomes, limiting their ability to reinvest in dairy farming. Regarding socio-economic factors, such as land size, can determine the number of livestock that dairy farmers can keep. Additionally, access to financial services can impact the capital available for dairy farming. These variables are interlinked as shown below:

Figure 4.1: Conceptual Framework of Study
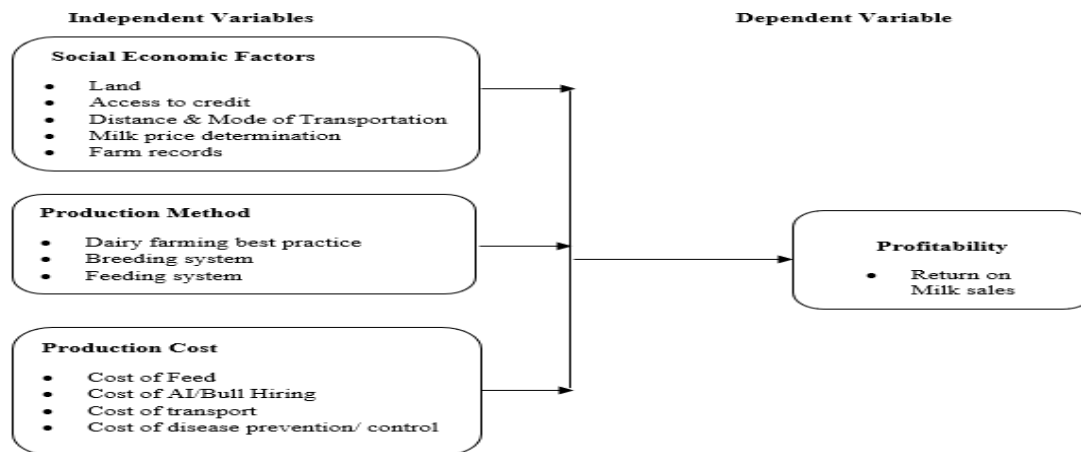
Source: Author, (2023).

Figure 4.1 above shows the relationship among the four main variables i.e Profitability, Social Economic Factors, Production Cost and Production Method. The independent variables are Social Economic Factors, Production Cost, and Production Method and the dependent variable is Profitability which illustrates that profitability is determined by the three independent variables.

V. RESEARCH METHODOLOGY

5.1 Research Design
The study employed a mixed method approach using the Concurrent triangulation design where qualitative and quantitative data were collected simultaneously, and the results were integrated during the interpretation and discussion stages.

5.2 Study Area
The study was conducted in Palabana area which is located 30 kilometers from Lusaka Central Business District (CBD). This area was selected on the basis that there is a high concentration of smallholder dairy farmers and a vibrant dairy cooperative that supplies milk to the various processing plants and urban dwellers.

5.3 Study Population and Sample Size
The study population included all 104 smallholder dairy farmers who are affiliated with Palabana Dairy Cooperative. The sample size of the study was selected from the smallholder dairy farmers who regularly deliver milk to the Milk Collection Centre (MCC) of Palabana dairy cooperative. A sample of 80 smallholder dairy farmers was selected from the population of the smallholder dairy farmers in the study area. However, only 73 respondents completed and returned the questionnaires for analysis representing a 91.25% response rate and made up the sample size of the study.

5.4 Sampling Technique
The study used a two-stage sampling procedure which included a Purposive sampling technique (qualitative) and Simple random sampling (quantitative). The two-stage sampling procedure first involved the purposive selection of the dairy farmers who regularly delivered milk to the milk collection centre (MCC) over a period of time. In the second stage, from a list of dairy farmers who regularly delivered milk to the milk collection centre (MCC), simple random sampling was conducted.

5.5 Data Collection

The study utilized a cross-sectional method of collecting both primary and secondary data using interview-based structured questionnaires and review of documents from the Milk Collection Centre (MCC), Dairy Association of Zambia publications and various journal articles. The data that was collected included socio-economic data, production cost and production method data.

5.5 Data Analysis

Analysis of the data involved utilizing a combination of methods. The Statistical Package for Social Sciences (SPSS) version 21 and Microsoft Excel Version 2016 were employed for the analysis of both quantitative and qualitative data. The data was analyzed using descriptive statistics and the relationships between independent variables and the dependent variable were established using regression analysis. The Likert scale measurement was employed to capture the specific parameters constraining the profitability of smallholder dairy farmers.

5.6 Model Specification

The effects of the social economic factors, production costs and production method on the profitability of the smallholder dairy farmers were evaluated using the multiple regression analysis below:

$$P = \beta_0 + \beta_1 SEF_1 + \beta_2 PC_2 + \beta_3 PM_3$$

Where:

P – Profitability; β_0 - The intercept; $\beta_{1\text{-}3}$ - Partial linear regression coefficients; SEF_1 – Social Economic Factors;

PC_2 – Production Cost; PM_3 – Production Method

VI.   PRESENTATION AND ANALYSIS OF RESEARCH FINDINGS
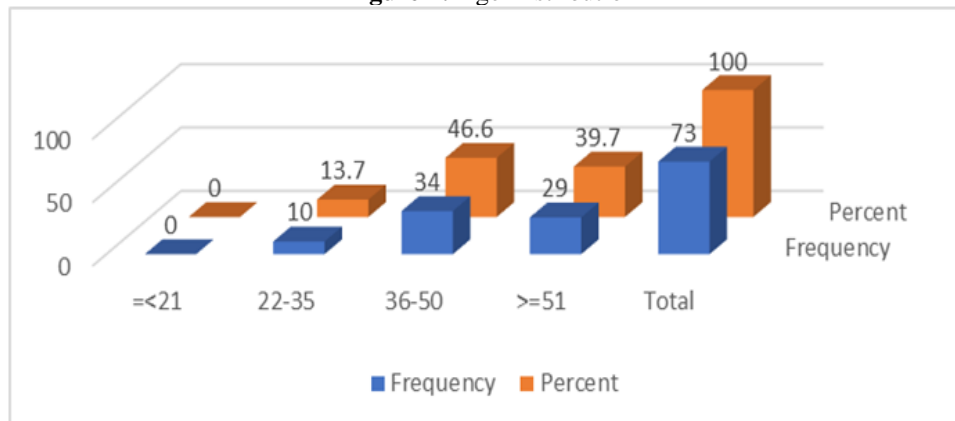
6.1 Background Information of the Respondents

Table 1: Gender Distribution

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	49	67.1	67.1	67.1
Female	24	32.9	32.9	100.0
Total	73	100.0	100.0	

Source: Researchers Data analysis (2023)

From the findings, 67.1% of the smallholder dairy farmers were male, while 32.9% were female.

Figure 2: Age Distribution

Source: Researchers Data analysis (2023)

The study showed that the age distribution was more skewed towards the elderly with 46.6% of the dairy farmers being aged between 36-50 years. This group represented the largest age bracket indicating a significant portion of middle-aged participants while 39.7% of farmers were above the age of 51 years. It is also worth highlighting that the youth i.e those below the age of 35 years were under-represented at 13.7%and highly inactive.

Table 2: Education Level

	Frequency	Percent	Valid Percent	Cumulative Percent
Primary	9	12.3	12.3	12.3
Secondary	6	8.2	8.2	20.5
Tertiary	58	79.5	79.5	100.0
Total	73	100.0	100.0	

Source: Researchers Data analysis (2023)

The results indicate that the majority of the dairy farmers had a relatively high educational and literacy level with 79.5% having tertiary education.

Table 3: Dairy Farming Experience

	Frequency	Percent	Valid Percent	Cumulative Percent
=<5 Years	9	12.3	12.3	12.3
6-10 Years	26	35.6	35.6	47.9
11-15 Years	9	12.3	12.3	60.3
>=16	29	39.7	39.7	100.0
Total	73	100.0	100.0	

Source: Researchers Data analysis (2023)

The results show that experience matters in dairy farming with 87.6% of the farmers having more than five years of dairy farming experience. This suggests that there are challenges for new dairy farmers to enter the industry and succeed in that experienced farmers may have established themselves well and have a competitive advantage.

6.2 Factors Affecting the Profitability of Smallholder Dairy Enterprises

To achieve the objectives of the study, multiple-regression analysis was conducted using SPSS with the dependent variable being the rating of the overall profitability and the independent variables considered were social economic factors, production methods and production costs. The regression table below shows the contribution of each independent variable in explaining the profitability of smallholder dairy farmers as shown by the standardized beta values.

Table 4: Regression Analysis results

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	.328	.432		.759	.001
Social Economic Factor	.384	.231	.215	1.662	.023
Production Cost	-.321	.154	-.287	-2.084	.000
Production Method	.191	.162	.183	1.179	.031
a. Dependent Variable: The rating of the overall profitability					

R-Square = 0.612, Adjusted R-Square = 0.534, F (3, 69) = 20.2, Sig. = 0.001

The model was statistically significant with a P-value of .001 at 95% confidence level. The collective impact of changes in production methods, production costs, and socio-economic factors represented by the R-square of .612 indicates that 61.2% of the changes in profitability were a result of the independent variables. Production cost had the most significant effect on profitability with a p-value of .000 and explained 28.7% of the variability in profitability. Social economic factors explained 21.5% of the variability in profitability and were statistically significant with a p-value of .023. Production methods had the least effect explaining 18.3% of the change in profitability and a p-value of .031. These results indicate that there was a statistically significant relationship between the independent variables and the profitability of smallholder dairy farmers. There was also a linear relationship among the variables understudy with an F-statistic of 20.2.

However, to fully understand the underlying constraints of the three independent variables, Likert scale measurements were used and the identified constraints are listed below:

6.3 The Social-Economic Constraints

Not enough grazing land: This was due to the shrinking size and limited availability of farmland because of population growth and increased land fragmentation which led to lower fodder production. Therefore, dairy farmers rely on expensive manufactured feed thus reducing their incomes. The majority of the smallholder dairy farmers (73%) had less than 10ha of farmland with 38.4% of the farmers using 2 acres or less to grow their dairy fodder and 34.2% did not grow their own dairy fodder.

Lack of Access to Credit Facilities: The majority (61.6%) of dairy farmers reported not utilizing credit facilities, while 38.4% had utilized such facilities to finance their dairy enterprises. Low access to finance was also identified to contribute to low profitability of the dairy farmers in that the farmer's capacity to increase investment as well as access running capital was rated low (34.2%) and very low (28.8%) thus a combined rating of 63% of the respondents rated it below average.

Non-Participation in Milk Price Determination: A combined Likert scale rating of high and very high (83.9%) indicated that dairy farmers perceive milk price determination as crucial for farm-level profitability and sustainability. However, none of the dairy farmers reported participating in milk price determination despite recognizing its significance. They however stated that the cooperative board members and dairy processors (buyer) determined the price at which the farmers sold milk without properly engaging the dairy farmers.

6.4 Production Cost Constraints

High cost of manufactured feed: The cost of manufactured feed was rated as high or very high by 94.5% of respondents. This suggests that feed costs are a significant factor contributing to high production costs, which in turn hinder farm-level profitability.

High Cost of Breeding: 52.1% rated the cost of artificial insemination (AI) as high and 37% as very high. This indicated that the cost of AI is perceived as a significant barrier by the respondents. High-quality semen which is used in AI was found to be expensive and unaffordable by most smallholder farmers. The dairy farmers thus buy relatively low quality semen that conceives low quality upgraded cows with low productivity capacities hence reduced profitability.

High Cost of Disease Prevention and Control: The cost of veterinary services and drugs was rated as high and very high with a combined percentage rating of 82.2, indicating that the cost of veterinary services and drugs were some of the constraints faced by the majority of dairy farmers.

6.5 The Production Methods Constraints

Farmers' Low knowledge of best husbandry practices: Farmer's knowledge of best husbandry practices was lowly rated, with 80.8% of respondents citing as average and below.

Poor breeding methods used: Breeding was through the use of bulls and AI, however only 15.1% of the respondents utilized AI and 35.6% acknowledged using the traditional way of breeding i.e use of bulls.

It is also Worth Noting that the Parameters Below were not Found to Constrain the Profitability of the Dairy Farmers:
Distance and Mode of Transportation: All the respondents who participated in the study stated that the mode of transport they use to transport milk to the milk collection centre (MCC) was bicycles. The use of bicycles by the farmers was a preferred method because they found it cheaper and easier to navigate to the MCC since most of the roads that lead to the MCC are not easily accessible and graded. The majority of the respondents (63%) stated that the distance from their dairy farms to MCC was 5 kilometers or less, while 26% indicated that it's 6 to 9 kilometers, and only 11% of the farmers indicated having their farms being more than 10 kilometres away from the MCC. This shows that most farms are near the milk collection point which makes it easy to transport the milk hence the majority of dairy farmers surveyed relied on bicycles to transport milk to the MCC because of the short distance and thus the distance and mode of transport did not hinder the farmer's operations hence having less effect on profitability.

Farm Recordkeeping: The results revealed that 64.4% of the farmers prepared and kept farm records, while 35.6% did not prepare farm records. This demonstrates that a significant number of farmers in Palabana prioritize maintaining farm records primarily to make informed decisions. However, when asked about the type of farm records that they prepared, 52.1% responded that they prepared General farm records only, 20.5% prepared both Financial and General farm records and 27.4% did not respond. The General farm records that were being prepared included basic expense and sales records, as well as detailed records for the cattle, including calving and health information. The financial record information included simple ledgers and books of accounts which involved recording the income and expenditures. Although the record-keeping practices may not have been systematic among all farmers, they still provided some insight into the amounts spent and the income generated from sales.

Transport Cost: The impact of transport cost was found to have a low rating on profitability due to the mode of transport used (Bicycles) and the shorter distances to the MCC with the majority of the dairy farm's locations being 5km or less to the MCC. Thus, the cost of transport was found not to constrain dairy farming profitability in Palabana.

Feeding System: A mixed-method approach which involves both stall feeding and free grazing, was adopted by 52% of the farmers. Meanwhile, 36% of the farmers practiced free grazing, allowing their animals to graze freely seeking a minimal amount of manufactured feed during milking times only. The zero-grazing system accounted for 12%, where animals were completely confined and provided with feed and water. The mixed-method feeding approach was the most common and preferred feeding method due to its flexibility and ability to save the farmer's resources.

VII.   DISCUSSION OF RESULTS

7.1 Background Information of the Respondents

Smallholder dairy farming in Palabana was first examined by focusing on the background information of the respondents. The gender distribution reflected a higher male representation than female indicating that the majority of individuals who control household resources are male, and as a result, they take the lead in making business decisions relating to dairy farming activities. These findings are consistent with that of Kinambuga (2010) in Nakuru County of Kenya where the number of female participants was also low at 24% and males at 76%. The limited involvement of women in dairy farming could be constrained by socio-cultural responsibilities. Sichilima, et al., (2017) emphasized the necessity for increased efforts to attract female farmers to the dairy industry. The study also revealed that the majority of the dairy farmers were above the youthful age of 35 years, indicating that it's dominated by the elderly and suggesting that the smallholder dairy farmers were slightly above the most productive ages and there was low involvement of youths. This entails that as the old generation ages, there are few new and younger farmers to take over and this hampers dairy productivity growth. Nyekanyeka, T. (2011) also found that the mean age in Lilongwe Malawi was 45.7 years thus indicating that smallholder dairy farmers are more skewed towards the elderly.

The education level of the dairy farmers was found to be high with the lowest being primary education thus indicating that the literacy level for the dairy farmers is high hence they can make informed decisions relating to dairy farming. The farmers who have minimum basic education can easily adopt new technologies and foster innovation leading to seamless

management of dairy farms thus increasing productivity and enhanced profitability. The smallholder dairy farmer's level of experience was gauged based on the number of years engaged in dairy farming. The findings revealed a diverse range in the number of years that the farmers had been practicing dairying with the majority having over 16 years of dairy farming experience. These results align with those of Birachi (2006), who reported a mean experience of 15 years in dairy farming. Experience impacts decision-making and resource allocation positively by enhancing them through the learning curve.

7.2 Constraints to Smallholder Dairy Farming Profitability

The effect of each independent variable in explaining the impediments to the profitability of smallholder dairy farmers in Palabana dairy cooperative was represented by the standardized beta values which assessed the contribution of each variable towards the prediction of the dependent variable. The research data was first subjected to a reliability test using the Cronbach's Alpha and the reliability test results for all the variables under study were above the acceptable limit of 0.7 indicating an acceptable level of reliability. The test results for social economic factors were 0.843, production cost; 0.826, production method; 0.746 and Profitability; 0.812.

Production cost had the greatest effect on profitability, explaining 28.7% of the change in profitability. This underscores the critical role of effective cost management in enhancing the financial performance of smallholder dairy enterprises. Social economic factors and production methods ranked second and third as a unit increase of social economic and production methods resulted in a 21.5% and 18.3% increase in profitability respectively. While not as pronounced as the impact of production costs, these findings highlight the significance of broader contextual and operational factors in influencing profitability.

Importantly, among the regressors, only production cost (p-value = .000) was statistically significant at the 1% level, while social economic factors (p-value = .023) and production methods (p-value = .031) were significant at the 5% level. This indicates that there was a statistically significant relationship between Production methods, Production costs, Social Economic Factors and profitability of smallholder dairy farmers. It implies that the three independent variables under study had constraining effects on the profitability of the smallholder dairy farmers. These results emphasize the interconnected nature of cost management, socio-economic considerations, and production methods in determining the financial success of dairy farming operations

Furthermore, the collective impact of changes in the independent variables represented by the R-squared explained 61.2% of the variability in the profitability of smallholder dairy farmers. The F-statistic of 20.2 indicates that there was a linear relationship among the variables since the model significance (Sig= 0.001) was below 0.05 at a 95% confidence level. Therefore, the overall equation as suggested in the model specification is represented by the use of standardized coefficients as follows: P = 0.328 - .287PC + .183PM + .215SEF.

This robust statistical relationship underscores the importance of considering production methods, production costs, and socio-economic factors collectively when assessing and improving the profitability of smallholder dairy enterprises in the study area.

The research further investigated and highlighted the underlying socio-economic, production cost and production method constraints through the Likert scale measurements to inform strategies for improving profitability in dairy farming. The study identified several significant challenges as stated below.

7.3 The Social-Economic Constraints on Smallholder Dairy Farming Profitability

Not Enough Grazing Land: The limited land size continues to get smaller due to population growth thus the portion allocated for grazing and growing dairy fodder was found not to be enough. The results are in consonance with the findings of Duguma (2022) who also found that the diminishing farmland sizes in Oromia Regional State, Ethiopia was a constraint to the dairy farming business and profitability. The struggle to make pastures due to land scarcity, compromises the sustainability of dairy production as it poses a substantial challenge to the profitability of dairy farming and constrains the potential for expansion and increased production.

Lack of Access to Credit Facilities: The use of formal credit was a major constraint in Palabana due to high interest rate, short repayment period and lack of securities as most of the dairy farmers are resource poor. The findings correlate with that of Hailemariam, et al., (2022), where he highlighted the lack of access to credit that could allow farmers investing in technological changes as a major constraint to intensification among smallholder dairy farmers in Dilla Zuriya district, Gedeo Zone, Ethiopia.

Non-Participation in Milk Price Determination: The price farmers receive for their milk significantly impacts their overall revenue and, consequently, their bottom line. The determination of milk price was reported to be done by the processors (buyer) and the cooperative board members without fully engaging the dairy farmers themselves. These findings are similar to that of Mugweni (2014) in his study of the economic viability of small-scale dairy farming in Zimbabwe where he reported that the smallholder dairy farmers had limited say in the determination of their milk price, hence their bargaining power was low against that of the buyer (processor).

7.4 Production Cost Constraints on Smallholder Dairy Farming Profitability

High Cost of Feed: A prevalent issue among the surveyed farmers was the economic strain associated with acquiring feed, which had a notable impact on their overall production costs and profitability. This observation is not an isolated one; it resonates with the findings of Kainda (2019) who stated that the cost of production for many dairy farmers depends on substantial supplementation through purchased feeds, accounting for the majority of the total production expenses.

High Cost of Breeding: The use of artificial insemination (AI) to produce superior breeds which could lead to increased production and thus enhance profitability was considered to be costly and beyond the financial means of many smallholder farmers in Palabana. A study by Kainda (2019), also found that most of the smallholder dairy farmers who preferred breeding using artificial insemination (AI) cited the high cost of AI as a constraint in their dairy enterprise and that the AI services were provided mostly by private personnel.

High Cost of Disease Prevention and Control: Treatment of diseases as well as prevention through veterinary drugs were found to reduce profitability levels for dairy farmers due to the high cost of drugs even though 56.2% of the farmers revealed low disease outbreaks in the area. These findings contradict that of Hailemariam, et al., (2022) who found that disease prevalence was highly ranked as the most severe constraint to improved dairying in Dilla Zuriya district of Ethiopia.

7.5 The Production Methods Constraints on Smallholder Dairy Farming Profitability

Low Knowledge of Best Husbandry Practices: Best husbandry practice was poorly practiced in Palabana as evidenced by the low rating and thus hindering production investment and profitability of the smallholder farmers. Luyombya (2014) stated that the ability of the smallholder dairy farmers to practice and generate more income from dairying largely depended on the successful implementation of improved dairy husbandry practices, resulting in increased productivity.

Poor Breeding Methods used: The predominant use of bulls for breeding purposes posed challenges in ensuring effective and strategic breeding for optimal outcomes in that it hindered negatively the ability to consistently produce high-quality offspring with good milk yields which in turn constrained dairy farming profitability.

VIII.   CONCLUSION AND RECOMMENDATIONS

8.1 Conclusion

The study found that social economic factors, production costs and production methods had a significant impact on smallholder dairy farming profitability and there was a linear relationship among the variables. The study further revealed that decreasing grazing land size, lack of access to credit, and nonparticipation in milk price determination were the main constraints identified under the socioeconomic constraints to profitability. The high cost of feed, cost of breeding (artificial insemination), and cost of disease prevention and control were the production cost constraints identified and had the greatest effect on profitability. Production methods constraints identified included low knowledge of best husbandry practices and poor breeding methods.

8.2 Recommendations

Based on the research findings and conclusions, the following recommendations are made to guide policy, address the identified constraints and enhance the profitability of smallholder dairy farmers in Palabana:

Access to Grazing Land: Implement targeted support programs to address the socio-economic constraint of shrinking grazing land sizes by leasing nearby farmlands and promote sustainable land use practices which explore community-based initiatives to ensure adequate grazing land for dairy farmers. This will increase fodder production, consequently reducing dependency on expensive manufactured feed and lowering overall production costs.

Access to Credit Facilities: The Government and private financial institutions should come up with various financial products and credit packages with reduced interest rates tailored for smallholder dairy farmers which will deal with the constraint of low accessibility to credit facilities.

Milk Price Determination: Farmers should form organized unions that would facilitate better milk price negotiations and also help source new and improved competitive markets for the milk produced. It is also recommended that the farmers should consider value addition which will enable them to sell processed products and be able to determine their own price.

Targeted Dairy Training Programs: Implement targeted training programs where demonstration farms will be established to showcase the successful implementation of advanced production methods which will enhance the farmers' knowledge of best husbandry practices. Emphasizing the use of technology, such as milking machines, to enhance efficiency and hygiene. This would increase their income levels and also their profitability.

8.3 Recommended Areas for Further Study

The broad range of issues covered in the present study provides a useful basis for future directions for research in the field of smallholder dairy farming enterprises. The following areas are however recommended for further study:

i. Land use policies by assessing the long-term impacts of urbanization on dairy farming, and the potential for policy interventions to preserve grazing land.

ii. Credit access and risk perception i.e understanding the perceptions of risk by the financial institutions in providing credit to smallholder farmers and develop strategies to mitigate these risks.

iii. In-depth financial assessments by conducting a detailed analysis of the effectiveness of different financial products and credit packages for smallholder dairy farmers

iv. Value chain analysis by examining the dairy value chain to identify additional opportunities for value addition and the impacts on productivity and profitability.

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