

Capacity Building and Sustainability of Livestock Value Chains in Samburu County, Kenya

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Abstract

Livestock value chains contribute significantly to food security, household income, nutrition, employment creation, and livelihood resilience in Kenya's arid and semi-arid regions. Despite their importance, these value chains experience sustainability challenges arising from inadequate technical skills, poor product-handling practices, weak record-keeping, limited financial literacy, and insufficient access to continuous training. Capacity building is increasingly recognized as an important supplier-development practice because it equips value-chain actors with the knowledge and competencies required to improve animal husbandry, product quality, business decisions, knowledge sharing, and market participation. This study examined the effect of capacity building on the sustainability of livestock value chains in Samburu County, Kenya. The study was anchored on Human Capital Theory and adopted descriptive and correlational research designs. The target population comprised 3,458 livestock value-chain actors, from whom a sample of 359 participants was selected using proportionate stratified random, simple random, and purposive sampling techniques. Data were collected using structured questionnaires and a key informant interview guide. Quantitative data were analysed using descriptive statistics, Pearson Product Moment Correlation, and simple linear regression, while qualitative data were analysed thematically. The study achieved a response rate of 69.6%. The findings established that capacity building had a strong, positive, and statistically significant relationship with sustainability ($r = 0.612$, $p < 0.001$). Capacity building explained 37.5% of the variation in livestock value-chain sustainability ($R^2 = 0.375$; adjusted $R^2 = 0.372$) and had a positive and statistically significant effect on sustainability ($\beta = 0.612$, $p < 0.001$). The study concluded that capacity building enhanced product handling, animal husbandry, knowledge sharing, business decision-making, and market participation. It recommends continuous and accessible training integrating technical, business, financial, and record-management competencies.

Keywords: *Capacity building, human capital, supplier development, livestock value chains, sustainability, Samburu County.*

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1. Introduction

Livestock production plays an important economic and social role in arid and semi-arid regions by supporting household nutrition, employment, income generation, asset accumulation, and livelihood resilience (AU-IBAR, 2022). Its contribution is particularly important in dryland areas where unreliable rainfall, water scarcity, and limited crop-production opportunities increase household dependence on livestock-based livelihoods (Balehegn et al., 2021). Livestock value chains comprise interconnected activities involving production, animal-health management, product handling, aggregation, transportation, processing, retailing, and marketing (Bahta et al., 2023). They also involve relationships among producers, collectors, traders, retailers, consumers, veterinary officers, extension personnel, and development organizations (Isako & Kimindu, 2019). Sustainable livestock value chains require consistent production, hygienic handling, reduced product losses, reliable market access, stable returns, and resilience to climatic and market disruptions (Balehegn et al., 2021). Achieving these outcomes depends on effective coordination and the ability of value-chain actors to protect product quality, maintain supply, satisfy market requirements, and adapt to changing conditions (AU-IBAR, 2022).

Capacity building involves deliberate investment in the knowledge, technical skills, managerial competence, and decision-making abilities of individuals and organizations (Tuggle et al., 2025). Within livestock value chains, it includes training in animal husbandry, feeding, disease prevention, hygiene, product handling, record keeping, financial management, marketing, negotiation, and climate adaptation (Hassan et al., 2023). Capacity-building programmes may be delivered through extension services, practical demonstrations, farmer field days, producer organizations, workshops, peer-learning forums, and mobile advisory platforms (Motsholapheko et al., 2024). These learning mechanisms enable value-chain actors to access technical information and translate acquired knowledge into improved production and marketing practices (Tuggle et al., 2025). Effective capacity building can therefore enhance product quality, production efficiency, risk management, market participation, and adaptation to environmental and commercial changes (Hassan et al., 2023).

Evidence from African livestock systems demonstrates that inadequate knowledge and limited advisory support constrain livestock production and value-chain development (Azine et al., 2025). Livestock producers in South Kivu experienced feeding and production challenges associated with insufficient technical knowledge and inadequate access to advisory services (Azine et al., 2025). Extension support improved technical competence, production practices, and value-chain participation among beef suppliers (Motsholapheko et al., 2024). In drought-prone pastoral settings, supplier training strengthened preparedness, coping capacity, and the adoption of resilient livestock practices (Hassan et al., 2023). These findings demonstrate that technical and managerial competence contributes to livestock productivity, resilience, and effective market participation (Motsholapheko et al., 2024).

In Samburu County, livestock value chains involve pastoralist households, aggregators, collectors, retailers, government agencies, and development organizations (Cheloti & Kamano, 2024). Pastoralist households undertake production, while collectors and aggregators consolidate products from dispersed suppliers and connect them to markets (Cheloti & Kamano, 2024). Retailers link products to consumers and communicate information on prices, quality, and demand (Isako & Kimindu, 2019). Veterinary officers, extension providers,

producer-group leaders, and development partners provide technical and market support (Cheloti & Kamano, 2024). However, inadequate technical assistance, weak market coordination, uneven technology adoption, and limited infrastructure continue to constrain livestock value chains in the county (Cheloti & Kamano, 2024). Addressing these constraints requires capacity-building interventions that strengthen actors' technical and managerial competence and improve coordination across production, handling, and marketing activities (Hassan et al., 2023).

1.1 Problem Statement

Sustainable livestock value chains are expected to provide reliable markets, stable household incomes, safe products, reduced losses, and improved resilience among pastoralist households and other market actors (AU-IBAR, 2022). These outcomes are particularly important in Samburu County, where livestock production supports household nutrition, income generation, asset ownership, and adaptation to arid and semi-arid conditions (Cheloti & Kamano, 2024). Climatic variability, water scarcity, and limited crop-production opportunities further increase pastoralist communities' dependence on livestock-based livelihoods (Machan et al., 2022). Achieving sustainable outcomes therefore requires actors who can apply hygienic handling practices, manage animal health, maintain records, evaluate costs and prices, negotiate with buyers, and respond effectively to climatic and market disruptions (Hassan et al., 2023). Capacity building develops these technical, managerial, and adaptive competencies and can strengthen the continuity and competitiveness of livestock value chains (Motsholapheko et al., 2024).

Despite its importance, the livestock value chain in Samburu County remains constrained by informality, weak coordination, inadequate infrastructure, and uneven access to technical support (Cheloti & Kamano, 2024). Poor product handling, limited cooling and transportation facilities, inadequate processing capacity, and fragmented marketing systems contribute to spoilage, low value addition, and unstable returns (Isako & Kimindu, 2019). Limited access to veterinary and extension services also constrains animal health, productivity, and the reliability of livestock-product supply (Mutune et al., 2024). Environmental pressures, including drought, water scarcity, poor grazing conditions, and long distances to markets, further disrupt production and market reliability in northern Kenya (Machan et al., 2022). Although these conditions require informed technical, financial, and marketing decisions, access to continuous training, business knowledge, extension services, and practical learning opportunities remains uneven (Cheloti & Kamano, 2024).

Previous studies examined separate factors affecting livestock production and value-chain sustainability. Hassan et al. (2023) investigated supplier training for drought resilience, while Mutune et al. (2024) focused on husbandry, feeding, animal health, welfare, and disease prevention. Machan et al. (2022) examined environmental factors influencing the camel milk value chain, whereas Cheloti and Kamano (2024) identified technology, infrastructure, support-service, and coordination gaps in Samburu County. However, these studies did not examine capacity building as an integrated supplier-development construct combining hygiene training, husbandry training, record keeping, business skills, financial literacy, and farmer learning (Hassan et al., 2023; Cheloti & Kamano, 2024). Consequently, regression-based evidence on its effect on livestock value-chain sustainability in Samburu County remains limited. This study addressed the conceptual, empirical, and contextual gaps by determining

the effect of capacity building on the sustainability of livestock value chains in Samburu County, Kenya.

1.2 Research Objective

To examine the effect of capacity building on the sustainability of livestock value chains in Samburu County, Kenya.

1.3 Research Hypothesis

H₀₁: Capacity building has no statistically significant effect on the sustainability of livestock value chains in Samburu County, Kenya.

2. Literature Review

2.1 Theoretical Review

The study was guided by Human Capital Theory, which is principally associated with Schultz (1961) and Becker (1964). The theory conceptualizes knowledge, education, training, experience, and skills as productive forms of capital that enhance individual and organizational performance (Schultz, 1961). Unlike physical capital, human capital is embodied in individuals and is developed through education, practical learning, professional experience, and investment in competence development (Becker, 1964). The theory assumes that individuals become more productive when they acquire knowledge and skills that improve task performance, problem-solving, adaptation, and decision-making (Schultz, 1961). Training is therefore regarded as an investment whose returns are reflected in increased productivity, improved quality, higher earnings, and greater organizational efficiency (Becker, 1964).

Human Capital Theory is relevant to supplier development because value-chain performance partly depends on the knowledge, skills, and decision-making capabilities of suppliers and intermediaries (Motsholapheko et al., 2024). Pastoralist households make decisions regarding animal feeding, disease prevention, livestock health, product hygiene, resource utilization, and timing of sales (Mutune et al., 2024). Aggregators and collectors consolidate products, maintain quality, coordinate supply volumes, communicate with producers and buyers, and organize transportation to markets (Isako & Kimindu, 2019). Retailers require information on prices, consumer preferences, product quality, handling practices, sales records, and market demand (Cheloti & Kamano, 2024). Developing these competencies can improve individual performance while strengthening coordination, product quality, supply reliability, and market participation across livestock value chains (Motsholapheko et al., 2024).

The theory further proposes that investment in knowledge and skills increases productive capacity and enables individuals to apply improved practices effectively (Becker, 1964). In this study, hygiene training was expected to improve product handling, enhance safety, and reduce spoilage and market rejection (Isako & Kimindu, 2019). Husbandry training was expected to strengthen feeding, animal-health management, disease prevention, productivity, and supply continuity (Mutune et al., 2024). Record-keeping skills were expected to support production planning, sales monitoring, cost management, and informed decision-making (Cheloti & Kamano, 2024). Business training was expected to improve pricing, negotiation, customer relations, and market selection (Mohamed & Nori, 2024). Financial literacy was expected to strengthen income management, saving, borrowing, and investment decisions (Ahairwe & Bilal, 2022). Farmer-learning activities were expected to support knowledge sharing, peer

interaction, collective problem-solving, and adoption of improved livestock practices (Hassan et al., 2023).

A major strength of Human Capital Theory is its direct connection between investment in learning and improvements in productivity and performance (Becker, 1964). However, it has been criticized for underestimating structural barriers such as poverty, market exclusion, weak infrastructure, resource inequality, and institutional limitations (Bowles & Gintis, 1975). Trained livestock actors may still be unable to maintain product quality where clean water, veterinary services, suitable containers, transportation, electricity, and cooling facilities are inadequate (Machan et al., 2022). Improved business and financial knowledge may also produce limited outcomes where actors lack affordable finance, reliable buyers, appropriate technology, and organized markets (Ahairwe & Bilal, 2022). The study therefore treated capacity building as important but insufficient on its own. Nevertheless, Human Capital Theory provided an appropriate basis for examining how technical, managerial, financial, and learning competencies influenced livestock value-chain sustainability in Samburu County.

2.2 Empirical Review

2.2.1 Capacity Building and Sustainability of Livestock Value Chains

Capacity building comprises formal and informal learning processes through which value-chain actors acquire technical knowledge, managerial skills, and adaptive competencies (Tuggle et al., 2025). These competencies support informed decisions concerning animal feeding, husbandry, disease prevention, hygiene, product handling, preservation, and climate-risk management (Mutune et al., 2024). Increasing commercialization also requires livestock suppliers to develop skills in record-keeping, financial management, price evaluation, negotiation, customer relations, and market coordination (Mohamed & Nori, 2024). Capacity building can therefore strengthen livestock value-chain sustainability by improving productivity, product quality, market participation, and resilience (Motsholapheko et al., 2024).

Internationally, Barbaruah (2024) reviewed livestock-related emergencies and response systems in Eastern Europe and Central Asia. The review established that preparedness training, technical competence, and institutional response capacity strengthened the ability of livestock-dependent communities to identify risks, coordinate interventions, and respond to crises (Barbaruah, 2024). However, the study concentrated on emergency preparedness rather than routine supplier development, livestock marketing, and long-term value-chain sustainability (Barbaruah, 2024). It therefore provided limited evidence on how continuous capacity building influences daily production, handling, financial management, record keeping, and market participation.

In Southern Africa, Motsholapheko et al. (2024) examined extension-based capacity building among beef suppliers and found that extension support improved supplier knowledge, production practices, and value-chain participation. The findings linked learning interventions to both farm-level productivity and supplier participation in broader livestock markets (Motsholapheko et al., 2024). Nevertheless, the study focused on beef suppliers, while the present study covered pastoralist households, aggregators, collectors, and retailers involved in livestock value chains in Samburu County.

Hassan et al. (2023) examined livestock-supplier training for drought resilience in a pastoralist context and established that training improved preparedness, coping capacity, and adoption of drought-resilient practices. The findings are relevant to Samburu County because drought and climatic variability influence livestock production, pastoral mobility, household livelihoods, and supply reliability (Machan et al., 2022). However, Hassan et al. (2023) focused primarily on drought resilience rather than broader sustainability outcomes such as income stability, product-loss reduction, market access, supply consistency, and buyer relationships.

Kenyan evidence also demonstrates the importance of technical and managerial competence. Mutune et al. (2024) identified feeding, husbandry, welfare, disease prevention, and animal-health management as essential to livestock productivity and supply continuity. Isako and Kimindu (2019) found that inadequate hygiene knowledge, weak product handling, limited processing skills, and poor market organization constrained Kenya’s camel milk value chain. In northern Kenya, commercialization is influenced by household needs, pastoral mobility, pricing arrangements, social relationships, and buyer–supplier interactions (Mohamed & Nori, 2024). These conditions require business, record management, negotiation, and customer relations competencies alongside technical husbandry knowledge (Mohamed & Nori, 2024).

The literature revealed conceptual, methodological, and contextual gaps. Existing studies examined separate dimensions of capacity building rather than an integrated construct (Barbaruah, 2024; Hassan et al., 2023; Motsholapheko et al., 2024). Some relied on reviews and technical assessments that did not quantify capacity building’s effect on sustainability (Barbaruah, 2024; Mutune et al., 2024). They also did not examine multiple livestock actors within Samburu County (Hassan et al., 2023; Cheloti & Kamano, 2024). This study addressed these gaps by measuring hygiene training, husbandry training, record-keeping, business skills, financial literacy, and farmer learning and testing their effect on livestock value-chain sustainability.

2.3 Conceptual Framework

The conceptual framework illustrates the proposed relationship between the independent and dependent variables, as presented in Figure 1.

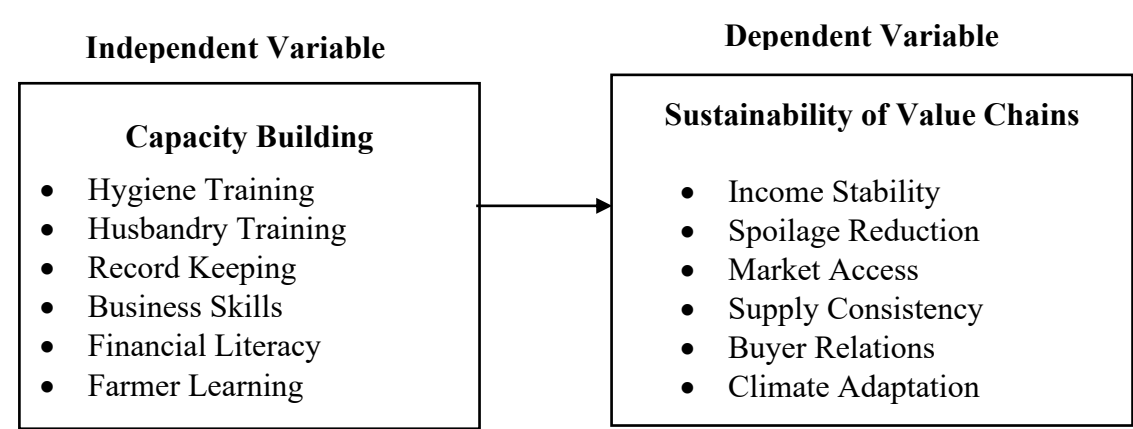


Figure 1: Conceptual Framework

3. Methodology

The study adopted descriptive and correlational research designs. The descriptive design summarized capacity-building practices and sustainability outcomes, while the correlational design established the relationship between capacity building and livestock value-chain sustainability. The study was conducted in Samburu County, Kenya, and targeted 3,458 pastoralist households, aggregators or collectors, local retailers, and key informants.

A sample of 359 participants was determined using Yamane's formula. Proportionate stratified sampling distributed the sample across respondent categories, while simple random sampling selected pastoralist households, aggregators or collectors, and retailers. Key informants were selected purposively based on their knowledge of livestock development, veterinary services, extension support, markets, and value-chain coordination.

Quantitative data were collected using a structured questionnaire, while qualitative data were obtained through a semi-structured key-informant interview guide. Capacity building was measured using six five-point Likert-scale items covering hygiene training, husbandry training, record keeping, business skills, financial literacy, and farmer learning. Sustainability was measured using income stability, spoilage reduction, market access, supply consistency, buyer relationships, and climate adaptation.

The instruments were piloted among approximately 10% of the sample in Isiolo County. Expert review established validity, while reliability was assessed using Cronbach's alpha at a minimum threshold of 0.70. Research authorization, informed consent, confidentiality, anonymity, and voluntary participation were observed.

Of the 359 instruments distributed, 250 were returned (69.6%). Quantitative analysis used 250 questionnaires, while five key informant interviews were analyzed thematically. Means and standard deviations summarized the variables. Pearson correlation established the relationship between the variables, while simple linear regression tested the hypothesis at the 5% significance level. Diagnostic tests confirmed normality, linearity, homoscedasticity, independence of errors, and absence of problematic multicollinearity.

4. Results and Discussion

4.1 Response Rate

The study targeted 359 participants drawn from pastoralist households, aggregators or collectors, local retailers, and key informants involved in livestock value chains in Samburu County. Of the 359 research instruments distributed, 250 were completed and returned, representing an overall response rate of 69.6%. The remaining 109 instruments were not returned, accounting for 30.4% of the distributed instruments.

Table 1: Response Rate

Response Category	Frequency	Percentage (%)
Returned instruments	250	69.6
Unreturned instruments	109	30.4
Total distributed	359	100.0

All the returned instruments were included in the study analysis. Quantitative responses were analysed using descriptive and inferential statistical techniques, while information obtained from key informants was analysed thematically. The qualitative findings were used to provide additional explanations and contextual support for the quantitative results. The response rate was considered adequate because it provided information from all the relevant respondent categories and supported the planned analysis of capacity building and livestock value-chain sustainability.

4.2 Descriptive Analysis of Capacity Building

The study assessed capacity building using six indicators: hygiene training, husbandry training, record keeping, business skills, financial literacy, and farmer-learning activities. As presented in Table 2, capacity building recorded an aggregate mean of 3.44 and a standard deviation of 0.97, indicating a high level of agreement among respondents. However, technical training and collaborative learning were more strongly established than record keeping and financial literacy.

Table 2: Descriptive Analysis of Capacity Building

Statement	Mean	SD
Hygiene training has improved livestock-product handling practices.	3.71	0.88
Husbandry training has improved livestock-production practices.	3.63	0.91
Record-keeping skills are applied in livestock production or marketing.	3.06	1.09
Business skills support better livestock-marketing decisions.	3.45	0.97
Financial literacy improves the management of income from livestock value-chain activities.	3.28	1.04
Farmer-learning activities improve knowledge sharing among value-chain actors.	3.52	0.93
Aggregate Mean/SD	3.44	0.97

Hygiene training recorded the highest mean score ($M = 3.71$, $SD = 0.88$), indicating that respondents generally agreed that training had improved livestock-product handling practices. This result supports Isako and Kimindu (2019), who identified poor handling practices as an important constraint within livestock value chains. Husbandry training ranked second ($M = 3.63$, $SD = 0.91$), demonstrating its contribution to improved livestock-production practices. This finding is consistent with Mutune et al. (2024), who emphasized animal health and husbandry competence as important foundations of livestock productivity.

Farmer-learning activities recorded a high mean score ($M = 3.52$, $SD = 0.93$), suggesting that field days, peer learning, group interaction, and practical demonstrations promoted knowledge sharing among livestock actors. Business skills also recorded a high mean score ($M = 3.45$, $SD = 0.97$), indicating that training supported livestock-marketing decisions. This finding is relevant because commercialization requires value-chain actors to evaluate prices, compare

buyers, negotiate trading terms, and maintain productive market relationships (Mohamed & Nori, 2024).

Financial literacy recorded a moderate mean score ($M = 3.28$, $SD = 1.04$), indicating that the ability to manage income from livestock activities was not consistently developed across respondents. Financial literacy enables livestock actors to separate household and enterprise finances, manage seasonal income, evaluate borrowing options, save for emergencies, and make informed investment decisions (Ahairwe & Bilal, 2022). Its moderate rating suggests that capacity-building programmes placed less emphasis on financial competencies than on technical production practices.

Record-keeping recorded the lowest mean score ($M = 3.06$, $SD = 1.09$), indicating that its application in livestock production and marketing remained moderate. The relatively high standard deviation showed considerable variation in record-keeping practices among respondents. Records enable actors to monitor production volumes, sales, prices, animal-health interventions, customers, and operating costs. Weak record-keeping can therefore limit planning, performance evaluation, traceability, and financial decision-making.

Qualitative findings supported the descriptive results. Respondents reported that hygiene and husbandry training improved product handling and livestock management. Key informants identified demonstrations, farmer field days, and group learning as effective methods of reaching pastoralist communities. However, they observed that record keeping and financial literacy were not consistently practised. Some livestock actors relied on memory or informal notes, while others experienced difficulty applying conventional training because of literacy limitations, pastoral mobility, and inadequate follow-up support.

Overall, capacity building was relatively well established but remained uneven across its dimensions. Technical training and collaborative learning were stronger than the managerial competencies required to monitor production, costs, income, and performance. Future capacity-building programmes should therefore maintain practical hygiene and husbandry training while placing greater emphasis on simple record-keeping systems, financial literacy, and business-management skills.

4.3 Descriptive Analysis of Sustainability of Livestock Value Chains

The sustainability of livestock value chains was assessed using six indicators: income stability, spoilage reduction, market access, consistency of supply, buyer relationships, and climate adaptation. As shown in Table 3, sustainability recorded a composite mean of 3.43 and a standard deviation of 0.97, indicating a high overall level. Nevertheless, the individual results showed that income stability and consistency of supply remained moderate.

Table 3: Descriptive Analysis of Livestock Value-Chain Sustainability

Statement	Mean	SD
Income from livestock value-chain activities is stable.	3.38	1.02
Spoilage of livestock products has reduced.	3.46	0.96
Access to livestock markets has improved.	3.61	0.91
The supply of livestock products remains consistent across seasons.	3.14	1.08
Buyer relationships within the livestock value chain are strong.	3.57	0.89
Climate-adaptation practices support livestock production.	3.42	0.98
Composite Mean/SD	3.43	0.97

Improved market access recorded the highest mean score ($M = 3.61$, $SD = 0.91$), followed by strong buyer relationships ($M = 3.57$, $SD = 0.89$). These results indicate that respondents generally perceived improvements in market participation and relationships between suppliers and buyers. Reduced spoilage also received a high rating ($M = 3.46$, $SD = 0.96$), suggesting progress in livestock-product handling and preservation.

Climate-adaptation practices recorded a high mean score ($M = 3.42$, $SD = 0.98$), indicating that livestock actors had adopted measures that supported production under changing environmental conditions. However, income stability recorded a moderate mean score ($M = 3.38$, $SD = 1.02$), showing that earnings from livestock value-chain activities remained uneven. Consistency of supply received the lowest mean score ($M = 3.14$, $SD = 1.08$), indicating that livestock-product availability continued to fluctuate across seasons.

Overall, livestock value-chain sustainability was relatively high but had not been fully achieved. Market access, buyer relationships, spoilage reduction, and climate adaptation were comparatively well established. In contrast, income stability and consistent supply remained constrained by seasonal production, drought, transportation difficulties, and inadequate cooling facilities. Strengthening capacity building alongside infrastructure, animal-health services, financial support, and market coordination could further improve the sustainability of livestock value chains.

4.4 Pearson Correlation Analysis

Pearson correlation analysis established the direction and magnitude of the association between capacity building and sustainability. The results are presented in Table 4.

Table 4: Pearson Correlation between Capacity Building and Sustainability

Variable	Capacity Building	Sustainability
Capacity Building: Pearson correlation	1	0.612**
Sig. (2-tailed)	—	<0.001
Sustainability: Pearson correlation	0.612**	1
Sig. (2-tailed)	<0.001	—
N	250	250

Note. **Correlation is significant at the 0.01 level (2-tailed).

Capacity building had a strong positive and statistically significant relationship with sustainability ($r = 0.612$, $p < 0.001$). This means that stronger hygiene and husbandry training, record keeping, business skills, financial literacy and farmer learning were associated with higher income stability, lower spoilage, improved market access, more reliable supply, stronger buyer relationships and better climate adaptation.

The finding is consistent with Human Capital Theory because it shows that investment in knowledge and competence is associated with improved productive and organizational outcomes. It also agrees with Hassan et al. (2023), who linked livestock supplier training to drought preparedness and resilient practices, and Motsholapheko et al. (2024), who associated extension-based capacity building with stronger supplier participation. The relationship does not by itself establish that every training intervention will produce equal benefits; the content, delivery method and enabling environment remain important. Nevertheless, its magnitude indicates that capacity building is a substantive factor rather than a peripheral support activity.

4.5 Bivariate Linear Regression Analysis

Simple linear regression was used to test whether capacity building predicted sustainability and to evaluate the null hypothesis. The model summary is presented in Table 5.

Table 5: Regression Model Summary for Capacity Building

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.612	0.375	0.372	0.469

Dependent variable: Sustainability of livestock value chains

Predictor: Capacity building.

The model produced $R = 0.612$ and $R^2 = 0.375$. Capacity building therefore explained 37.5% of the observed variation in sustainability, while 62.5% was associated with factors outside the bivariate model. The adjusted R^2 of 0.372 was close to the unadjusted value, indicating model stability after accounting for sample size. An explanatory proportion of 37.5% is practically meaningful for a construct measured within a complex pastoral value chain because sustainability is also shaped by climate, infrastructure, technology, finance, market conditions, and institutional support.

The ANOVA results in Table 6 tested whether the regression model provided a significantly better prediction than a model without capacity building.

Table 6: ANOVA for Capacity Building and Sustainability

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	32.135	1	32.135	145.864	<0.001
Residual	53.558	243	0.220		
Total	85.693	244			

The model was statistically significant, $F(1, 243) = 145.864$, $p < 0.001$. Capacity building therefore significantly predicted sustainability, and the observed relationship was unlikely to be attributable to random sampling variation.

Table 7: Linear Regression Coefficients for Capacity Building

Predictor	Unstandardized B	Std. Error	Standardized Beta	t	Sig.
Constant	1.512	0.160	—	9.450	<0.001
Capacity Building	0.568	0.047	0.612	12.078	<0.001

Dependent variable: Sustainability of livestock value chains.

The coefficient for capacity building was positive and statistically significant ($B = 0.568$, $SE = 0.047$, $\beta = 0.612$, $t = 12.078$, $p < 0.001$). A one-unit improvement in the capacity-building score was associated with a 0.568-unit increase in the predicted sustainability score. The estimated equation was:

$$\text{Sustainability} = 1.512 + 0.568(\text{Capacity Building})$$

Since the p-value was below 0.05, the null hypothesis that capacity building has no statistically significant effect on sustainability was rejected. The evidence supports the conclusion that capacity building positively influences the sustainability of livestock value chains in Samburu County.

The result confirms Hassan et al.’s (2023) training–resilience relationship, supports Motsholapheko et al. (2024) on supplier competence and complements Cheloti and Kamano’s (2024) local mapping with quantified evidence. Taken together, the findings show strong technical and peer-learning foundations but weaker record and financial competencies.

Practical demonstrations, extension follow-up, local-language delivery and peer learning are likely to be more suitable than classroom instruction alone.

The unexplained 62.5% of variance is equally instructive. Sustainability depends on access to water, animal-health services, transport, cooling, finance, technology, buyers and supportive institutions. Training can help actors make better decisions within these conditions but cannot substitute for basic infrastructure and market access. Capacity building should therefore be designed as part of an integrated supplier-development strategy rather than an isolated intervention.

5. Conclusion

The study established that capacity building had a positive and statistically significant effect on the sustainability of livestock value chains in Samburu County, Kenya. Capacity building strengthened the knowledge and skills required by pastoralist households, aggregators, collectors, and retailers to improve livestock production, product handling, knowledge sharing, and market participation. The regression findings confirmed that capacity building significantly predicted sustainability, leading to rejection of the null hypothesis.

Hygiene training was the most strongly established practice, followed by husbandry training and farmer-learning activities. Business skills also supported pricing, negotiation, customer relations, and marketing decisions. However, record keeping and financial literacy were comparatively weaker, potentially limiting production planning, cost control, income management, and performance monitoring. The study concludes that capacity building is a strategic supplier-development practice whose effectiveness depends on continuous, practical, accessible, and context-responsive training.

6. Recommendations

Samburu County livestock, veterinary, and extension departments should provide continuous training aligned with production cycles, drought risks, and market seasons. Training should emphasize hygienic handling, animal health, feeding, disease prevention, drought preparedness, business management, record keeping, and financial literacy. Practical demonstrations, local languages, mobile extension services, and follow-up visits should be used to improve accessibility and application.

Producer organizations and development partners should expand farmer field days, peer-learning forums, and exchange visits while promoting the participation of women and young people. County agencies should evaluate programmes using indicators such as adoption of improved practices, product quality, loss reduction, record use, income management, market access, and supply reliability. Capacity building should also be integrated with investments in veterinary services, clean water, cooling facilities, transport, digital communication, finance, and market infrastructure to strengthen long-term sustainability and resilience.

References

- Ahairwe, P. E., & Bilal, S. (2022). *AgriInvest-Food Systems Project: Leveraging private finance for sustainable agrifood value chains in Burkina Faso, Ethiopia, Kenya and Niger*. Food and Agriculture Organization.
- African Union–Interafrican Bureau for Animal Resources. (2022). *Sustainable livestock development for livelihoods and economic growth in Africa*. <https://www.au-ibar.org>

- Azine, P. C., Mugumaarhahama, Y., Mutwedu, V. B., Baenyi, S. P., Kunde, E. A., Mwanga, J. C. I. M., & Ayagirwe, R. B. B. (2025). Livestock feeding practices in South Kivu, Eastern Democratic Republic of Congo: Challenges and opportunities. *Discover Animals*, 2(1), Article 8.
- Bahta, S., Wanyoike, F., Kirui, L., Mensah, C., Enahoro, D., Karugia, J., & Baltenweck, I. (2023). Livestock sector transformation in Kenya: Current state and projections for the future. In *Food systems transformation in Kenya* (p. 51).
- Balehegn, M., Kebreab, E., Tolera, A., Hunt, S., Erickson, P., Crane, T. A., & Adesogan, A. T. (2021). Livestock sustainability research in Africa with a focus on the environment. *Animal Frontiers*, 11(4), 47–56.
- Barbaruah, M. I. (2024). *Desk review of livestock-related emergencies and response in Eastern Europe and Central Asia*.
- Becker, G. S. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education*. National Bureau of Economic Research.
- Bowles, S., & Gintis, H. (1975). The problem with human capital theory: A Marxian critique. *American Economic Review*, 65(2), 74–82.
- Cheloti, M., & Kamano, H. (2024). Livestock value-chain mapping and technology-needs assessment in Samburu County, Kenya. *Journal of Environmental Science and Agricultural Research*, 2(4), 1–9.
- Hassan, A. M., Jama, A. O., & Mohamed, S. A. (2023). Livestock supplier training for drought resilience. *Pastoralism*, 13(1), Article 12.
- Isako, T., & Kimindu, V. (2019). Camel milk value chain in Kenya: A review. *Journal of Marketing and Consumer Research*, 58, 51–64.
- Machan, S. N., Agwata, J. F., & Oguge, N. O. (2022). Environmental factors influencing the sustenance of the camel milk value chain in Isiolo County, Northern Kenya. *Resources*, 11(3), Article 27. <https://doi.org/10.3390/resources11030027>
- Mohamed, T. S., & Nori, M. (2024). The moral economy behind the commoditisation of camel milk in northern Kenya. *Journal of Eastern African Studies*, 1–22.
- Motsholapheko, M. R., Kgathi, D. L., & Vanderpost, C. (2024). Beef supplier capacity building through extension services. *Livestock Science*, 285, Article 105678.
- Mutune, J., Mureithi, S., Kibet, S., Kipleting, N., Miruye, K., Gitonga, P., & Lalaigwanani, J. (2024). *Camel husbandry, health and welfare handbook*. TRAMAP Project, AgriFoSe2030 Programme, University of Nairobi.
- Schultz, T. W. (1961). Investment in human capital. *American Economic Review*, 51(1), 1–17.
- Tuggle, F. J., Afolayan, O. W., Smith, M. A., Cline, D. J., & Kiadii, O. (2025). Evaluation of a global capacity development project to educate, empower and advance sustainable food production. *Journal of Social Work in the Global Community*, 8(1), 1.