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Enhancing Competitiveness of Livestock Markets in Arid Regions: Focus On Livestock Production, Marketing, and Trade Systems in Turkana, Kenya

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Abstract: The study examined the performance of livestock markets in arid areas, specifically in Turkana, with an emphasis on competitiveness and determinants of market access within livestock production, marketing, and trade systems. The research study involved 168 livestock traders selected from operational livestock markets in Turkana, specifically Kerio (Turkana Central Sub County), Lokiriama (Loima Sub County), and Kachoda (Turkana North Sub County), with their performances also juxtaposed against other markets in arid regions of Kenya. The study results indicated that extreme competition is evident in the Turkana livestock marketing system, considerably affecting livestock production and marketing activities. This leads to the non-functionality of some potential markets, diminishes the competitiveness of several traders, and ultimately obstructs market access initiatives. Factors include inadequate legislation, insufficient research, informal marketing systems, resource –based conflicts and insecurity, restricted capital, market competition, exploitation of low-capital traders, and climate change intensify these consequences. The study advocates for comprehensive programming in livestock development in Turkana, emphasising stakeholder capacity enhancement, systems-oriented methodologies, knowledge and technology dissemination, legislative improvements, and the augmentation of competition and market access capabilities. This includes the transformation of Livestock Marketing Associations (LMAs) into Livestock Marketing Cooperatives (LMC) and the increase of capital resources for livestock businesses to enhance the competitiveness of local traders and diversify enterprises. These objectives are accomplished when national and county livestock plans incorporate the production and marketing potential of dryland regions.

Keywords: Livestock Production, Market Access, Pastoral Economy, Market Functionality, Competition, Livestock Policy.

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1. Introduction

Livestock plays a crucial role in expanding state economies and developing sustainable food systems. The global market for livestock is expected to reach $20 billion by 2026, with production expected to reach over 2 billion heads. However, the livestock industry in Africa contributes 30–80% of the continent's GDP (FAO et al., 2020). Livestock and development programmes contribute to the 17 Sustainable Development Goals (SDGs), notably poverty eradication (SDG 1), zero hunger (SDG 2), good health and wellbeing (SDG 3), gender equality (SDG 5), decent work and economic growth (SDG 8), industry, innovation and infrastructure (SDG 9), reduced inequalities (SDG 10), sustainable cities and communities (SDG 11), responsible consumption and production (SDG 12), climate action (SDG 13), and partnerships for the goal (SDG 17).

In Kenya, the livestock industry provides subsistence for a significant portion of the population, contributing to food, economic, and nutrition security (Martijn and van Leynseele, 2018). It is estimated that 80 per cent of Kenya's landmass is classified as Arid and Semi-Arid Lands (ASALs). Despite having the biggest livestock population in Kenya, Turkana is also the area with the lowest standard of living in the country. Twenty years ago, according to data from the year 2000, seventy percent of the population of Turkana was either nomadic or semi-nomadic. This number has decreased to approximately sixty per cent as a result of the severe effects that climate change and urbanization have had on pastoral economies and ways of living.

Increasingly, pastoralists are dropping out of livestock farming occupation as a result of drought, disease, insecurity and cattle rustling, increasing urbanisation and severity of arid areas hardships. According to Shabana and Matanda (2019) and Anno and Pjero (2021), the dominance of urbanisation, land grabbing over pastoral lands and migration from rural areas to urban areas exacerbate the challenges affecting pastoral livestock farming systems. Kenya’s livestock policy is elaborate in guiding the development of livestock subsectors such as dairy, beef, and poultry farming on matters of production, health, market development and access, processing, and agribusiness, with the private sector at the centre of such market-orientated models (Anno and Pjero, 2021).

The livestock policy remains largely silent on enhancing such subsectors in the arid areas of Kenya. This scenario denies pastoral and agropastoral communities and livestock entrepreneurs in the arid areas the ability to maximise the production and trade of cattle, sheep, goats, and camels, which are largely produced in the arid areas as envisioned in Kenya's Agricultural Sector Growth Strategy (ASGTS, 2019–2029). Having frameworks that encompass various aspects of livestock development in arid areas will not only create avenues for productive and lucrative livestock farming but also orient pastoral farming systems, which are largely subsistence, despite the availability of enormous factors of production, to market-driven livestock farming, which is competitive, profitable, and sustainable (Isako et al., 2019).

Modernisation of livestock trading, especially in the urban and peri-urban areas in Kenya, is aimed at motivating livestock production and market access among livestock keepers and entrepreneurs. However, livestock production and marketing elements and best-fitting livestock trade systems have not yet been achieved due to a myriad of challenges and untapped opportunities which call for livestock policy strengthening, research advancements and decentralisation of finance as prescribed in Anno and Pjero (2021).

Livestock production and marketing systems are essential components of the expansion of the livestock industry in any jurisdiction and farming context. These systems make it possible to create and communicate the value of animals and livestock products to various market segments, which is a critical step in the growth of the livestock sector. Controlling the variables that affect competition and market access would, as a result, increase livestock development programming in arid areas. Such an approach will enable pastoral areas to maintain investments in livestock production and marketing them with greater flexibility in markets with varying capacities (Berihun, 2017; Anno, 2025).

2. Literature Review

2.1 Livestock for Development

The livestock industry and the associated economic opportunities provide food, livelihoods, and income for a significantly larger number of people across the world. These benefits stem from various sources. Investments in livestock development are made by governments and development partners, civil society organisations, and livestock farming entrepreneurs. The key intention is to boost livestock production and productivity for industry growth and humanity's wellbeing (Zhou and Staatz, 2016). The rapid increase in demand for livestock products (LPs) in developing nations is referred to as a "food revolution".

Livestock supplies account for more than fifty per cent of the world's agricultural production, with thirty per cent of that supply coming from developing nations. Currently, consumption levels in developing nations are low, but they are expected to increase as wages and other pull factors continue to rise. The enhanced livestock productivity, competitiveness, and market access enablers are anticipated to bring about an expansion of the economies of states and regions that engage in livestock farming. It is also anticipated that these enablers will contribute to the development of rural areas by facilitating the creation of jobs and the reduction of poverty, which has stunned the pastoral areas for many years (Berihun, 2017).

2.2 Livestock Markets and Dryland Economies

The term "marketing" refers to the product channels, market actors, and commercial activities that are responsible for facilitating the passage of goods and services from producers to consumers. Purchasing, selling, and slaughtering animals are all part of the livestock trade in dryland regions. Additionally, the meat is processed and value added, and the livestock and products are marketed at intended markets. Marketing is associated with functions that add value to farm output in agriculture, and market access is an essential component of market involvement and risk management for pastoralists. As a result, a bigger share of the sale of animals and livestock products occurs on marketplaces that are moderately competitive (Isako et al., 2019).

In the arid areas, when drought is occurring, marketing plays a pivotal role in altering herd sizes to reduce pressure on scarce environmental resources. The majority of the time, livestock is sold in pastoral areas to raise money to meet the financial requirements of families for things like food, clothes, education, and medical care. The transportation of livestock and products to markets, on the other hand, presents a barrier for many livestock businesses, which hinders the efficiency of livestock trading and the economic rewards that may be obtained from markets (Abebe et al., 2018).

2.2.1 Socioeconomic Factors on Livestock Markets

There are a variety of socioeconomic factors that can restrict the performance of livestock entrepreneurs in various market segments. These factors include culture, religious practices, beliefs, conflicts, poverty, and limited firm start-ups. Likewise, according to Berihun (2017), there are a number of factors that are driving the consumption of animal products, including but not limited to population growth, urbanisation and the expansion of urban centres, income levels in developing nations, foreign influences, and technological breakthroughs.

The successful implementation of a livestock marketing system has a significant and favourable impact on the commercialisation of livestock trade. Organising livestock production and marketing interventions with strong market links can enable local entrepreneurs to join new markets and become more competitive (Ameso et al., 2018). The impact is demonstrated by the practices and processes of livestock marketing, as well as the role of sectors that do not include livestock in dryland areas.

2.2.2 Livestock Production and Marketing Risks

There are different livestock farming and trade systems around the world, and animal markets are frequently seen as hotspots for the transfer of diseases (Anno and Pjero, 2021). It is vital to increase knowledge of the hazards associated with livestock trade systems and markets to facilitate the establishment of livestock development initiatives that are targeted and based on evidence. Markets for animals are excellent locations for the collection of data and the dissemination of information. Nevertheless, stakeholders and policymakers responsible for livestock do not have a sufficient understanding of animal markets and the ways they influence public health. The most significant aspect of this knowledge gap is the role that policy and research play in ensuring sustainable livestock development (Kelley et al., 2019; Mousley, 2015).

Concerns about the health of animals and the general population can be alleviated throughout the entire supply chain for livestock by reorganising and managing livestock developments in a more careful and organised manner. Trade across international borders is the principal source of revenue for the vast majority of livestock-based business owners in the Horn of Africa region. This, according to Hardstaff et al. (2015), will encourage the development of the livestock sector as well as the economic viability of livestock farming and industry at various levels of the economy. Strengthening the cross-border livestock trade protocol, regional livestock development initiatives, and ongoing stakeholder engagements are all ways to make livestock sector and industry developments more robust and yielding.

2.2.3 Institutional Livestock Development Solutions

Reforms in legal, institutional, and policy frameworks, in addition to the participation of stakeholders, are necessary to develop livestock market solutions that are sustainable. Concerns pertaining to institutions and policies are impacting the number of livestock and trade activities that take place in countries and regions that engage in these activities (Mugunieri, 2016). To note, there is a correlation between the protocols that govern the international market and the efficiency of international trade, which is made possible by the unrestricted movement of livestock and products. Social, economic, and political instability in the market region negatively impacts the performance and diversity of the livestock trade by increasing the dynamics of livestock production and marketing (Napp et al., 2018).

Extreme competition is caused by a lack of formal marketing, systemic imbalances in supply and demand forces, ineffective management of non-market forces, and an increase in the dynamics of livestock production and marketing frameworks. Some of the significant ways in which the performance of local and regional markets can be improved include the participation of young people and women in the livestock trade, the incorporation of adult literacy programmes into pastoral production systems, the establishment of proactive livestock development directorates, and the foundation of livestock marketing in viable business models and strategies (Lubungu, 2016).

2.3 Supply and Demand relationship in livestock Markets

It is necessary for livestock farmers to raise the amount of animal resources they produce and reduce the amount of money they spend on transactions to have an effective production and marketing strategy that is efficient and sustainable (Anno and Pjero, 2021). If small-scale farmers are to be lifted out of poverty through market access, it is now more important than ever before to educate farmers on the appropriate breeding stock and local breed improvement, to increase investment in livestock health management, to disseminate information about prices, and to improve the quality of meat and milk produced by livestock. Also, construction of infrastructure for livestock production and trading, as well as the conduct of research to inform policies and strategies for maximising livestock value chains, should be a collaborative effort between governments, community producer organisations, and other interested parties in the private sector (Aggrey et al. 2018).

2.4 Brokerage in Livestock Production and Trade

Brokers are one of the most important market actors. They function as a mediator for both legal and informal transactions that take place inside and between livestock markets, making them crucial in the movement of commodities and services both within and across national borders (Holm et al., 2019). When it comes to the trade of livestock across international borders in the borderlands of Kenya and Somalia, brokers play a vital role. The analysis of broking offers crucial insights into the informal economy of the African borderlands. The suppliers and consumers of livestock and livestock products that are involved in cross-border trading networks are usually separated by substantial distances. Additionally, the vendors and purchasers may have their headquarters in trade corridors that have a variety of institutional contexts and risk exposures (Manyeki et al., 2021).

Inter-ethnic commercial transactions are the primary area in which brokers provide assistance. Additionally, brokers are responsible for negotiating prices with other dealers and ensuring the safety of producers in border markets that are regulated by informal standards. Brokers are responsible for providing market information on remote marketplaces. Information asymmetry is a problem not only in livestock sales but also in businesses all over the world. This phenomenon creates a gap or "structural hole" in trade networks, which must be addressed by brokering (Martijn and van Leynseele, 2018).

2.5 Livestock Marketing and Export Constraints

Most livestock production systems in Africa rely on subsistence farming, leading to low output levels. The principal limitations that are placed on the production of livestock for export are the low animal productivity and the absence of production techniques that are orientated towards the market (Murendo et al., 2020). For the livestock trading industry to function well, there must be a well-developed infrastructure for the transportation of livestock, as well as modern slaughterhouses, areas for animals to rest, and facilities for storage and quarantine.

The production and selling of livestock in pastoral, agro-pastoral, mixed farming, urban and peri-urban farming, and specialised intensive farming systems can be made more economically feasible, productive, market-orientated, competitive, and sustainable through the implementation of ethical and environmentally sensitive production and trade systems (Zhou and Staatz, 2016).

3. Methodology

3.1 Sampling, Data Collection and Analysis

A total of 180 registered livestock traders were identified to participate in the study. The participants consisted of livestock traders operating in the three sampled markets in Turkana. The markets included Kerio, Lokiriama, and Kachoda. A confidence level of 95% and a margin of error of 2% were employed in the statistical sampling process, yielding a sample size of 168 traders, representing 93% of the total population under examination. The research instruments employed were semi-structured questionnaires. Data triangulation employed PRA methodologies like visualisation, ranking, scoring, alongside secondary data from literature reviews.

The data was examined quantitatively, employing standard deviation to calculate numerical variables, frequencies, and percentages. The chi-square test was employed to ascertain significant differences among categorical variables, while the Kruskal-Wallis test was utilised to compare numerical variables across respondents in the three livestock markets. Qualitative data was evaluated through coding, topic development, interpretation of findings, validation and reliability assessment, with results presented logically and systematically.

4. Results and Discussion

4.1 *Quantitative Results*

4.1.1 Demographic Characteristics of Study Participants

The average age of the respondents in all three marketplaces was 36.45 years old. The standard deviation was 8.83 years, and the age range of the respondents was anywhere from 18 to 65 years old. Men made up the majority of the responses (83.47% of them). 79.27% of the study respondents were illiterate, and only 3.80% of them had completed a certificate training program. The standard deviation of the respondents' years of experience in livestock production was 5.90 years, with the average number of years of experience being 12.76 years.

The Kruskal-Wallis test demonstrated that there was a statistically significant difference between the three markets with regard to the average number of years spent in livestock marketing. In terms of years in livestock marketing, the respondents from the Lokiriama market had the greatest mean of 14.21 years, while those from Kachoda market had the lowest mean of 11.30 years. At the 5% level of significance, there was a notable difference between these two marketplaces in terms of the mean number of years spent selling livestock. The majority of respondents, which accounted for 95.53% of the total, were livestock keepers, and the findings were consistent across all three markets (Table 1).

Table 1: Descriptive statistics of study respondents

Market	Overall n=168	Kerio livestock Market n=56	Lokiriama Livestock Market n=56	Kachoda Livestock Market n=56	Kruskal Wallis test	Chi-square
Age	36.45 (8.83)	37.74 (7.81)	35.67 (10.68)	35.97 (7.99)	4.613	
Male (%)	83.47	78.40	85.50	86.50		1.502
Female (%)	16.53	21.60	14.50	13.50		
Education level (%)						
Adult Education	16.93	26.7	12.7	11.4		
Certificate	3.80	3.4	4.7	3.3		2.645
Non-literate	79.27	69.9	82.6	85.3		
Years in livestock marketing	12.76 (5.90)	12.77 (4.94)	14.21 (6.32)	11.30 (6.45)	7.085**	
Main occupation						
Business	4.47	5.40	2.60	5.40		0.263
Livestock keeping	95.53	94.60	97.40	94.60		

Note: Figures in the parentheses are the standard deviations associated with the means for the variables indicated.

**P < 0.05 mean significant at 5% level.

Source: Survey data, 2025.

A post hoc analysis for multiple comparisons using Tukey HSD indicated a significant difference in the mean score of livestock production and market access between all markets, that is, Lokiriama and Kachoda livestock markets, Kerio and Lokiriama livestock markets, as well as Kachoda and Kerio livestock markets, at the 5% level.

4.1.2 Livestock Production and Market Access in Turkana

The evaluation of livestock production and market access elements reveals that livestock producers and traders are reaping the benefits of the markets ($\bar{x}$ 3.52), that livestock marketing is widely practiced in Turkana ($\bar{x}$ 3.05), and that despite the challenges faced by arid regions, livestock production is advancing ($\bar{x}$ 2.88). The consideration of value addition for livestock productivity, which was recorded as ($\bar{x}$ 1.43), was the factor that received the least amount of evaluation. Additionally, the study demonstrated that there is a general lack of regulation regarding market research, that livestock marketing systems are ineffective, and that the factors of production for livestock are insufficient.

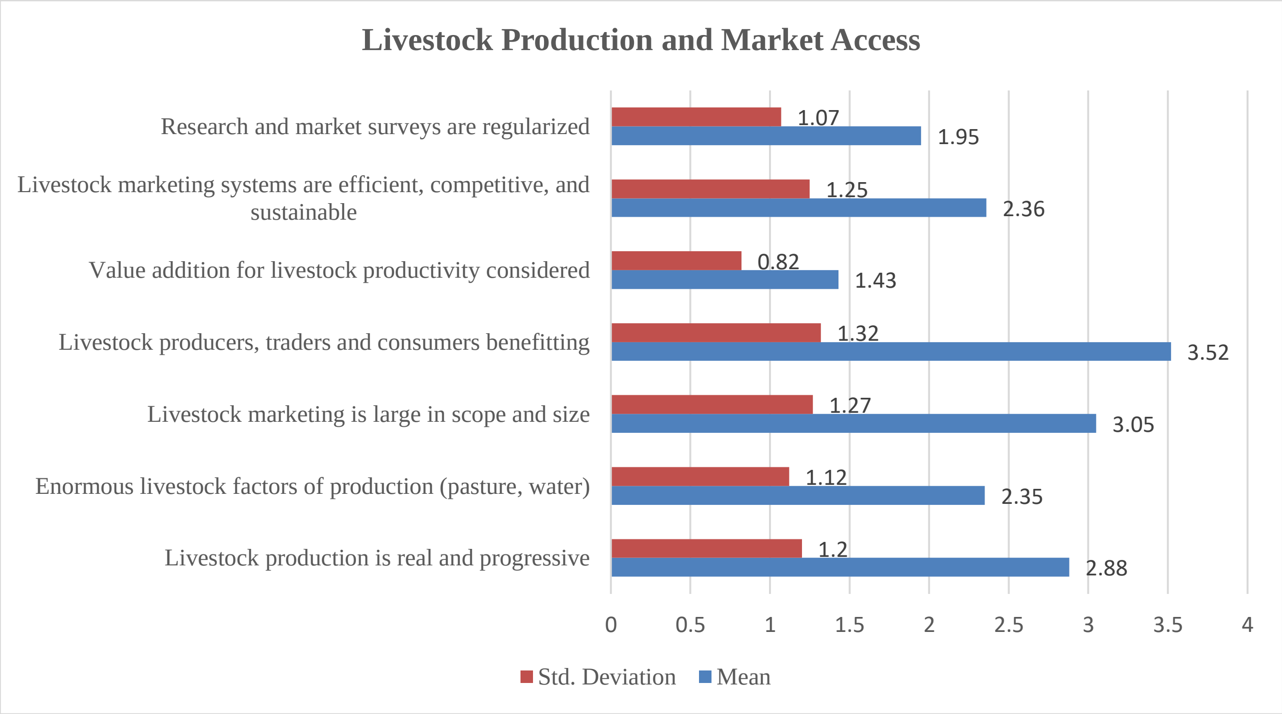

Figure 1: Livestock production and market access elements

4.1.3 Traders' Competition and Rivalry in Turkana

Regarding the competitive rivalry among traders, the study revealed that traders engage in rivalry for their own self-serving benefits ($\bar{x}$ 3.84), livestock traders have a positive relationship with one another ($\bar{x}$ 3.6), competitive rivalry is influencing the performance of the livestock market ($\bar{x}$ 3.57), livestock producers and traders have positive relationships ($\bar{x}$ 3.41), and competitive rivalry is visible in markets ($\bar{x}$ 3.24). One of the components of the lease is that competition in livestock markets is advantageous to the sector ($\bar{x}$ 2.48) and that there is a system in place to govern competition ($\bar{x}$ 2.42). In spite of the challenges that Turkana has in terms of livestock production and marketing, it is clear that the livestock marketing industry has the potential to thrive. On the other hand, intense rivalry continues to be a hindering factor for market expansion attempts.

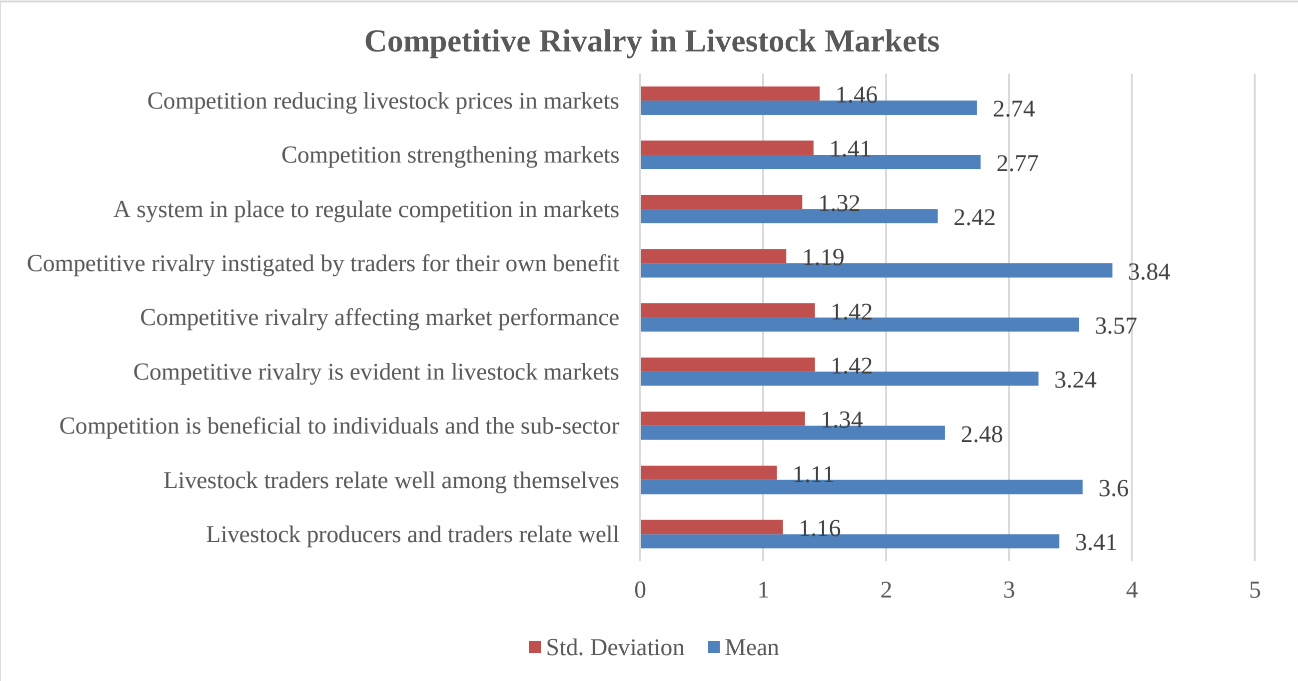

Figure 2: Market competitive rivalry elements

Table 2: Competitive rivalry effects on livestock production and market access

Variable	Coef.	Std. Err.	T	P>t
Constant	1.319	.219	6.028	.000
Trader's competition and rivalry	.381	.069	5.536	.000

F (1, 166) = 30.642, Prob> F = 0.000, R-squared =.156, Adj R-squared=.151

4.2 Qualitative Results

4.2.1 Livestock Production in Turkana County

The major system of livestock production in Turkana is pastoralism; however, the viability of this mode of production is endangered by a number of factors, including livestock disease, drought, diminishing biodiversity and pasture supplies, insufficient water, and mobility constraints. When the cash economy is weak, it makes it difficult for pastoralists to buy the supplies they need for livestock husbandry. This leads to low levels of output, which in turn leads to decreased household wealth and economic stability. Among the other factors that hinder the performance of livestock production systems in Turkana are the instability and unpredictability of border regions that contain sufficient pasture and water resources, the rampant livestock raids and thefts that occur both within and across borders, and the political and transboundary issues that exist with neighbouring countries.

In pastoral communities, rangelands and grazing grounds are experiencing a decline as a result of increasing urbanisation and built economy investments. There has been a significant influence that climate change has had on the economy and the pastoral production system. This is because the output and productivity of livestock have been impacted significantly. Turkana pastoralists continue to face challenges in transitioning from subsistence livestock production to commercial livestock production. These challenges include long distances to markets, expensive transportation, and a lack of competitive education and skills to maximise livestock sector gains.

4.2.2 The Scale of Livestock Marketing in Pastoral Areas

There is a high level of confidence among traders and organisations in Turkana regarding the marketing and trade of livestock. This confidence is supported by the County Directorate of Livestock Production, the County Livestock Marketing Council (CLMC), and the Livestock Marketing Associations (LMAs) that operate primary and secondary livestock markets. Tertiary livestock off-takers purchase animals at low rates from low-capital traders, which results in exploitation, greed, and intense competition in the livestock trade. On the other hand, formal cooperatives do not have trader contacts, which indicates that they have restricted access to business capital resources.

The lack of contracts that have been negotiated with potential tertiary markets can be attributed to the fact that CLMC and the County Directorate of Livestock Production have been slow to develop contract farming in livestock production and marketing. The inconsistencies that exist between national and county legislation concerning livestock make it difficult for livestock resources to meet the requirements of potential customers.

4.2.3 Impact of Livestock Markets on the Turkana Economy

Livestock markets have made it possible for livestock farmers to sell their animals and meet their financial requirements. These markets have made it possible for livestock farmers to obtain finances for a variety of costs, including food and clothing, education, medical expenses, veterinary supplies, and business. Despite the challenges posed by climate change, social issues, economic conditions, and political situations, livestock traders have broadened their investment opportunities and increased the amount of cash that is flowing into rural areas and homes that are pastoralist. Although the cash market for livestock has made it possible for customers to obtain a wide range of animal products, the costs of meat continue to be prohibitively high for a significant number of consumers. However, the construction of an organised livestock trading system has not yet been accomplished, despite the fact that the county government of Turkana considers livestock markets to be the most important point of investment in livestock production.

Both the Livestock Subsector Policy and Bill and the Livestock Marketing Bill for Turkana are now in the process of being drafted to fulfil the purpose of providing policy and regulatory guidelines regarding the efficiency and effectiveness of livestock production as well as the organisation of livestock marketing activity within the county. Additionally, the proposed legislative frameworks for livestock aim to enable the production of animal resources that are both healthy and productive, establish livestock markets and trader capacities, and install governance and administrative mechanisms for the operation of livestock markets. However, the issue of insufficient capital availability has not been overcome, and inbreeding has resulted in the weakening of the local breeds, which has led to a regeneration of inferior breeds, reduction in market competition and economic rewards.

4.2.4 Traders' Competition and Rivalry in Turkana Livestock Markets

Livestock traders reported having great ties with livestock producers; however, traders breached market chains to acquire and sell animals outside of the agreed-upon market organisation and structures. This was seen as a kind of competition and a barrier to interactions between producers and traders. The style of competition that is now being utilised is detrimental to the livestock industry because of the disparities that exist between the capital resources of traders, the marketing strategies they employ, the purchases and sales they make, and the market share that is held by individuals and groups. The duplication of livestock enterprises, the specialization of traders, and the control that the LMA authorities have over market operations are all examples that show this phenomenon. As a result of the closing of the Lomidat abattoir in Lokichoggio, the difficulties that are present in the livestock trade have become even more severe.

4.3 Discussion of Study Results

The findings of the study indicate that males are more likely to be involved in the production and marketing of livestock in Turkana. This means that women are only able to engage in production without having ownership of the animal resources, products, or financial resources that they help to generate. There are a significant number of livestock producers and traders who are illiterate, and the inability to read and write unquestionably restricts the chances available to utilise the knowledge to execute production and marketing projects. In Turkana secondary markets, almost all of the people who deal in livestock trade are also livestock keepers, with the typical number of years engaged in the livestock trading industry varying from person to person. This demonstrates that there are disparities in marketing expertise, experience, and capital resources, which in turn creates opportunity for competition that is totally unnecessary.

The production and selling of livestock in Turkana are usually considered to be non-progressive and critical variables in livestock production. This is because forage and water continue to be scarce throughout the seasons, which has an impact on animal nutrition, market weights, and the food and income security of livestock keepers. According to the findings of the study, despite the fact that difficulties in livestock production and marketing are reducing the benefits that livestock farmers, traders, and consumers are receiving, there are still significant chances for maximising livestock development in Turkana. The value addition of livestock and livestock products is extremely limited as a result of the continued use of traditional practices, as well as the slow advancement of production and marketing strategies, as well as the slow adoption of these approaches.

In Turkana, there is not yet a defined livestock marketing system that is formal in design and that has the potential to enable local markets and entrepreneurs to effectively compete in a wider market arena. There are elements of inefficiency and unsustainable practices that are present in the semi-formal Livestock Marketing Association (LMA) and co-management models that are now in use. The research, surveys, data gathering, and transmission of information regarding livestock production and marketing lack consistency. This causes a significant gap in the development of livestock since the amount of domestic knowledge and experiences that can have an impact on the local setting is quite restricted.

Due to the fact that low-capital traders are exploited and compete with one another, consumers do not consider competition to be helpful. The performance of the market is impacted by competitive rivalry since it is a form of unethical behaviour that is initiated by certain "elite" traders for their own self-serving profits. Neither the regulation of competition in markets nor the utilisation of such a system for the purpose of enhancing market strength exists. The costs of livestock and products derived from livestock continue to be high in Turkana because competition is not defined, controlled, or managed anywhere in the country. Regrettably, the town of Lodwar in Turkana, which is situated at the centre of livestock production in the county, has extremely high pricing currently.

5. Conclusion

Production and marketing practices are vital components of livestock development, independent of the setting in which they should be implemented. For the purpose of producing high-quality animals and livestock products that are able to generate and maintain market demand and supply, the contents and processes of each contribute to the creation of better livestock resources. The characteristics of livestock and livestock products produced in arid lands should be differentiated to create a uniqueness that can support local markets and entrepreneurs in sustaining market performance. This is necessary to manage competition in livestock markets. Competition and competitiveness among local entrepreneurs and markets can be structured through the establishment of livestock markets and product consumption outlets in strategic locations, the provision of market information, the regulation of the number of sellers in each market, and the management of entry barriers. This will ultimately result in the maintenance of the performance of the livestock markets in Turkana.

Market access is a critical component in determining the viability of local livestock markets and the capacity of business owners to successfully engage in livestock trading throughout the year in both domestic and foreign markets. Competitiveness and access to markets are two factors that should be considered when it comes to the production and sale of livestock in dry regions. To have physical access to markets, it is necessary that areas that produce livestock are located within a reasonable distance of market yards, that roads are in good condition, and that adequate transit choices are available.

The structure of markets, which includes government, taxation, and the cooperative organisation of traders, has a significant role in the design of market access. Structuring and improving the performance of livestock enterprises in the arid areas through the capacity development of market stakeholders, the formulation of necessary policies and regulations motivating livestock production and marketing activities will be accomplished through the commercialisation of livestock resources and trade protocol, the control of competition in markets, and the provision of a level playing field for all livestock entrepreneurs.

Climate change and instability, as well as livestock rustling along prospective livestock production areas and trade routes, continue to be important hurdles to the development of livestock in Turkana, despite the fact that pastoralism is the predominant mode of livestock farming in the region. The lack of capital presents a big challenge for livestock businesses that are controlled by traders with minimal capital, making them more susceptible to extreme competition and exposure to exploitation. In the livestock trade, Turkana does not engage in contract farming, and the sector is left unstructured and disorderly as a result of the lack of proper regulations and procedures governing livestock production and commerce.

6. Recommendations

6.1 Recommendations for Application

The government and other development partners should make investments in programs that empower young people and women so that they can take advantage of chances for livestock development and increase their economic potential and level of self-sufficiency. Pastoralists should be encouraged to enroll their children in school in large numbers, and adults should participate in the adult literacy program. This will help reduce the amount of illiteracy and ignorance that exists in Turkana.

Through the use of communication, both young people and adults will be able to speak with one another and share their knowledge, as well as develop and maintain relationships with various stakeholders and leverage communication to participate in the market. The livestock industry should be encouraged to diversify the commercial operations of non-pastoralist business owners. Taking this move will result in a greater diversification of revenues for pastoralists, an increase in the livestock commerce, and an injection of additional money into livestock businesses.

The trading in animals is controlled by male proprietors. Studies should be conducted on the participation of women in enterprises that are based on livestock, and these studies should be incorporated into national and county livestock development policies and plans. This should include the development of women's competencies to successfully compete in marketplaces. Livestock stakeholders should increase the efforts that are being made to eradicate livestock ailments, which will result in zones that are free of livestock diseases. This will allow for an increase in the commercialisation of livestock, the diversification of livelihoods, and the competitiveness of important livestock value chain firms. In areas where livestock is produced and in the vicinity of livestock market yards, it is important to make investments in the production of forage and the formulation of alternative feed.

Local business owners will have an advantage over their competitors on both domestic and international markets if they implement a resource management plan that allows for the production and marketing of livestock that is both healthy and productive from year to year. Continuous inbreeding and a lack of improved breeding services in pastoral settings are two factors that contribute to the underdevelopment of indigenous livestock breeds. The production problem in Turkana can be alleviated to some degree by the establishment of breeding systems and the introduction of superior breeds.

The low livestock productivity that occurs in pastoral regions results in a number of issues that are severe to the market. These challenges include low market weights, low price, and poor quality livestock and livestock products. To protect livestock production areas from the encroachment of growing urbanisation, which tends to increase the number of trading centres, villages, and non-pastoral business investments, the Turkana County Government should prioritize the identification, mapping and protection of livestock production areas in collaboration with civil society and corporations.

A combined analysis of climate change phenomena should be carried out by civil society organisations and pastoral communities to determine the extent of the impact that climate change will have on the livelihoods and environment of pastoralists. An empirical and policy-oriented evaluation of the capacity of pastoralists to resist climate shocks and the effects of periodic drought on livestock resources is something that should be done. To improve communication, pricing, and transportation, all of which are essential for the long-term performance of markets, a transparent livestock marketing system that includes transferable livestock and value chain strategies is required. This will allow for the raising and selling of livestock in arid areas to become easier, more profitable, and more competitive over the course of time.

Main livestock traders in Turkana are hampered in their ability to aggregate livestock purchases for tertiary or terminal markets due to limited capital resources and the high expenses of transportation. The scenario reduces the competitiveness of local traders, along with their operating capital and bargaining capacities, and it also affects their ability to negotiate best market deals. It is necessary for those who have a stake in livestock production and marketing to acquire knowledge regarding the relevance of the cash economy in livestock farming and trade. Developing relationships with many stakeholders and establishing a systematised approach to marketing and markets are both quite important. To avoid the formation of cartels, mistrust, and fierce competition in the market, marketing systems for livestock should be free of corruption and unethical tactics that benefit market participants disproportionately.

It is possible for governments and organisations that are part of civil society to give livestock traders and business owners the ability to determine the extent and scale of the livestock trade in their respective geographic areas. Traders are aware that pastoral regions contain a large quantity of animals; nevertheless, they are unable to match this quantity to the demand that is now being met by the market. To facilitate the sale of surplus livestock in foreign markets, it is necessary to compare the supply of livestock to the current demand in both the local and international markets. As a result, the marketing approach for livestock will be improved, which will increase its competitiveness in marketplaces. Notable is the fact that wealthy traders have a monopoly on main livestock marketplaces, and they use low-capital traders as their suppliers.

Institutions that are responsible for the production and selling of livestock should encourage the widespread implementation of business models that are both realistic and competitive, and that are tailored to specific demographics of the market. The players in the market will be able to control the level of competition and reduce the amount of competition within their own jurisdictional markets. The ability of each livestock market and its stakeholders to handle daily marketing activities and cultivate healthy stakeholder relationships will be facilitated by the identification and evaluation of the danger provided by new entrants, suppliers, and buyers' negotiating power. This threat is in addition to the threat posed by alternative products.

By ensuring that farmers, traders, and consumers have access to information regarding the prices of livestock and products generated from livestock, the government and other significant market actors are obligated to fulfil their responsibility. The promotion of healthy competition in markets through the reduction of conflicts of interest and hostility between stakeholders, as well as the guarantee that marketing strategies are able to properly manage competition in livestock markets through the enhancement of pricing and the sharing of information. It is vital to have a thorough understanding of the production lines, selling, transportation, and taxation costs associated with livestock and livestock products to make them affordable and equitable.

6.2 Recommendations for Future Research

The current level of livestock production and management techniques in pastoral areas should be evaluated, and recommendations should be made for ways to improve these practices. The viability of pastoral rangeland ecosystems should be evaluated, and the potential for pastoralists to support themselves through nature-based livelihoods should be determined. Livestock based businesses that have the potential to be successfully established and maximised through the utilisation of future and spot markets should be invested on. To transition subsistence livestock farming into a livestock economy that is focused on the market, it is important to evaluate the benefits that value addition will bring to the production and marketing of animals in pastoral areas.

It is important to determine the extent to which market and non-market forces influence the selling of animals in arid areas. The supply and demand of the internal market should be the primary focus, while the government's policy on livestock trading should be the focus of the non-market factors. Livestock market actors should determine whether or not the theories and models established by corporations may be applied to the production and marketing of livestock in arid areas.

To enhance the functioning and efficiency of local livestock markets, it is necessary to ascertain whether or not it is feasible to transform existing livestock marketing associations (LMA) into livestock marketing cooperatives (LMC). Not only should the Turkana Lomidat Slaughterhouse Cooperative be evaluated for its performance, but also the socioeconomic and political conditions that contributed to its inability to function properly should be taken into consideration. In pastoral areas, it is important to investigate the prevalent livestock diseases that have a significant impact on the economic aspects of animal production, marketing, trade, and product consumption.

It is important to investigate the potential advances that could lead to disease-free zones in pastoral areas, the role that women and young people play in the production and trading of livestock, as well as the potential that exist for them to contribute to the growth of the dryland livestock sector. Finding out the institutional dynamics that enable the efficient and successful production and trade of livestock in Turkana, as well as the aspects that drive pastoralists to sell their animals when market circumstances improve, is something that has to be done.

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