*Original Research Article*

Enhancing Smallholder Sheep Farmers' Livelihoods through Collective Marketing Interventions: Evidence from Mwanga District in Tanzania

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ABSTRACT

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| This study evaluated the effectiveness of collective marketing interventions in improving the livelihoods of smallholder sheep farmers in Mwanga district, Tanzania, addressing a significant research gap in the literature on collective marketing within this specific context. While various socio-economic interventions, including market associations, sheep producer groups, and market information systems, have been implemented in Mwanga district since 1990 to boost farmer incomes, limited research has quantitatively assessed their impact on smallholder sheep farmers' livelihoods. Using a quantitative survey design, data were collected from 283 households randomly selected from a total of 384, using questionnaires. Descriptive statistics and multiple regression analysis were used to analyze the data. Results indicated that participation in collective marketing interventions significantly impacted smallholder sheep farmers' income, as influenced by gender, education, farming experience, practices, and asset ownership (cell phones, bicycles). Specifically, sheep producer groups and market information systems demonstrated the strongest positive correlation with increased income. The ANOVA results (p < 0.001) indicated a significant relationship between the independent variables (sheep producer groups, market associations, and market information systems) and the dependent variable (livelihood improvement). These interventions facilitated improved access to technology, extension services, microfinance credit, communication, and market linkages. The study concluded that strengthening producer groups and market information systems is crucial for enhancing smallholder sheep farmers' household income. These findings highlight the need for policies supporting producer group development and reliable market information dissemination for long-term sustainability. Continued investment in these interventions, coupled with strategies to address gender disparities and enhance access to education and technology, is essential for maximizing their impact and ensuring the long-term economic well-being of farming households in Mwanga district. Further research should explore the long-term sustainability and scalability of these interventions across diverse agro-ecological zones. |

*Keywords: Collective action, Livelihood improvement, Market access*

1. INTRODUCTION

Smallholder farmers, including sheep producers, are vital to the economies of many developing nations, contributing significantly to food security, rural employment, and economic growth [1]. In Tanzania, the livestock industry is experiencing moderate expansion, growing at an annual rate of 5.0% and accounting for 7.1% of the country's GDP [2]. With an estimated 9.4 million sheep [3], smallholder sheep farming is particularly crucial for supporting rural livelihoods, especially in regions with suitable agro-ecological conditions such as Kilimanjaro Region, and specifically Mwanga district [4]. Despite the sector's importance, accessing lucrative markets and achieving higher incomes remain significant obstacles for Tanzanian smallholder sheep farmers. Consequently, their incomes remain low, limiting spending opportunities for improved living standards and enterprise growth [5]. This is largely due to the inherent challenges faced by smallholder farmers operating at a small scale with limited resources and bargaining power [6]. They contend with market-related constraints including price volatility, information asymmetries, and high transaction costs, mirrored in similar findings from Kenya [7]. Poor infrastructure, including inadequate roads, undeveloped livestock market facilities and storage facilities, further hinders efficient marketing transportation and sales, resulting in reduced incomes [8]. The reliance on poorly organized and oligopsonic rural markets exacerbates this issue, leading to low prices due to the small volumes sold by individual households [9]. This necessitates collective action to overcome these market inefficiencies.

Collective marketing offers a pathway to address these challenges by enabling economies of scale, improving market performance, increasing volume of sales, and enhancing bargaining power [10]. Embracing formal and informal groups can foster mutual trust and experience, providing access to training, market information, credit, inputs, and value addition [11].

Transaction cost theory

Tanzania's livestock industry is a cornerstone of the national economy, significantly contributing to both national income and rural livelihoods. The industry's marketing landscape has evolved, particularly through the rise of producer groups. Examining these groups through the lens of transaction cost economics (TCE), as proposed by Coase and Williamson, offers valuable insights in organizing, managing, and optimizing economic transactions within these frameworks [12]. TCE centers on minimizing the costs associated with market exchanges—the expenses incurred in buying and selling goods and services. This study applies TCE to analyze how producer groups in Tanzania's livestock sector improve interactions among farmers, buyers, and other stakeholders, thereby potentially reducing transaction costs and enhancing efficiency within the livestock trading industry.

Collective market action theory

This study utilizes collective action theory to analyze the impact of collective marketing interventions on smallholder sheep farmers in Mwanga district, Tanzania. The theory's development stemmed from critiques of the largely unsuccessful rural development programs of the 1960s and 70s, which underestimated the complexities of fostering and sustaining collective action within communities [13]. Building on the work of [14], [15], [16], and [17], the theory identifies key conditions for successful collective action. Within the context of smallholder sheep farmers, Collective Action Theory provides a framework for understanding how market associations can improve livelihoods. Key tenets of the theory highlight the benefits of collective marketing, including enhanced information sharing, economies of scale, expanded market access, improved risk management, and increased bargaining power [18]. These factors are crucial for improving economic outcomes and the overall well-being of smallholder farmers participating in collective marketing initiatives.

Information asymmetry theory

[19] established the concept of information asymmetry, highlighting how unequal access to information, particularly regarding product quality, can lead to market failures [19]. This theory posits that inefficiencies and suboptimal outcomes can result when one party in a transaction possesses more or better information than the other. Market Information Systems (MIS) are critical tools for mitigating information asymmetry in agricultural market chains. This study explores how MIS can improve the livelihoods of smallholder sheep producers through the lens of Information Asymmetry Theory. By providing timely and accurate market data, including price forecasts and demand projections, MIS empowers farmers to make informed decisions. This knowledge facilitates better bargaining, enhances access to resources such as credit, training, and inputs, and ultimately boosts profitability and productivity [20].

Livestock producer associations are vital for improving the livelihoods of Tanzanian smallholder sheep farmers by facilitating collaborative marketing, information sharing, and resource pooling, ultimately leading to enhanced economic outcomes [21]. This study empirically investigates the impact of these associations on smallholder sheep farmers in Mwanga district. Research indicates that active participation in producer groups significantly strengthens farmers' bargaining power, increasing market access and improving negotiation outcomes [22]. For example, one study demonstrated a 30% increase in market access and improved bargaining power among participating smallholder producer groups. Recognizing the importance of marketing in the livelihoods of Tanzanian smallholder sheep farmers, this study examines current marketing strategies, focusing on collective marketing interventions. Evidence suggests that marketing associations, such as sheep and wool marketing associations, significantly enhance bargaining power and negotiation skills, better prices and access larger buyers, including export brokers and processors [23].

Furthermore, Management Information Systems (MIS) function as a crucial collective market intervention within the livestock industry. They facilitate data collection and integration, improve decision-making, enhancing transparency among stakeholder, and support the execution of collective market actions [24]. Research by [25] demonstrates the positive impact of well-maintained MIS on income stability, showing a 25% improvement due to the ability to respond more effectively to market price fluctuations and uncertainties. This study, therefore, aims to evaluate the effectiveness of collective market interventions in improving the livelihoods of smallholder sheep farmers in Mwanga district, Tanzania.

2. mETHODOLOGY

Conceptual Framework

This conceptual framework outlines the key variables and hypothesized relationships underpinning the study of the effect of these collective marketing interventions on the livelihoods of smallholder sheep farmers in the Mwanga district. The framework identified the independent variables which are Sheep Producer Groups, Market Association and Market Information System. Each of these categories plays a distinct role in shaping the marketing landscape for smallholder sheep farmers and influences their income levels. In the conceptual framework, "Smallholder Sheep Farmers' Livelihood Improvement" is the dependent variable. The statement denotes the degree to which these farmers' income levels may be raised by collective marketing activities (the independent variables).

Using a quantitative survey design in Mwanga district, Tanzania, data were collected from 283 households randomly selected from a total of 384, using questionnaires. The sample size was determined using Cochran's formula (1977), considering the district's population (148,763 according to the 2022 Tanzania National Census Report) and specifying the desired confidence level and margin of error. Data analysis involved descriptive statistics to summarize the data and regression analysis to investigate the relationship between independent and dependent variables.

The regression model employed is: Y = β₀ + β₁X₁ + β₂X₂ + β₃X₃ + ε

Where:

Y represents smallholder farmers' livelihoods (the dependent variable).

X₁ represents participation in livestock producer groups.

X₂ represents participation in market associations.

X₃ represents access to market information systems (MIS).

β₀ is the intercept.

β₁, β₂, and β₃ are the regression coefficients representing the effect of each independent variable on the dependent variable.

ε represents the error term.

This model assesses the influence of livestock producer groups, market associations, and market information systems on the livelihoods of smallholder farmers in Mwanga district.

Statistical analysis

Analysis of Variance (ANOVA) was employed to analyze the survey data, specifically examining the effects of livestock producer group participation, market association membership, and access to market information systems on smallholder farmers' income. This statistical method determined whether significant differences existed among the mean scores of different groups within the study. ANOVA tested the null hypothesis that there were no significant differences between group means. The results of the ANOVA test provided insights into the impact of these specific variables on the dependent variable.

3. results and discussion

The regression model demonstrated a strong positive correlation between the independent and dependent variables, exhibiting an R - value of 0.711. The R² value of 0.63 indicates that the independent variables (livestock producer groups, market associations, and market information systems) explain 63% of the variance in smallholder sheep farmers' livelihood improvement. This signifies a substantial contribution of these factors to variations in income among the study's participants.

The ANOVA results (p < 0.001) indicate a significant relationship between the independent variables (start-up capital provision, financial literacy training, and business capacity building) and the dependent variable (poverty reduction among youth and women). The model demonstrates a statistically significant ability to predict poverty reduction. These findings strongly suggest that the independent variables significantly influence the dependent variable.

The Impact of Market Associations on Smallholder Sheep Farmers' Livelihoods

Table 3 shows that 50.53% of respondents were market association members, 17.67% were not members, and 31.8% were neutral. Association members reported an average annual sales volume of TZS 1,500,000.00 and received an average of 11 collective marketing training sessions annually. Regarding financial performance since joining the association, 19.43% rated it as good, 15.9% as average, and 15.19% as very good; 50.52% were neutral. Similar studies in Kenya have shown even higher participation rates in market associations among dairy farmers, reaching up to 70% [7, 8]. However, the reported financial improvements in this Tanzanian study are comparable to those observed in Ethiopian studies on coffee cooperatives [10, 11], suggesting a consistent positive impact of collective action. Further research comparing training intensity and its effect on financial outcomes across different regions would be valuable.

Livestock Producer Groups and Smallholder Sheep Farmers' Livelihoods

Membership in livestock producer groups resulted in a 15% increase in income, a 7% reduction in costs, and access to credit representing 2% of group revenue. Figure 2 illustrates the diverse collective marketing activities undertaken by group members: group sales (48.41%), joint procurement (40.99%), shared transportation (16.96%), and buyer identification (1.41%). These income increases are slightly lower than those reported in studies of producer groups in Rwanda focused on dairy farming, where income gains of up to 25% have been documented [25]. The diversification of activities within the Tanzanian producer groups, however, mirrors findings from similar studies in Ghana involving poultry farmers [26], highlighting the adaptability of this model across different livestock sectors. A comparative analysis of cost reduction strategies employed across different regions would provide valuable insights.

Impact of Market Information Systems on Smallholder Sheep Farmers' Livelihoods

Figure 3 depicts the frequency of market information receipt among respondents: daily (15.9%), weekly (15.55%), monthly (9.54%), and very rarely (0.35%). Table 4 further analyzes the influence of market information systems on farmers’ sheep sales decisions, revealing that 58.66% of respondents reported neutral influence, while moderate influence was reported by 27.21%, high influence by 13.78%, and no influence by 0.35%. The relatively high percentage of respondents reporting neutral influence suggests a need for improved information dissemination strategies, a challenge also noted in studies on market information systems in Uganda [27]. However, the positive influence observed in a subset of farmers aligns with findings from similar interventions in India targeting smallholder farmers [28], indicating the potential for significant impact with targeted improvements. Further research should investigate the factors influencing the effectiveness of information dissemination across contexts.

Overall Impact on Household Welfare

Collective marketing interventions increased average monthly sheep farming revenue to TZS 385,000 among participants, compared to TZS 320,000 for non-participants. Market access improved significantly, with 88% of participants accessing markets versus 22% of non-participants. Table 5 details the positive impacts on household well-being: enhanced education opportunities for children (51.24%), better nutrition and food security (47.7%), improved healthcare access (44.52%), and increased household income (25.44%). The positive impacts on household welfare are consistent with findings from studies in other developing countries, such as those focusing on the impact of agricultural cooperatives in Bangladesh [29]. However, the specific proportions allocated to education, nutrition, and healthcare may vary depending on cultural contexts and pre-existing access to services. Further research should explore the long-term impacts on household well-being and the sustainability of these improvements. The observed improvements are comparable to those found in similar studies in other regions, highlighting the general effectiveness of collective marketing interventions.

The study comprehensively examines the impact of collective marketing interventions on the livelihoods of smallholder sheep farmers in Mwanga district, Tanzania. The findings reveal a strong correlation between participation in these initiatives and significant improvements across various economic and social dimensions of well-being. A substantial majority (50.53%) of surveyed smallholder sheep farmers actively participate in market associations, underscoring the crucial role these organizations played within the community [6]. This participation translates into tangible economic benefits. Members report an average annual sales volume of TZS 1,500,000, significantly exceeding the average for non-members. This increased revenue is not solely a consequence of higher sales volume; the supportive environment within the associations facilitates skill development and knowledge sharing [6]. Participants receive valuable training, enhancing their business acumen and financial literacy, empowering them to make more informed decisions and optimize their farming practices.

The positive impacts extend beyond market associations. Membership in livestock producer groups yields equally impressive results [6; 7]. Farmers participating in these groups report a notable 15% increase in average revenue, alongside a 7% reduction in overall costs. These gains are directly attributable to the collaborative nature of the groups. Pooled resources, shared knowledge, and coordinated marketing strategies offer significant economies of scale and risk mitigation, leading to enhanced efficiency and profitability [7; 8]. Furthermore, access to credit, representing up to 2% of their income, provides crucial financial support for strategic investments in their farms, further boosting productivity and income generation [8]. The diverse range of activities undertaken by producer groups—including joint procurement (40.99%) and group sales (48.41%)—highlights the comprehensive and multifaceted nature of their collective marketing approach [8; 9]. This coordinated approach not only improves market access but also strengthens their negotiating position, enabling them to secure more favorable terms and prices for their products.

The study also highlights the significant role of Market Information Systems (MIS) in improving farmers' livelihoods. While a substantial portion (58.66%) of respondents reported a neutral influence of MIS on their selling decisions, a significant minority (15.9%) received daily market information updates [24]. This access to timely and relevant information is directly linked to increased monthly revenue and enhanced market access, with a remarkable 88% of participants reporting improved market access as a direct result of collective marketing efforts.

However, the positive impacts of collective marketing extend far beyond mere financial gains. The study reveals significant improvements in various aspects of household well-being. A substantial 51.24% of participants reported enhanced educational opportunities for their children, reflecting the increased financial capacity to invest in education. Similarly, 47.7% reported improved nutrition and food security, indicating a direct link between increased income and improved dietary intake [18; 21]. Furthermore, improved access to healthcare (44.52%) and increased household income (25.44%) underscore the far-reaching positive consequences of participation in these interventions [18; 21] which largely depicts livelihood improvement.

The study unequivocally demonstrates the extensive and multifaceted positive impact of collective marketing interventions on the economic and social well-being of smallholder sheep farmers in Mwanga district. The strong correlation between participation in these initiatives and improvements across income, household welfare, and access to resources underscores the critical role of collective action in fostering sustainable development within this community. The findings strongly advocate for strengthening and expanding these initiatives to further support the growth and prosperity of smallholder sheep farmers, promoting both economic empowerment and improved quality of life.

4. Conclusion

This study conclusively demonstrates the substantial and multifaceted impact of collective marketing interventions on the livelihoods of smallholder sheep farmers in Mwanga district. The strong positive correlation between participation in these initiatives (livestock producer groups, market associations, and market information systems) and improved livelihoods (R² = 0.63) highlights their crucial role in driving economic growth and enhancing well-being within the community. This significant R² value indicates that a substantial portion of the variation in farmer income can be directly attributed to their engagement in these collective efforts.

Market associations, in particular, prove invaluable, facilitating not only significantly higher annual sales volumes (averaging TZS 1,500,000) but also providing crucial training and support in financial management. This combination of increased income generation and improved financial literacy empowers farmers to make more informed decisions, optimize their resource allocation, and ultimately enhance their long-term economic stability. Similarly, participation in livestock producer groups yields substantial benefits, with members reporting significant increases in revenue (15%) and cost reductions (7%) through cooperative efforts and access to credit. These groups provide a crucial support network, facilitating shared resources, coordinated marketing strategies, and access to vital financial resources. The accessibility and effective utilization of market information systems are also shown to be critical determinants of success. Access to timely and relevant market information empowers farmers to make more informed decisions regarding sales, maximizing their profits and mitigating risks. This, in turn, contributes to improved market access and overall economic resilience.

The cumulative effect of these interventions extends beyond purely economic gains. The study reveals significant improvements in various aspects of household well-being among participating farmers. Increased access to healthcare, improved nutrition and food security, and enhanced educational opportunities for children are all directly linked to the increased income and economic stability facilitated by collective marketing initiatives. This holistic improvement in household welfare underscores the transformative potential of these interventions, not only boosting individual livelihoods but also contributing to broader community development and social progress. Therefore, the findings strongly advocate for continued investment in and expansion of these collective marketing programs to further support the growth and prosperity of smallholder sheep farmers in Mwanga ddistrict and beyond. Thus, this study recommends a multi-faceted approach to further empower smallholder sheep farmers in Mwanga district. Key strategies include: strengthening existing market associations to enhance their capacity for training, financial management support, and market access; expanding and improving livestock producer groups to facilitate greater collaboration, resource pooling, and access to credit; enhancing market information systems through improved data collection, analysis, and dissemination, particularly via digital channels; and providing targeted support to marginalized groups, including women and youth, to ensure equitable access to resources and opportunities. Finally, advocating for policy changes that explicitly support and facilitate collective marketing initiatives is crucial for long-term sustainability and impact. These combined efforts will not only improve farmers' livelihoods and financial outcomes but also contribute to broader economic development and social progress within the community. Further research could explore the specific mechanisms through which these interventions achieve their positive impacts and investigate the potential for scaling up these successful models to other regions and farming communities.

AcknowledgEments

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Competing interests

Authors have declared that no competing interests exist.

Authors’ Contributions

S. Marijani designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. C. Mfugale managed the analyses of the study. K.T. Kabuni and E.P. Maro managed the literature searches. All authors read and approved the final manuscript.

Ethical approval (where ever applicable)

Research ethical clearance was obtained from the Tanzania Livestock Research Institute (TALIRI) (September, 2024).

Table 1. Summary of model fitness

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | R | R Square | Adjusted R square | Std. error of the estimate |
| 1 | 0.711a | 0.630 | 0.513 | 0.623211 |

Table 2. Summary of ANOVA

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 71.888 | 9 | 23.963 | 56 | 0.001b |
| Residual | 52.170 | 274 | 1.272 |  |  |
| Total | 124.058 | 283 |  |  |  |
| *a. Dependent Variable:* Smallholder Sheep Farmers' Livelihood Improvement | | | | | | |
| *b. Independent Variables,* Sheep Producer Groups, Market Association and Market Information System) | | | | | | |

Table 3: Market Association Membership

|  |  |  |
| --- | --- | --- |
| VALUE | Frequency | Percentages |
| Yes | 143 | 50.53% |
| No | 50 | 17.67% |
| Neutral | 90 | 31.8% |
| TOTAL | 283 | 100% |

Table 4: Influence of Market Information Systems on Sheep Sales Decisions

|  |  |  |
| --- | --- | --- |
| VALUE | Frequency | Percentages |
| Moderate | 77 | 27.21% |
| High influence | 39 | 13.78% |
| No influence | 1 | 0.35% |
| Neutral | 166 | 58.66% |
|  | 283 | 100% |

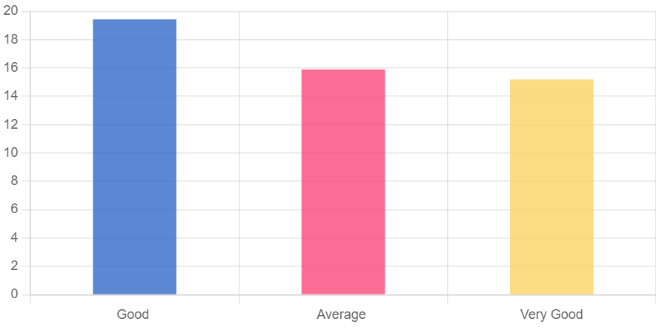


Figure 1: Financial Performance of Market Association Members (Percentage)

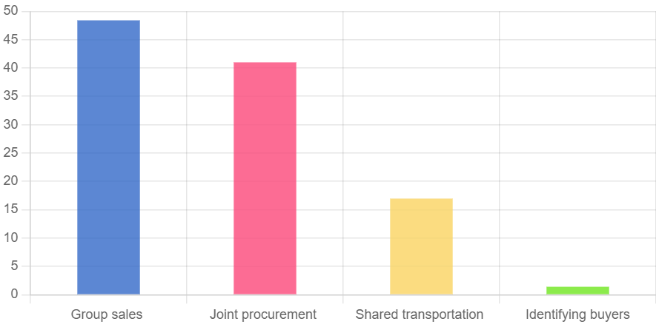


Figure 2: Collective Marketing Activities of Sheep Producer Groups

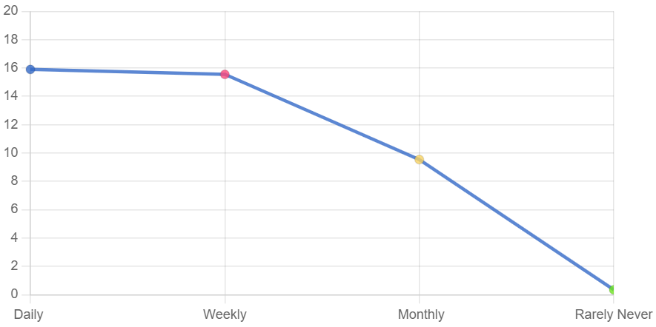


Figure 3: Frequency of Market Information Receipt on Sheep Marketing

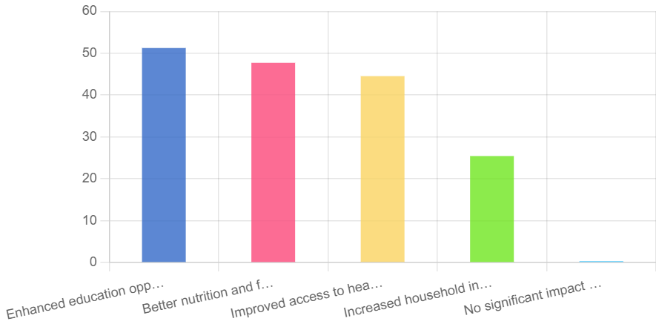


Figure 4: Impact of Collective Marketing on Sheep Farmers' Household Well-being (%)

**Disclaimer (Artificial intelligence)**

Author(s) hereby declare that no generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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