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Contributions of dairy cooperatives to the competitiveness of smallholder dairy farmers in Palabana area of Chongwe District

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Abstract
This study investigates the influence of dairy cooperatives on the competitiveness of small-scale dairy farmers in Palabana, Chongwe district, Zambia. The focus is on several crucial aspects: increasing milk production, enhancing productivity, improving quality, and boosting market share through cooperative membership. Data was collected from 73 randomly selected cooperative members through semi-structured questionnaires using a convergent parallel mixed-method technique. The quantitative data was examined using descriptive statistics and presented visually, while the qualitative data added contextual richness to these conclusions. The findings revealed a significant rise in milk production among members of the cooperative, even though there was a lack of direct provision of nutritional inputs. This implies that additional elements, such as training and the exchange of knowledge, played a key role in these gains. Furthermore, there was widespread mention of training sessions covering a range of dairy management subjects, which highlights the cooperative's efforts to improve farmers' abilities and increase output. Cooperatives played a crucial role in enhancing the quality of milk by offering valuable advice on managing milk quality, specifically in preventing and treating mastitis. Furthermore, farmers saw enhanced market dominance and financial gains as a result of their participation in cooperatives, which was made possible by greater opportunities to access larger markets and engage in joint sales initiatives. This study finds that cooperatives play a significant role in improving the competitiveness of smallholder dairy farmers by increasing yields, productivity, and market access. However, providing more comprehensive support in areas like animal health, input provision, and continuous training could further enhance these benefits. To maintain sustainable growth and competitiveness in the dairy sector, it is important to emphasize the necessity of ongoing improvement in cooperative initiatives.

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Introduction

The importance of the livestock industry in Zambia cannot be over-emphasised. According to the 2017/2018 Livestock and Aquaculture Census report, 2.7 million households were involved in agriculture (crop or livestock production or both) and 72% of these agriculture households were involved in livestock rearing. In 2018, the estimated number of cattle in Zambia was 3.7 million (including 1.6 million cows) (MFL, 2019). The dairy herd in Zambia is approximately 20,000 (Dairy Association of Zambia, 2017) [20].

Dairy farming is an important contributor to the nutritional needs of people and presents livelihood opportunities for farmers, processors, shopkeepers, and other stakeholders in the dairy value chain. In Zambia, the dairy industry is one of the major livestock subsectors and the fastest growing. Zambia has three main types of dairy producers, namely: traditional dairy farmers; smallholder dairy farmers; and commercial dairy farmers. The smallholder dairy farmer lies between the traditional dairy farmer and the commercial dairy farmer. They own an average of four dairy cows and most of them are organized in cooperative societies around milk collection centres from where processors collect the raw milk (Mumba *et al*., 2011) [13]. These smallholder dairy farmers use mostly mixed-breed cows. Unlike traditional dairy producers, smallholder dairy farmers sell the bulk of their output to processors in the formal market or consumers in the informal market with more than half of the milk produced in Zambia being produced by them (Mumba *et al*., 2011) [13].

Dairy Cooperatives have the potential to improve productivity in the smallholder sector as well as enhance market participation by farmers (Birthal *et al*., 2005:2). Dairy Cooperatives have also been introduced to help mitigate some constraints faced by smallholder dairy farmers. The cooperatives are meant to become the backbone of the smallholder dairy farmers, and the well-functioning of these groups is of crucial importance for the successful operation of the emergent farmer, as they are often the only channel to reach the smallholder farmer. Through these cooperatives, farmers continuously request additional training and coaching in the various aspects of managing their dairy animals. (Pandey and Voskuil, 2011) [15].

Cooperatives play a major role in improving productivity, minimising transaction costs, and improving the marketing capabilities of farmers. This has resulted in the formation of many producer-cooperatives in Zambia. The government and other non-governmental organisations have supported and encouraged the formation of these Cooperatives. Experiences gained particularly in East Asia and East Africa indicate that Cooperatives are among the institutional arrangements that can help smallholder farmers to overcome the numerous constraints that they face.

In this regard, the dairy stakeholders in Zambia have recognised farmer-controlled Cooperatives as instruments of change that can effectively reduce transaction costs, increase farmer productivity as well as enhance market participation by smallholder farmers. Some sectors of society have questioned the contributions to competitiveness that the existing cooperatives make to the dairy industry. There has been a general view that despite the existence of cooperatives in this sector, the sector is still not as competitive as it should be. Perhaps other intervening factors or reasons including government policy, shortage of capital, insufficient inputs, and poor marketing infrastructure could be the reason for the non-performing industry (Kaluba, 1992) [6].

Organising farmers through dairy cooperatives has many advantages over individual farming. It improves or facilitates access to market information, reduces costs of marketing, and increases producers' access to technology, extension, and related services, thereby enhancing efficiency in the production and marketing of milk as well as dairy products (Lapar *et al*, 2006) [9]. All of these will contribute to the competitiveness of the smallholder dairy farmer. Hence, development interventions should be aimed at improving the production and marketing activities of smallholder farmers by addressing constraints in the smallholder sector thus making them more competitive. This can be achieved through collective organisations such as farmer associations and cooperatives. Similarly, the government has a role to play in the development of infrastructure and provision of technical services as cooperatives are unable to do so due to their limited access, particularly to financial resources.

Improving the dairy industry involves mitigating these problems. As a result, many countries are attempting to increase milk production by assisting small-scale farmers to integrate into markets since they are the most numerous and poorest of the farmer population. This has an impact on the provision of rural employment, increase in income and diversification away from traditional production to modern systems of production. Therefore, the cooperative system has proved to be an effective vehicle for dairy development, particularly in rural areas (Lapar, *et al*., 2006) [9]. It has featured prominently in dairy development worldwide because of the range of skills involved in milk production and marketing which require several activities that can best be provided through collective action, hence the importance of cooperative societies.

The Government and all stakeholders must work together to improve dairy production in Zambia. One of the ways the government has contributed to the dairy industry is through The Dairy Industry Development Act of 2010 which is an Act to regulate the dairy industry so as to develop an efficient and self-sustaining dairy industry that will effectively contribute towards poverty alleviation, household food security and employment creation; establish the Dairy Industry Development Board and provide for its functions and powers; enhance milk production in order to fully utilise the capacity of processing facilities, so as to achieve growth in the processing of safe and wholesome high value milk products; provide for the processing, manufacturing, marketing and distribution of milk; ensure collaboration and participation of all stakeholders within the dairy industry and provide a wider service to farmers in the dairy industry; promote self-regulation of the dairy industry through the development and use of codes of practice; repeal the Dairies and Dairy Produce Act, 1931; and provide for matters connected with, or incidental to, the foregoing. Other stakeholders like cooperatives can also positively contribute to improving the dairy industry.

Smallholder dairy production plays a crucial role in Zambia's milk industry, accounting for 80% of the total 655 million litres of milk produced annually (Dairy Association of Zambia-Business Times, 2020). However, only approximately 70-80 million litres of this milk is formally collected, with the majority originating from commercial dairy farms. This discrepancy highlights a significant gap in the market and presents a challenge for small-scale dairy farmers.

Identified several constraints that hinder the competitiveness of small-scale dairy farmers. These include poor access to markets, a lack of milk collection centres, animal disease challenges, limited access to veterinary health services, a lack of ideal cattle breeds, inadequate dairy animal feeds, limited availability of extension services, and a lack of deliberate government policy.

The dairy industry in Zambia has received some growth due to increased human and milking cattle population, but the industry's productivity remained low; thus, the sector has not

been able to meet country demand (Cheelo, 2019) [1]. Despite the poor performance of the dairy industry, the sector continues to attract new members and more farmers continue to join the dairy co-operatives/farmer groups.

A significant deficit of dairy products has been observed in Zambia, which is currently being filled by imports. This deficit is evident in the per capita milk consumption of Zambia, which stands at around 36L, significantly lower than the 200L recommended by the WHO and FAO (AGRITERRA, 2024). This is another indicator of the underperformance of the dairy industry in Zambia. In many emerging economies, such as the Asian Tigers and Latin America, and even in neighbouring countries like Botswana, Kenya, and Tanzania, dairy cooperatives have significantly contributed to the competitiveness of small-scale dairy farmers (International Farm Comparison Network [IFCN], 2022). This model has been replicated in Zambia, but the extent to which dairy Cooperatives contribute to the competitiveness of smallholder dairy farmers remains unclear.

This research therefore investigated the role of dairy cooperatives in improving smallholder dairy farming in Zambia, particularly in Palabana, Chongwe District. The study aimed to fill the research gap by exploring the contributions that dairy cooperatives have made to the competitiveness of small-scale farmers in Zambia. This investigation was necessitated by the need to understand why, despite the presence of dairy cooperatives, the industry is still not able to meet the country's milk demands, and smallholder dairy farmers remain uncompetitive.

Materials and Methods

Study area

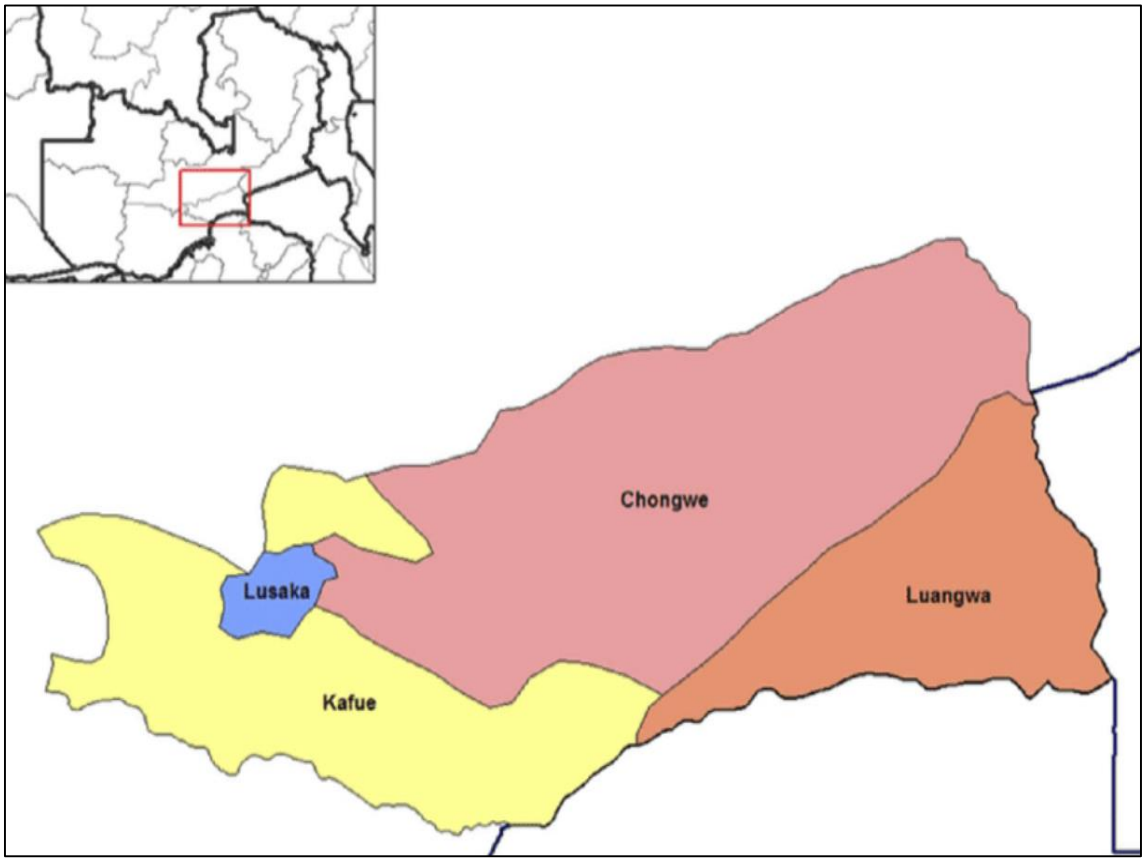

Fig 1: A Map Showing Chongwe District in Lusaka Province of Zambia

The study was conducted in Palabana which is situated near the Chalimbana River, which provides water for irrigation and domestic use. Palabana has a substantial representation of farmers within the cooperative and a noteworthy population of dairy cattle in the area.

Data collection

The target population was the farmers affiliated with Palabana Dairy Cooperative. The total population was 90 members at the time data was being collected. The membership information was according to the records of the cooperative. This population was targeted for various reasons including but not limited to the number of farmers, the cattle population the location of the area, the performance of the cooperative and the substantial representation of farmers in the cooperative.

The selection of participants from the Palabana Smallholder Dairy Cooperative involved a transparent and equitable process using simple random sampling. Guided by the Yamane Taro table, data was collected from a sample size of 73 participants, ensuring a 95% confidence level. Below is the formula that was used-:

$n=N/1+(e)2$

Where n is the sample size, N is the population size and e is the margin of error. $n=90/(1+90(0.05)2) =73.4$

Each member was assigned a unique identifier based on their

position in the register. This ensured that every member had an equal opportunity to be selected for the study. The allocation of identifiers created a systematic framework for the lottery drawing process. For the selection, 73 identifiers were randomly drawn from the pool of assigned numbers, emulating the fairness inherent in a lottery. Each drawn identifier corresponds to a specific member's name in the register. The individuals identified through this process were then invited to participate in the study.

Out of the selected 73 participants, only 65 individuals from the selected pool eventually turned up for the study. This discrepancy could be attributed to various factors such as scheduling conflicts, personal commitments, or unforeseen circumstances that might have hindered some members from participating.

Instruments of Data Collection

Primary data was collected by administering semi-structured questionnaires which were self-administered. The questionnaire included both open-ended and closed questions. The steps taken to formulate the questionnaire were according to Taherdoost (2022) [17].

Data analysis

The quantitative data was analyzed using Statistical Package for Social Sciences (SPSS) version 27. The descriptive statistics included frequency distributions and graphical presentations using line graphs, bar charts, and pie charts. Significant differences were considered significant at only $P<0.05$. The qualitative data analysis was not conducted in isolation; rather, it was integrated with the quantitative responses. Excerpts chosen from open-ended questions were aligned with the corresponding closed-ended questionnaire responses, providing a qualitative depth to the quantitative findings. Therefore, the data analysis entailed a blend of quantitative and qualitative methodologies.

Results

Population Demographic Characteristics

The demographic characteristics of the participants are presented in Table 1.

The results indicated more than half of the participants in terms of age distribution were aged 50 years or older. This age bracket signifies a substantial portion of experienced farmers within the cooperative. Remarkably, only one participant fell within the age range of 20 to 29 years old, suggesting a relatively limited presence of younger farmers in the cooperative. A noteworthy proportion of participants, fell within the age group of 40 to 49 years old, reflecting a group of seasoned farmers. Additionally, a smaller subset of seven individuals were in the age range of 30 to 39 years old, further demonstrating the varying age demographics among cooperative members.

In examining the educational background of the participants, the findings presented in Table 1 showed the majority of the participants, had attained a tertiary level of education. Conversely, a smaller segment, reported that they had not received any formal education, indicating a range of educational backgrounds within the cooperative.

Notably, over 60% of the participants, were engaged in formal employment in addition to their dairy farming activities.

Table 1: Demographic information of participants.

Variable	Frequency (n)	Percent (%)
Gender		
Female	18	27.7
Male	47	72.3
Total	65	100
Age Group		
20-29	1	1.5
30-39	7	10.8
40-49	21	32.3
50 and above	36	55.4
Total	65	100
Level of Education		
No formal education	5	7.7
Primary	2	3.1
Secondary	4	6.2
Tertiary	54	83.1
Total	65	100
Formal Employment Status		
Not employed	25	38.5
Employed	40	61.5
Total	65	100

Dairy Cooperatives and Milk Yield

Figure 1 shows the approximate amount of milk produced before and after joining the cooperative. It reveals a striking and noteworthy trend, a significant upturn in milk yield after farmers became members of the cooperative. This shift in production levels strongly indicates that cooperative membership had played a pivotal role in augmenting milk production among the participating farmers. The upward trajectory of milk yield illustrated in these graphs underscores the cooperative's substantial influence on the farmers' dairy operations. This was also reflected in the respondents' answers to an open-ended questionnaire that sought their views on the advantages or benefits of joining the cooperative.

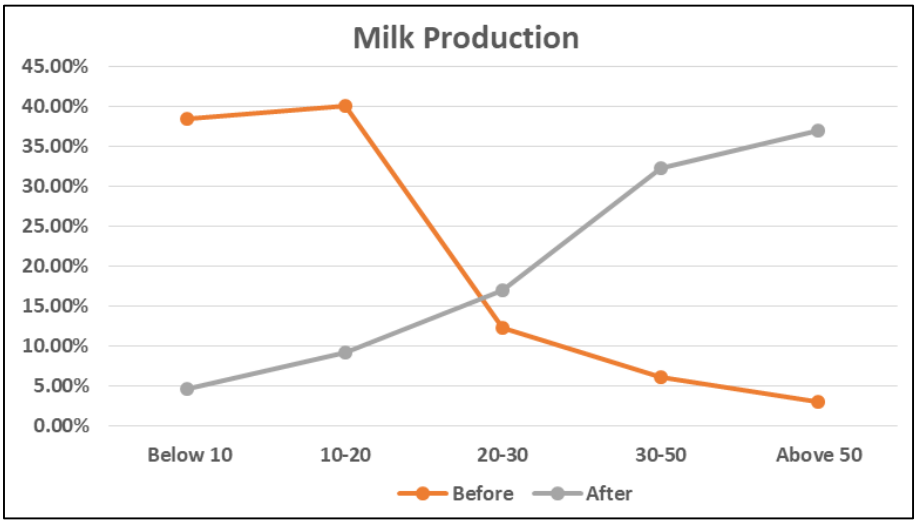

Fig 1: Reported approximate amount of milk produced before and after joining the cooperative

Figure 2, unveils an interesting facet of the cooperative's role. This dimension of the study revolves around the support mechanisms provided by the cooperative to its members, which extends beyond just material assistance. Despite the observed rise in milk production, a significant portion of the farmers did not receive any direct provision of dairy feed and concentrates or raw materials from the cooperative. In contrast, 37% of the participants reported receiving dairy feed and concentrates, while a smaller subset of 8% mentioned receiving raw materials. These numbers suggest that while material assistance is indeed one contributing factor to the enhanced milk yield, other factors, such as knowledge sharing, guidance, and collaborative efforts among cooperative members, could also be instrumental in driving this improvement. The advantages of joining a cooperative are clearly illustrated by the responses to an open-ended question posed to the participants. Here are some representative quotes from the respondents:

Respondent 1: "The cooperative has fostered a spirit of collaboration among us farmers."

Respondent 2: "Membership in the cooperative has expanded our market reach and facilitated the exchange of knowledge."

Respondent 36: "The cooperative serves as a safety net. It has enabled me to finance my children's education through the sale of milk. Additionally, we can secure loans and other items, such as bicycles, through the cooperative. Palabana is a highly reliable cooperative."

These testimonials from the participating farmers underscore the multitude of benefits they have reaped from their involvement in a cooperative.

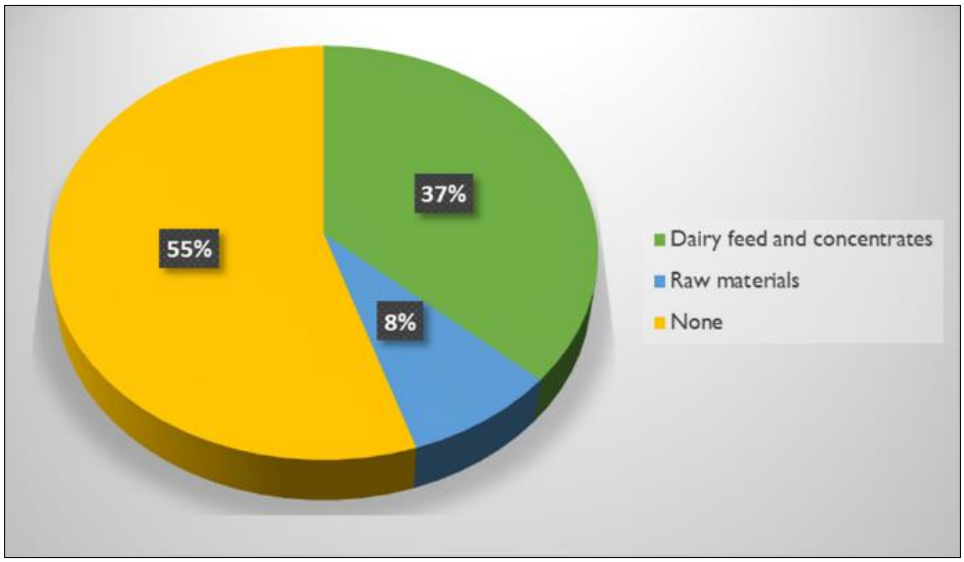

Fig 2: Type of assistance received from the cooperative

Dairy Cooperatives and Milk Productivity

Figure 3, furnishes valuable insights into the prevalence of different cattle breeds among the surveyed farmers. The most held type of dairy cattle breed was dairy cross breeds. This breed choice was followed closely by Holstein Friesian. These figures underscore the popularity of these two breeds within the surveyed community, possibly indicative of their recognized potential for high milk productivity. Ownership of Jersey cattle was less than 50% while less than 25% had traditional cows. In contrast, only a relatively modest proportion of farmers, confirmed ownership of crossbred beef breeds, with the majority indicating not having such breeds in their possession play pivotal roles in determining actual milk productivity.

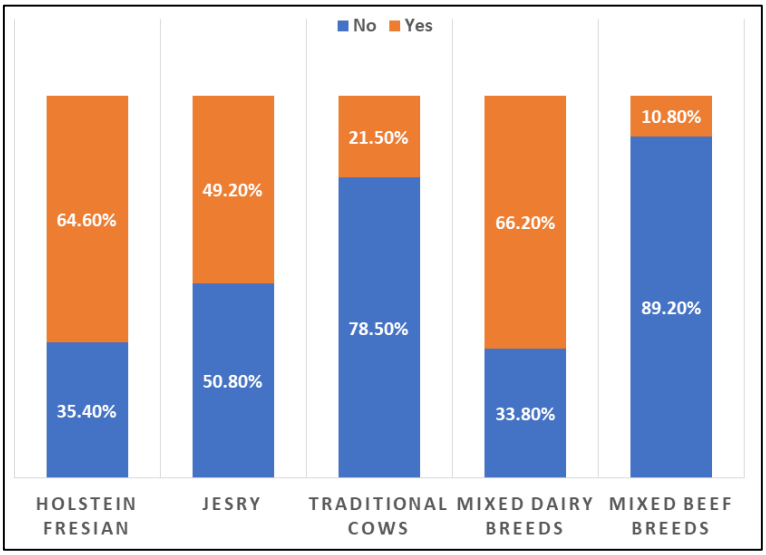

Fig 3: Breeds of dairy cattle ownership

Type of training received

Figure 4, shows a majority of the participants, reported receiving training from the cooperative. The rest did not receive any training from the cooperative, highlighting a distinction in knowledge and skills acquisition within the community. A substantial majority of the participants had received training specifically related to cattle management. Approximately 54.2% of those who received training reported that they had been trained in feed formulation and mixing, indicating the cooperative's efforts to equip its members with knowledge on optimizing feed for their cattle. Moreover, it was noteworthy that 50% of those who received training indicated having undergone instruction in milking techniques and milking Parlor management, emphasizing the importance of efficient milk extraction practices. Less than 50% received training in aspects of dairy farming with the least being cow comfort.

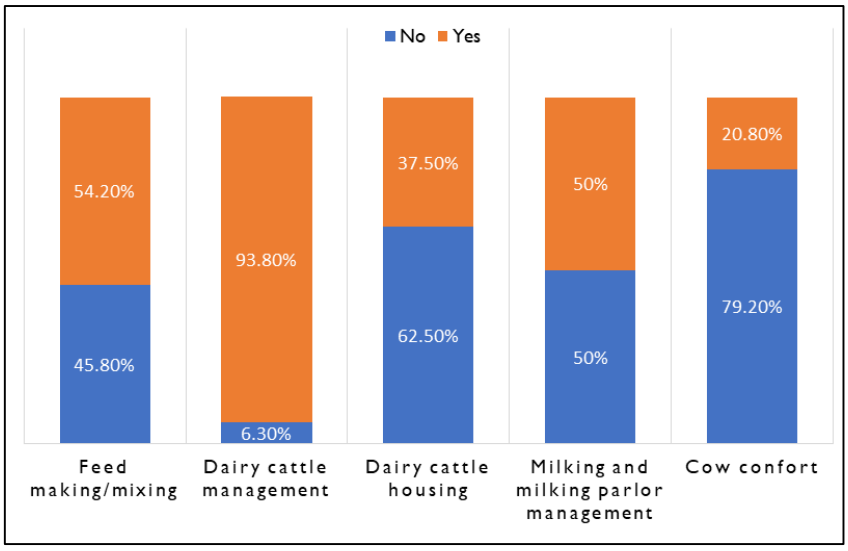

Fig 4: Type of training received.

Dairy Cooperatives and Milk Quality

Table 2 illustrates the specific areas of advice and guidance that were provided to the farmers. A substantial majority of farmers confirmed that they had indeed received advice and guidance from the cooperative in their quest to enhance milk quality. Notably, a small percentage, reported that they did not receive such advice, while one participant did not respond to this inquiry. Remarkably, the most prevalent advice, as reported, centred around mastitis prevention. Furthermore, above 80.0% of participants acknowledged receiving guidance on mastitis diagnosis, an essential step in identifying and addressing milk quality issues promptly. Turning to mastitis treatment, a pivotal aspect of maintaining milk quality, the majority of farmers who received advice were guided in this area. It is also worth mentioning that the least commonly received advice pertained to general udder health and general cow health.

Table 2: Type of advice or guidance received (n = 59).

Type of advice or guidance	Frequency (%)	
	No	Yes
Mastitis prevention	4 (6.8%)	55 (93.2%)
Diagnosis of mastitis	11 (18.6%)	48 (81.4%)
Treatment of mastitis	13 (22.0%)	46 (78.0%)
General udder health	35 (59.3%)	24 (40.7%)
General cow health	37 (63.8%)	21 (36.2%)

Figure 5 below provides insights into the extent to which these crucial quality assessments were integrated into the milk production and processing workflow. The somatic residue test was regularly conducted on their milk. With the freshness test, a significant majority of farmers reported that the test was routinely performed on their milk. The most prevalent quality test conducted at the milk delivery centres was the antibiotic residue. The high incidence of this test underscores the cooperative's rigorous quality control measures aimed at safeguarding milk quality by identifying and mitigating any potential antibiotic contamination.

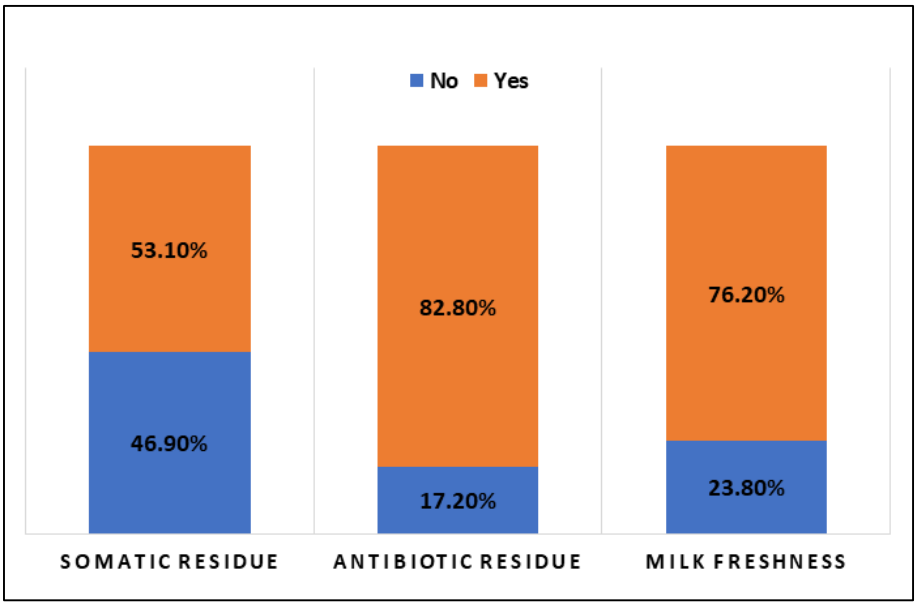

Fig 5: Tests conducted at milk delivery centres.

Table 2: Outlines the reasons for milk rejection. The findings showed over 70% of respondents, reported that their milk had indeed been rejected due to these tests, while less than 25% did not.

Table 3: Reasons for milk rejection

Reason for rejection	Frequency (%)	
	No	Yes
Milk had mastitis	3 (6.1%)	46 (93.9%)
Milk failed the freshness test	42 (85.7%)	7 (14.3%)
Milk had high SCC	47 (95.9%)	2 (4.1%)
No reason	47 (95.9%)	2 (4.1%)

Market Share of Cooperative Dairy Farmer Members

The findings, as presented in Table 4, reveal that below half reported receiving input assistance from the cooperative. A substantial majority of the participants affirmed that their profit margins had indeed risen because of cooperative membership. This sentiment was also echoed in responses to an open-ended question, where participants were asked to highlight the advantages of joining the cooperative. The qualitative data yielded a consistent picture of the benefits of cooperative membership. Farmers emphasized that being part of a cooperative not only facilitated the sale of their entire milk production but also ensured secure storage and access to contract offers for milk supply. Below are selected respondents' views regarding the benefits of cooperative membership?

Respondent 8: "Joining the cooperative enables us to meet the high milk volume demands of buyers like Dairy Gold, increasing our income."
Respondent 18: "We receive monthly payments for our milk deliveries, providing a steady source of income."
Respondent 19: "The cooperative guarantees proper milk storage and ensures that all our milk is sold."
Respondent 28: "The cooperative helps us sell all our milk, especially when production is high, and it also provides storage solutions."
Respondent 30: "Cooperative sales are superior because they are in bulk, and we receive lump-sum payments."

The responses from both the closed-ended and open-ended questions strongly underscore the tangible benefits that farmers derived from cooperative membership, which demonstrably enhanced their market share and profit margins. In terms of the available market options, respondents were presented with five choices, which included Parmalat, Dairy Gold, Varun, and Zambeef, as well as non-commercial channels. A significant majority reported that they were provided access to the Dairy Gold market, while a smaller proportion indicated that they had access to the Parmalat market.

Table 4: Participants' benefits for joining a dairy cooperative

Variable	Frequency (n)	Percent (%)
Input assistance from the cooperative		
No	40	61.5
Yes	25	38.5
Total	65	100
Increase in profit after joining the cooperative		
No	7	11.7
Yes	53	88.3
Total	60	100
Market type provided by the cooperative		
Parmalat	5	10.2
Dairy Gold	44	89.8
Total	49	100

Discussion

Enhanced Milk Yield

The research findings showed a significant upturn in milk yield after the farmers joined the cooperatives. The shift in the amount of milk produced indicated that cooperatives played a pivotal role in improving milk yield. This aligns with previous studies by Kumar *et al*. (2018) [8], which assessed the impact of cooperative membership on welfare and the results showed that indeed cooperative membership increases household income and yield produced. The finding by Bayan (2018) showed that farmers who participated in dairy cooperatives had a positive and statistically significant increase in milk yield, farm income, marketed surplus and employment. It is important to also note that other scholars like found that dairy cooperatives membership did not make any significant contribution to improving milk yield, technical efficiency, price and net income in Manipur, India. This finding contradicts the results of this research which found that the dairy cooperative contributed to enhanced milk yield of small dairy farmers.

The improvement in milk yield can be attributed to the fact that Palabana dairy cooperative organised inputs like feed-making raw materials, complete feed and concentrates for the farmers as seen in the results. These findings echo what has been said who note that cooperatives are prominent organisers of input and resource services which play a vital role in nurturing, strengthening, and providing livelihoods to rural households highlight the importance of nutrition in dairy cows by stating that poor nutrition and undersupplying feed for lactating dairy cows could be one of the leading factors contributing to low milk yields. This emphasises the importance of nutrition in dairy cows.

Improved Milk Productivity

It is clear from the findings of this study that dairy cooperatives have contributed to improved milk productivity in Palabana area. Similar results were reported who found an improvement in the performance of dairy cooperative societies in Jammu because of better milk prices and the high productivity of the animals.

The results also showed that 73 % of the farmers had received training on various topics, with cattle management being the most popular and cow comfort the least popular. The training provided is a huge contributor to improved milk productivity as highlighted by Mutinda *et al* (2015), who affirmed that education and training programs are instrumental in the success of the dairy cooperative business.

Earlier studies suggest that farmers' participation in dairy Cooperatives has resulted in a significant increase in milk production and productivity and has reduced per unit cost of milk production. The improved productivity is mainly attributed to the collective bargaining power that cooperatives bring to the table which enables them to source inputs and services at a lower cost.

Despite the results showing an improvement in milk productivity, the results indicated that the farmers did not receive any animals via cooperative efforts, whereas the Mpima dairy cooperative received 30 dairy animals in 2004 in a bid to enhance milk production and contribute to the improved nutrition of the country. This highlights the importance of having the correct cattle breed for improved productivity to make members more competitive.

According to Shoemaker *et al*. (2008) [16], for dairy farmers to increase milk productivity, they have to implement strategies which include feeding balanced diets, optimizing cow comfort, using proven milk production technologies, filling facilities to above 100% of capacity and milking more than two times per day. This corroborates the findings of this study where it has been noted that the cooperative has contributed to this measure of competitiveness by guiding the farmers on the above strategies. The contribution has been through the provision of training of the member farmers on various relevant topics. The results also showed more still needs to be done in some of these areas like cow comfort, dairy cattle housing, and milking & milk parlour management.

Milk Quality

The importance of quality milk in dairy farming cannot be overemphasized, the market requires high-quality milk for further processing. Cooley (2019) [2] defined milk quality based on somatic cell count and bacteria count. This research investigated the contributions cooperatives made to milk quality and the results indicated that the cooperatives provided advice and guidance on conditions that affected milk quality like mastitis, poor udder health and general cattle health. The importance of guidance on mastitis is corroborated by Cheelo (2019) [1] who showed that access to veterinary services helps to prevent diseases, like Mastitis, that have a bearing on milk quality. Despite the cooperative contribution not being directly responsible for affecting milk quality, it is worth noting that any management changes instituted by the farmers due to this guidance and advice of the cooperative will influence the quality of milk produced. A study conducted by Feed the Future in Ethiopia indicated that technical capacity building and facility upgrades significantly increased yield and quality, and reduced the amount of milk rejected at the MCC.

To further ensure only good quality milk is received and aggregated at the MCC and stored in the refrigerated storage tank, the cooperative instituted milk quality tests. The results showed that they carried out the following tests: Antibiotic residue tests, Somatic cell counts and milk freshness tests. These tests allowed the farmers to know how well they implemented the advice and guidance offered by the cooperative on milk quality. Knowing that the milk produced at delivered to the MCC would be screened, encouraged farmers to apply the knowledge acquired to avoid losses through unsold milk due to poor quality.

Despite all the advice and guidance, the farmers still reported some of their milk being rejected. Interestingly, when farmers were asked to give reasons behind the rejection of their milk, mastitis emerged as the most prevalent cause. This finding is intriguing, considering that most farmers had been provided with guidance on mastitis prevention. In this context, we are left with a situation that calls for further investigation and analysis. One plausible interpretation could be that the guidance on mastitis prevention was not entirely effective, or it could imply that some farmers did not fully adhere to the provided advice. It also raises questions about the adequacy of the guidance and the practical challenges faced by farmers in implementing these preventive measures.

Market Share

Market share is crucial to dairy farmer's competitiveness. The more they produce the bigger the market share. Dairy cooperatives are cardinal in ensuring dairy farmers have an outlet for their produce. Mumba *et al*, (2013) [12], indicated that market access is one of the foremost factors influencing the performance of small-scale producers in developing countries. Thus, making available a market for smallholder dairy farmers would increase their competitiveness. This is supported by Mutinda *et al*. (2015) who stated that market access motivates members to increase their production and productivity.

Profitability increases as market share increases. The increase in profitability is because the farmers can sell all their produce and possibly produce more. The results showed that 80% of the farmers indicated having increased profit margin after joining the cooperative. The increase in profits is coupled with making a market available for all the milk produced. This finding is consolidated by other scholars like who indicated that improving smallholders' access to markets is considered essential to enhance their income and increase the number of marketing options available to them.

Improving smallholder farmers' competitiveness is achieved by not only providing markets for the produce but also helping farmers produce the milk efficiently and effectively. This involves among other things monitoring and maintaining inputs at competitive costs. Shoemaker *et al* (2008) [16] indicated this in their second, third and fourth measure of competitiveness which were cost control – feed cost per cow, cost control- herd feed cost and cost control – operating expense, all needed to be at less than or equal to certain amounts indicated in the literature. Despite cooperatives organising inputs being one of the mandates, the results indicated that only a small fraction of the farmers received assistance in acquiring farming inputs from the cooperative.

New Institutional Economies Framework

Relating the findings to the NIE theoretical framework, highlighted how dairy cooperatives, as a form of collective action, have contributed to the competitiveness of smallholder dairy farmers in Palabana area of Chongwe district. The cooperatives took advantage of economies of scale and collective bargaining to provide the members with accessing inputs through them and a market for all the milk produced as affirmed by the respondents. The provision of markets significantly contributed to the competitiveness of the member smallholder farmers.

NIE framework application in the context of this research showed how cooperatives have additionally enhanced information flow by providing training, advice, and guidance to the member farmers. The Cooperatives also provided quality assurance by having refrigeration and quality milk testing at MCC.

Therefore, the application of the NIE framework enabled the researcher to have a better understanding of how dairy cooperatives function as catalysts to help smallholder dairy farmers become competitive.

Conclusion

The Palabana dairy cooperative was found to significantly contribute to milk yield and thus improve smallholder farmers' competitiveness by contributing to the nutritional needs of the cows. On milk productivity, the contribution of the Cooperatives was through training of the farmers rather than direct contribution through the provision of improved dairy breeds. Milk quality assurance by the cooperate was done via providing quality tests at the MCC and providing advice and guidance on topics affecting milk quality like mastitis prevention, diagnosis, treatment, general udder and cow health. The market for the milk produced was provided and profit margins increased even if the Cooperatives did not help in acquiring farming inputs. Based on the findings, recommendations are to strengthen farmer education and training on dairy farming topics, to facilitate knowledge exchange among farmers by organising seminars, workshops, etc, to continue monitoring milk quality and finally consider market diversification.

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