

# Transforming the Pastoral Livestock Economy for Viability, Competitiveness, and Sustainability. A Case Study of Kenya's Arid Regions

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**Abstract:** The transformation of pastoral livestock farming systems is a policy focus for national and county governments in Kenya, intended to enhance the economy of livestock-dependent regions, where significant portions of the population continue to experience severe food, income, and nutritional insecurity. This study, focusing on Turkana County, aimed to (i) delineate livestock production and marketing systems; (ii) compare Turkana's livestock production and marketing with other arid regions in the Horn of Africa; (iii) evaluate the impact of market and non-market factors on livestock production and trade in dryland areas; and (iv) propose a strategic framework to enhance the viability, competitiveness, and sustainability of livestock sector initiatives in pastoral and dryland regions. Exploratory and descriptive study designs were utilised, including a mixed-methods approach to examine the transformational aspects of pastoral economy and industry. The study was conducted in Loima, Turkana East, and Turkana North sub-counties of Turkana, with 210 study participants selected statistically from 12 livestock-producing zones and markets. The study demonstrated the importance of the adverse impacts of social, economic, political, environmental, technological, and ethical factors on livestock production and marketing in arid regions. The failure of livestock herders, traders, and development partners to effectively mitigate these effects results in the stagnation of livestock development opportunities. To sustainably address the intrinsic impacts of these market and non-market factors, the study advocates for the enhancement of breeds and genetics, the adoption of efficient and sustainable market-orientated livestock farming systems, the facilitation of local traders' access to capital for business financing to augment livestock trade volumes, and the improvement of logistics and market infrastructure, all supported by technology. Strengthened relationships between local and external markets, traders, and herders; augmented governmental and civil society financial allocations for the livestock sector, including the enhancement of accountability processes; tackling supply and demand-related risks through robust and effective mitigation strategies; and formulation of a livestock policy that supports drylands livestock and economic development to sustain the benefits from remedial investments improve livestock sector performance. The study delineates regional patterns in pastoral livestock farming, the resilience of livestock keepers and traders, market accessibility, development methods, and banking solutions for dry regions as areas for future research.

**Keywords:** *Pastoral economy, Market systems, Competition, Cross-border trade, Livestock and market risks, Market access, Pastoral livelihoods.*

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## Introduction

Globally, the livestock value chain is responsible for employing nearly 1.3 billion people, and the contribution of pastoralism to the gross domestic product of African countries ranges from 10 to 44 percent. It is estimated that 80 percent of Kenya's territory is made up of arid and semi-arid lands (ASAL), and pastoralism is the predominant mode of agriculture and the primary source of livelihoods in these areas. Pastoralists are responsible for managing over 75 percent of Kenya's livestock herds, which are the primary source of meat for the country's markets. Pastoralism in Ethiopia is responsible for the direct feeding of over 20 million people, the production of 80 percent of Ethiopia's total annual milk supply, and the provision of 90 percent of the meat that is consumed in East Africa.

Pastoralism is responsible for around 60 percent of the meat and milk products that are sold on the West African market. Misconceptions about pastoralism, climate change, rangeland instability, globalisation, urbanisation, and the undervaluing of the pastoral economy are all factors that prevent the production system from reaching its full potential. This is the case despite the fact that pastoralism provides an overwhelming number of benefits to populations that are dependent on livestock and to state economies. Despite the volatility of rangeland habitats, the majority of pastoral communities in Eastern Africa continue to domesticate their animals. This is due to the fact that essential resources, such as water and nutrients for livestock, become accessible in temporary and frequently unexpected quantities. The majority of the time, they use them for sociocultural purposes, such as dowry payments,

ceremonies, household food, and maintaining a high social position and prestige by keeping a large number of animals.

The livestock husbandry and marketing in pastoral areas has been the subject of numerous initiatives made by governments, civil society organisations, and the donors. A number of abattoirs have been established in strategic locations, in addition to the establishment of formal livestock marketing yards, with the goals of increasing livestock sales and the functionality of market yards, facilitating hygienic slaughtering and the safety of meat products, processing and adding value to product value chains that are destined for markets, and strengthening the connections between

livestock production areas, distribution channels, markets, and consumer needs.

It has been claimed that a significant number of abattoirs, particularly those located in the arid parts of Kenya, are either not functioning at all or are operating at a capacity that is below their potential. The performance of dryland abattoirs, as well as animal production and trading projects, is affected by a wide range of cultural, social, economic, political, environmental, technological, and legal factors that require strategic solutions to minimise their negative effects on the entire livestock sector's prospects. Below is the map of the study area (Figure 1).

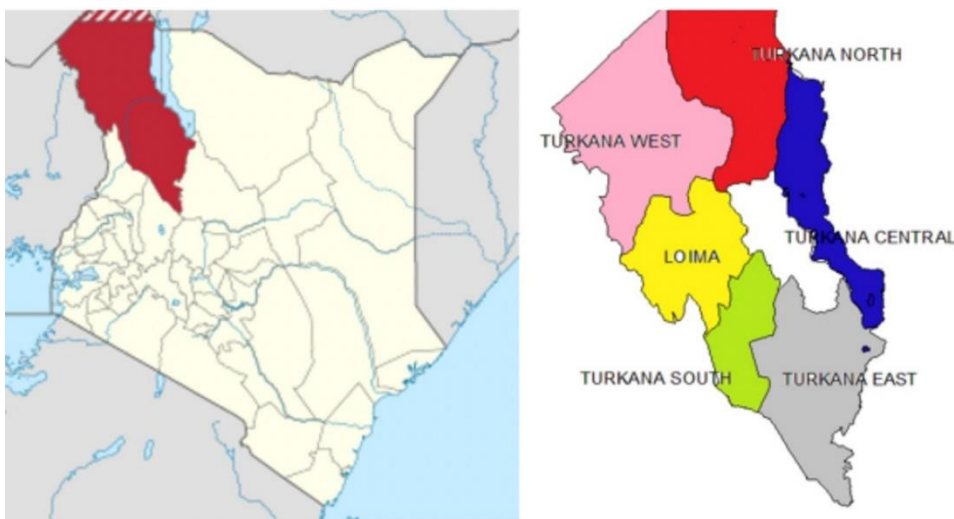


Figure 1: Map of Kenya showing Turkana County and Map of Turkana County showing Sub Counties

## Literature Review

### Traditional livestock farming practices in pastoral areas

Improvements to traditional livestock farming practices, the establishment of a reliable livestock market economy, and the influence of livestock development stakeholders' knowledge, skills, and attitudes are all avenues for transforming the pastoral economy, making it more viable and competitive (Ryschawy et al., 2017; Diawara et al., 2021). This is because livestock farming is essential for the livelihoods of pastoral communities, as well as for their social-cultural and economic well-being, and contributions to the economies of states and regions (Anno and Pjero, 2021). According to Goldman (2015) and Mwangi, Ngigi, and Mulinge (2015), the lack of access to markets continues to be a significant danger to the economy of pastoralist regions and the people who live there.

As a result of the severity of the effects of drought, national and local governments and regional organisations are continuing to develop and implement policies and regulations with the intention of enhancing the well-being of livestock-dependent populations (Shibia, 2018; Carabine, Jouanjan, Tsui, 2015; Wambui et al., 2016). Limited conventional knowledge of livestock husbandry and marketing practices, long-term traditional livestock production and trade systems, ineffective environmental and land-use policies, marginalisation of pastoralists and lack of social and economic inclusion continue to weaken pastoral systems, mobility strategies and management of associated risks, and lack of vibrant livestock business strategies and models and political and economic inefficiencies are some of the problems directly affecting

agricultural initiatives and markets in the drylands (Kelly et al., 2016; Jones et al., 2015; Eguru et al., 2015).

### The performance of pastoral livestock production and marketing systems

The performance of livestock markets in pastoral areas is further hindered by inconsistencies in price setting, a lack of coordination between marketing and sales strategies, and the absence of adequate resources for producers and traders to sustain livestock marketing and livestock insurance costs (Fornari et al., 2016). These factors all contribute to a lack of understanding of the value of marketing systems. The majority of people living in rural areas are illiterate and are not aware of their rights and entitlements, which makes the capacity gaps that have been found much more severe (Kariuki and Birner, 2015).

Lack of market segmentation, limited commercialisation of livestock production, limited capital resources, and low trust in the quality of livestock and products from pastoral areas are all factors that hinder the effectiveness of livestock businesses, even in regions with high potential for production and consumption (Clark & Tilman, 2017; Anno & Pjero, 2021). Through a variety of strategies, including the provision of training and extension services, the strengthening of market structures and systems, the utilization of technology for the expansion of the livestock industry, and the financing of livestock development projects, civil society and governments are attempting to address the gaps that have been identified in the pastoral areas through a multiplicity of development strategies and programmes (Fernández-Giménez et al., 2015).

### **Pastoralism and its significance to pastoral economies**

Pastoralism is the main way of making a living in dryland areas. It can be improved by investing in pastoral resources like land, water, and rangeland protection; making it easier for livestock keepers to get socio-economic services; promoting local value chains; and dealing with problems that come up with pastoral mobility (Bonfoh et al., 2016; Nyariki & Amwata, 2019). Strengthening the roles that pastoralists play in the development of public policies, such as disease control and management, the improvement of water and forage resources, the upgrading of local livestock breeds, and the commercialisation of traditional livestock production practices, would assist in the development of pastoral areas and communities in a more rapid and sustainable manner (Kagunyu et al., 2016; Egbe et al., 2016).

According to Ayele (2019) and Yiram et al. (2017), market competition is beneficial to all parties involved since it guarantees the satisfaction of consumers and the provision of quality products. By conducting research, livestock markets would assist businesses in identifying and addressing deficiencies in production, marketing, and customer satisfaction, as well as improving their capacity to expand their operations in a manner that is both sustainable and environmentally responsible (Abebe et al., 2018). Competition is essential for boosting market awareness, lowering market prices, extending product choices and business diversification, and enhancing consumer satisfaction (Kgosikoma & Malope, 2016; Fornari et al., 2016). This is because pastoral regions are constantly changing and expanding, and competition is a result of these changes.

In pastoral areas, market competitiveness safeguards enterprises with limited capital by fostering an environment that allows these enterprises to expand and increase their market share, while also enabling markets to organize their marketing procedures. From a microeconomic perspective, healthy competition improves livestock markets and products, promotes market equilibrium between supply and demand forces, makes it easier to enter markets, and makes more information resources available and easier to find by market stakeholders (Yiram et al., 2017; Anno et al., 2023). All of these benefits are a result of healthy competition.

### **Livestock commercialization intents for pastoral areas**

It is possible to transform the commercialisation of livestock resources by including market intent as a goal for livestock keeping (Ameso et al., 2018; Kelly et al., 2016; Anno, 2025). However, the subsistence orientation of pastoral communities significantly inhibits the commercialisation of livestock resources. Market structures and trade systems need to be enhanced and modernized through research to manage excessive market rivalry in markets. Additionally, institutional capacity development packages need to be standardized, make transportation of livestock and product supplies to markets reasonable, and remove the current insecurity. These achievements will result in a fair playing field for livestock farmers and traders to participate in the market (Stephen et al., 2018; Eguru et al., 2015).

High priorities for the transformation of dryland economies through the livestock commercialisation process include the reduction of trader cartels and brokers, the expansion of the cash economy and financial infrastructure for electronic payments, the establishment of cash savings and credit, and the conversion of

Livestock Marketing Associations (LMA) into cooperatives. All of these are important steps in the right direction. According to Dido (2019) and Shibru (2017), the incorporation of power relations, trust, and goodwill into livestock marketing will contribute to the creation of political capital, which is essential for ensuring the long-term survival of livestock resources and entrepreneurial endeavors. In addition, this will help in the process of reversing market control measures such as long-term quarantines and unauthorized access to particular prospective markets. It will also promote consumer preference and loyalty for locally produced animals and products. As a result of livestock commercialization, it is expected that market monopolies will become less common as the market becomes more open and democratic. This will enable every investor to follow their own business objectives (Lubungu, 2016; Addis, 2017). This development will be accomplished by resolving a wide range of difficulties that are associated with livestock production and market access in dryland areas.

According to Ameso et al. (2018) and Stephen et al. (2018), stakeholders will acquire knowledge and skills that will assist them in resolving issues that make it difficult for producers, traders, and consumers to access the livestock market. Investigating the ways in which extreme competition affects the marketing of livestock in pastoral areas will provide them with the opportunity to acquire essential marketing knowledge and skills. When a changed livestock development agenda for drylands is achieved, it will make it easier to achieve the functionality that is envisioned for livestock markets. These markets will be less likely to be exploited and abused by players as a result of unhealthy competing practices (Anno and Pjero, 2021).

### **The livestock industry in Kenya and the Horn of Africa (HoA) countries**

Livestock farming significantly contributes to GDP and local economies through foreign exchange, enhancing food, economic, and nutrition security (Mayanja et al., 2015). In Eastern Africa, particularly Kenya, the livestock industry is predicted to grow remarkably over the next 30 years, addressing increasing demands for animal products due to rising human populations (Pica-Ciamarra et al., 2015; Amwata et al., 2015). Market estimates for Kenya show that the number of cattle and poultry will rise significantly by 2050, by 94% and 375%, respectively. Cattle and poultry contributed approximately 70% of Kenya's animal production, valued at \$1.622 billion in 2016 (Dido, 2019; Isako et al., 2019).

Strengthening the pastoralist economy and marketing livestock from eastern Africa's dryland regions hinges on private sector involvement. The livestock industry is rapidly growing, aiding the rise of small-scale farmer cooperatives, which saw a 20.2% increase compared to 2017 (Njiru et al., 2017). A lack of a well-defined breeding programme and production processes, along with insufficient transport infrastructure and limited access to market information, negatively impact livestock markets in drylands (Addis, 2017). Compounded by competition among market entrepreneurs and minimal capital for investment, these issues have led to a diminished demand for livestock products from rural areas, resulting in decreased marketability and economic benefits (Shibru, 2017). Ndoro et al. (2015) highlight that the long-term subsistence orientation of pastoralists notably influences livestock sales in Africa's arid and semi-arid areas.

Effective livestock marketing systems face challenges, including poor market infrastructure, limited institutional capacity, high transport costs, insecurity, corruption, and other structural inefficiencies that increase transaction costs (Watson and van Binsbergen, 2008; Togarepi et al., 2016). Trader cartels and market brokers dominate livestock markets in dryland regions of Ethiopia, Somalia, and Kenya, which hinders the revitalisation of marketing strategies. Persistent challenges include insufficient political capital to eliminate colonial imposed quarantines, limited market access, inadequate savings, undeveloped financing systems, and unstable producer prices (Lubungu, 2016; Shibu, 2017).

### **Abattoirs and the systems where meat is supplied**

Meat is a crucial dietary component and nutrient source for people of all ages, as noted by Ngoro et al. (2015) and Amwata et al. (2015). To capitalise on the export potential of the Middle East and North Africa, several large-scale abattoirs have been established in the arid and semi-arid regions (ASAL) of Kenya, Ethiopia, and Somalia (Kimaro et al., 2018; Herrero et al., 2016). These facilities serve as terminal markets for livestock, which helps livestock keepers and vendors reduce transportation costs to major cities (Addis, 2017; Dido, 2019; Lokuruka, 2016).

Establishing meat export abattoirs in eastern Africa is a significant advancement in diversifying foreign exchange earnings and enhancing the socioeconomic conditions of livestock traders and producers (Ayele, 2019). However, the underutilisation of certain meat processing facilities highlights the absence of a cohesive livestock marketing system that connects production areas to both local and international market opportunities (Isako et al., 2019; Addis, 2017).

### **The requirement for slaughterhouses and the viability of meat supply chains**

According to Isako et al. (2019), the current meat processing facilities in Kenya are operating at less than 50 percent of their operational capacity. This is because the market does not require a sufficient amount of live animal throughput. This situation is most likely due to the fact that export abattoirs are unable to acquire adequate amounts of high-quality live animals for the purpose of processing meat (Isako et al., 2019; Afnabi et al., 2014). The demand for live animals for domestic consumption, as well as the demand for such animals for legal and informal (cross-border) trade, puts export abattoirs in rivalry with one another.

When meat processing abattoirs operate below capacity, they face higher operational expenses, reducing their competitiveness in domestic and international markets (Singh et al., 2014; Dido, 2019). Exporting abattoirs must maintain a steady supply of meat to satisfy consumer demand in importing countries (Togarepi et al., 2016). To improve efficiency and competitiveness, it is important to find other ways to get high-quality live animals to meet processing needs. Such measures can make the abattoir business profitable for meat vendors and rewarding for livestock suppliers (Silvestri et al., 2013; Bonfoh et al., 2016).

### **The significance of policy and environmental restrictions for slaughterhouses**

Kenya has made significant advancements in developing a policy framework to enhance the livestock sector. The strategy focuses on fostering locally produced livestock components to boost competitiveness in regional and global markets. Key

legislative measures supporting this framework include the Public Health Act (Cap. 242) for health safeguards, the Animal Diseases Act (Cap. 364) addressing animal disease issues, the Meat Control Act (Cap. 356) for meat product regulation, the Food, Drugs and Chemical Substances Act (Cap. 252) to prevent food adulteration, and the Prevention of Cruelty to Animals Act (2012) aimed at animal welfare.

Regulatory frameworks in Kenya governing the livestock sector include the Fertilisers and Animal Foodstuffs Act (Cap. 345), which oversees fertiliser and animal foodstuffs; the Kenya Meat Commission Act (Cap. 363), which manages meat production; and the National Bio-Safety Authority Act (2009), ensuring responsible research practices. The Veterinary Surgeons and Veterinary Para-Professionals Act (2011) focuses on professional registration and capacity building in animal health services. Key additional legislation comprises the Uplands Bacon Factory Act 2, the Cattle Cleansing Act (Cap. 358), the Anti-Rabies Act of 2007, the Animal Breeding Policy 2009, and the National Livestock Policy 2019, which together support livestock development and resource conservation.

### **Obstacles that slaughterhouses must overcome**

Alterations to licensing, taxation, quality standards, inspection, and market access are all components of the regulatory regime that can occasionally have an impact on the operations and management of abattoirs (Kheradia and Warriner, 2013; Pica-Ciamarra et al., 2015). Other factors that hinder the performance and competitiveness of an enterprise include the availability and affordability of skilled and specialized labour; capital expenditures; customer preferences and trends; obstacles that are specific to the livestock industry; competition; and the discontinuation of operations at abattoirs (IRIN, 2013; Anno & Pjero, 2021).

Capacity building to support humane slaughtering practices, capacity-building activities that focus on veterinary public health, slaughterhouses being able to comply with client requirements in terms of food safety and quality, product development, and a better system for tracing livestock products are the primary challenges that slaughterhouses are facing in terms of their performance (Afnabi et al. 2014; Ayele, 2019; Ngoro et al., 2015). There have been instances where the government has been successful in implementing a plan that involves converting community slaughterhouses into commercial slaughterhouses and renting out publicly owned slaughterhouses to private companies. However, such policy strategies have not materialized due to market and non-market challenges (Afnabi et al., 2014; Ferry et al., 2013; Lubungu, 2016).

### **Recommendations for public policy made by the government of Kenya**

The overarching policy actions that are being promoted in the wider region of Eastern Africa include improving the livestock market system, lowering the cost of livestock transportation, improving security and information flows, creating opportunities for pastoralists to sell their livestock, and holding livestock auctions which will improve financial benefits to livestock producers and vendors, reducing the influence of marketing cartels, thus strengthening livestock management associations (Charlebois and Summan, 2014; Singh et al., 2014). It is recommended in Kheradia and Warriner (2013) that major livestock diseases that are of public health significance be controlled by enhancing the

existing veterinary service through vaccination and the use of effective and safe veterinary medications.

A legal framework that is conducive to the trade of livestock, sanitary conditions at slaughtering facilities, and employee training is worth implementation. Additionally, the continuous development of smallholder farmers, the improvement of local breeds, adequate meat cold chain facilities, and the maintenance of quality assurance standards reinforce livestock sector developments (Stephen et al., 2018; Berihun, 2017). To improve the functioning, profitability, and competitiveness of livestock markets, it is essential to provide access to credit and financial literacy services; establish a protocol for the trade of livestock across international borders; make livestock production areas and trade corridors safer; and conduct consistent and futuristic scientific research on livestock health, production, and marketing (Yiram et al., 2017; Mayanja et al., 2015).

## Methodology

Turkana County in Kenya, characterized as a vast and complex pastoral region, serves as a case study. The study incorporated numerous insights from a literature on various aspects of livestock transformation, focusing on viability, competitiveness, and sustainability improvements. Additionally, it examined the same variables through primary research conducted in 12 livestock markets, representing 30 per cent of the markets in Turkana, which included 3 secondary markets, 5 primary markets, and 4 itinerant trader market areas.

The markets were purposefully selected based on established performance benchmarks and the continuous nature of trading operations throughout the season. The Turkana County sub counties where the study took place were Loima, Turkana East and Turkana North. Statistical sampling was employed to choose study participants from trader categories, as illustrated in the table below:

Table 1: Statistical sampling of study participants from different market segments

Trader category	Confidence level	Margin of error	Population proportion	Sampling frame	Sample
<b>Itinerant market traders</b>	95%	5%	50	120	63
<b>Primary market traders</b>	95%	5%	50	100	80
<b>Secondary market</b>	95%	5%	50	80	67
				Total sample	210

## Results and Discussion

### Study participants demographics

Out of 210 study participants, 93 percent (195) of them responded to the study, of which 12 percent (23) were women and 43 percent (84) were youth (people below 35 years of age). The illiteracy rate of the study participants was 55 percent, meaning 107 people did not know how to read and write, with only 10 percent of them (20 people) being holders of training certificates. On the other hand, livestock trade remains male-dominated, and the number of young people venturing into livestock marketing activities is increasing. Over 70 percent of the study participants had taken 8 years in the livestock trade, making it a dependable economic and livelihood activity for them.

### Effects of Market and Non-market Forces

#### The political and economic factors

The research highlights that political and economic factors significantly contribute to instability in East Africa, hindering commerce and business. Conflicts in regions like Northern Kenya, Northeastern Uganda, South Sudan, and Ethiopia disrupt trade corridors, leading to unpredictable market conditions. This unpredictability affects livestock supply chains crucial for enhancing livestock product value. Additionally, colonial-era livestock movement restrictions in Kenya's frontier districts continue to negatively impact the pastoralist population and livestock business prospects, resulting in diminished returns on market investments and industries due to their minimal GDP contributions.

The ongoing civil strife in South Sudan since 2011 has significantly disrupted livestock markets, limiting regional access

to livestock resources and affecting market functionality. Corruption in Kenya has similarly compromised the livestock sector, with inadequate anti-corruption mechanisms exposing businesses to vulnerabilities. The burden of taxation and removal of subsidies for livestock and transportation has escalated operational costs, particularly harming profitability in dryland areas. Additionally, while Turkana has abattoirs and slaughterhouses, poor connections with key market actors like the Kenya Meat Commission hinder their economic potential, which adversely affects small and medium-sized enterprises critical for job creation and living standards improvement in the region.

The study highlights that the ongoing depreciation of the Kenyan shilling since 2007 has led to significant inflation, severely impacting pastoral areas like Turkana, where over 80 percent of the population faces increased hardship due to rising product costs. The scarcity of consumer goods raises living expenses, particularly affecting poor households who struggle with the high prices of meat. This contributes to ongoing food insecurity and malnutrition in the region. Additionally, the Lomidat Abattoir has been inactive since 2013 due to market and security issues, which diminishes the livestock market and competitiveness for traders in Turkana and neighboring areas.

The limited banking services in Kenya's pastoral areas significantly hinder livestock production and marketing, exacerbating the poor cash economy. Government focus on social services fails to support sustainable market system development. The weak economy, with low employment and purchasing power, restricts commercial opportunities. High product prices complicate price elasticity assessments, while expensive technological needs prevent the revival of essential facilities like abattoirs and tanneries.

### **Sociocultural factors**

Turkana County is undergoing demographic changes that affect its social and economic structures, characterized by a rising population and limited socioeconomic opportunities hindering local investment. The area's challenges and low consumption of commercial goods restrict investment from external sources, while traditional pastoral lifestyles complicate market segmentation and product differentiation. Resource-based conflicts in surrounding regions are persistent, but the East Africa Community (EAC) protocol aims to foster stability through cross-border markets, enhancing opportunities for livestock farming and trade.

The lack of market capitalisation incentives and local livestock trader involvement hinders the revival of non-functional markets, impeding resource mobilisation and investment. Ongoing conflicts, such as cattle rustling and livestock confiscation, demotivate market participants and are exacerbated by weak legislation and peace structures. The potential for cross-cultural communication is underutilized due to differing perspectives on peace efforts. Enhancing political and economic stability through government and civil society initiatives can greatly benefit pastoral communities near the borders of Kenya, Uganda, South Sudan, and Ethiopia, facilitating harmonious cohabitation among livestock herders, traders, and enterprises across boundaries.

### **The technological and legal factors**

The technological transformation in Turkana County aims to enhance the livestock economy by developing valuable products and connecting to various markets. Urbanization in pastoral areas relies on technology tools like network coverage, social media, and technology-driven banking to support livestock farming and value chain development. Improved livestock markets can enhance production integrity and consumer confidence through quality assurance. However, as operations advance, outsourcing products and services may become costly and less beneficial. The limited research on livestock sales and value chains in pastoral areas hinders the growth of livestock businesses. Market research and knowledge management strategies are essential for industry initiatives. Utilizing computer programs can enhance quality control, pricing, and sales forecasting. Varying tax policies may complicate the business landscape, especially if not aligned with local farming contexts. Additionally, employment restrictions in Kenya limit the hiring of skilled foreign professionals necessary for enhancing livestock opportunities in drylands.

The upcoming regulatory changes for livestock sales and related products will impose stricter compliance standards, posing risks for businesses failing to meet these requirements, potentially jeopardizing their registration. Consumers are increasingly emphasizing the need for safe consumables and environmental health, particularly regarding slaughterhouses, where safety and waste management are vital. Following regulations can enhance business credibility and support environmental goals. Additionally, genuine advertising strategies tailored to diverse customer groups can build loyalty and influence purchasing decisions.

### **The environmental and ethical factors**

The study highlights that regulations on environmental usage are essential for shaping livestock production and marketing strategies. Livestock development initiatives must align with environmental and resource economics standards to avoid unethical practices. Furthermore, infrastructure plans in the

livestock sector must adhere to strict environmental laws and significantly reduce production-related risks, including pollution. Environmental oversight bodies advocate for environmentally friendly products, emphasizing the need for accurate documentation of social and economic impacts on communities during pre-impact assessments. This approach is crucial to evaluate the cost-effectiveness of business initiatives. Furthermore, integrating recycling and waste management into livestock development strategies is necessary.

Actors in livestock value chains in dryland areas are willing to comply with legal and ethical standards; however, inadequate waste disposal mechanisms lead to environmental hazards from improperly managed livestock waste in markets and slaughterhouses in Turkana. This issue is aggravated by insufficient financial support from the county government for market infrastructure and a lack of incentives to encourage recycling of livestock wastes, such as manure and biogas, which fails to attract investors.

### **Recommendations for pastoral livestock economy transformation**

- Breeds and genetics play a crucial role in the productivity of animal resources in Kenya and the Horn of Africa, where herders primarily maintain dual-purpose native varieties. These breeds are generally substandard, resulting in inferior market weights compared to enhanced breeds, thus hindering competitiveness in markets. To improve economic returns, herders in arid areas should consider crossbreeding indigenous breeds and adopting high-yielding livestock breeds to enhance adaptability and profitability in harsh environments.
- Herders have traditionally managed livestock resources, but this approach is becoming outdated due to market demands for quality and safety. To remain competitive, they must adopt a market-oriented strategy in livestock production, allowing them to improve their capabilities and face market challenges.
- Local traders face limitations due to low capital, restricted livestock volumes, and inadequate transportation, hindering their access to larger markets. There is a need for comprehensive training that goes beyond theoretical approaches. This should also include focusing on market system development and practical commercial practices. Such training aims to equip traders with skills to enhance their competitiveness and navigate the cash economy effectively.
- In the Horn of Africa's arid regions, development focus is mainly on primary and tertiary livestock markets, which lack sufficient infrastructure and systems. Key marketplaces that facilitate initial interactions among herders and traders are inadequate, missing essential facilities such as modern marketing yards, demand-supply management systems, record-keeping technology, financial services, and early warning systems. Enhancing marketing infrastructure and systems is crucial for transforming the livestock industry in these areas.
- Enhancing relationships among internal and cross-border herders and traders is vital for improving livestock output in arid regions and optimizing trade. Strong connections among herders are crucial for effective livestock management, particularly in resource-limited areas.

Recent positive interactions between regions like Turkana, Karamoja, and Kapoeta have increased livestock movement and trade. Addressing tensions in border areas by restoring community links will facilitate collaboration in cross-border livestock resources, thereby improving animal health, productivity, and economic activities linked to these relationships.

- The improper allocation of resources by government and civil society for livestock production and marketing is a major challenge impacting performance. Lack of accountability has led to resource loss in the livestock sector. To address this, training in accountability for herders and stakeholders is essential, alongside the implementation of performance criteria, outcome measurement, continuous monitoring, and project audits to combat resource depletion and improve project conditions.
- Both livestock production and commercialization face risks that hinder sector development, including drought, disease, outdated technology, and limited access to inputs. Market risks like seasonal fluctuations, inadequate economies, inflation, political instability, and regulatory challenges complicate the environment further. Effective and policy-driven solutions are necessary to address these issues, yet resource limitations persist. Gaining sustainable funding from governments for risk mitigation is crucial to improve livestock production and marketing, leading to a more competitive sector.
- Enhancing banking prospects in arid regions is essential for facilitating livestock commerce among herders and traders. Improved access to business financing can help overcome current challenges, including limited mobile banking, which forces traders to rely on cash. This reliance has led to increased robbery incidents, posing risks to traders' safety. Digital banking solutions are proposed to improve transaction efficiency and security within the livestock industry.
- Addressing challenges in the livestock sector of arid regions, including social, economic, political, environmental, technological, and legal issues, can empower communities and improve marketing and production. Enhancing knowledge, skills, and attitudes among stakeholders is essential for adopting changes that transform livestock into a source of economic sustenance. Policy orientations should align stakeholder strategies with development targets to boost the economy and welfare of livestock-dependent communities.

#### Areas for Future Research

The study delineates regional patterns in pastoral livestock farming systems, the resilience of livestock keepers and traders, their market access capabilities, viable market system development strategies, and banking solutions for arid regions as critical areas for future investigation. The methodology employed in examining these factors must be multisectoral and multistakeholder in nature to broaden the breadth of knowledge and resources necessary for their realization.

#### Disclaimer

- The views stated in this article are those of the author and do not necessarily represent those of any of the entities mentioned.

#### Interest Conflicts

- The author declares no conflict of interest whatsoever in this publication.

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