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Structural Analysis and Value Chain Mapping of Sheep Farming in the Sahel

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Abstract

This study investigates the Sahel sheep value chain in the Binah prefecture of Togo, focusing on its organization, structural constraints, and potential for improvement. Utilizing the Value Links methodology, the data were collected through focus groups discussion and individual interviews through the open questions with key actors including breeders, fatteners, livestock traders, feed sellers, butchers, and support services. Findings reveal that informal relationships among actors, insufficient veterinary services, political and tariff barriers, and food scarcity during the dry season are significant constraints. Despite these challenges, the opportunities exist in the seasonal availability of agricultural by-products, the presence of microfinance institutions, and emerging sub-regional markets. The study emphasizes the need for enhanced formalization, improved support services, and infrastructure development to boost the efficiency and sustainability of the value chain. Though significant obstacles remain, efforts to standardize pricing and improve transport infrastructure are highlighted. The resilience and adaptability of local farmers and the continuation of traditional knowledge and emerging export trends indicate promising potential for the Sahel sheep value chain in Binah prefecture. The findings provide a comprehensive understanding of the value chain's dynamics and offer strategic insights for policymakers and stakeholders to enhance the sector's contribution to food security and economic growth.

Keywords: Focus Groups, Food Security, Livestock, Value Links.

Introduction

The agricultural sector, including livestock farming, and more specifically the rearing of small ruminants, constitutes one of the principal activities in most West African countries. This sector produces food for the population, provides raw materials for factories, and significantly contributes to sustaining rural activities (1). In Togo, the economy is dominated by agriculture, with nearly 70% of the population working in this sector, which accounts for about 40% of the GDP. However, despite its importance, more than half of the population remains food insecure, particularly affecting agricultural households (2). Livestock farming is central to the production systems of rural households. It is one of the primary economic activities upon which the poorest people rely for food and monetary income (3). It also serves as the main form of insurance against risks for millions of poor people who depend on rain-fed agriculture for their livelihood (4). Today, more than ever, livestock farming is seen as a crucial sub-sector for job creation and poverty eradication. Small ruminant farming provides most of the meat consumed in Togo's cities and villages. Unfortunately, this predominantly traditional form of livestock farming does not meet the growing demand (3). In reality, national production only covers two-thirds of the country's needs. According to the PNIASAN document (2017-2026), the rate of demand satisfaction for meat products in Togo is largely deficient. Specifically, for small ruminants, the country has to import around 40,000 live sheep and goats annually from Sahelian countries to meet the population's needs (5).

Togo's dependency on external sources to meet its needs for meat products poses a geostrategic risk. The COVID-19 pandemic, the Russo-Ukrainian war, and current diplomatic tensions between ECOWAS member states, including Togo, along with the rising prices of imported goods, particularly livestock, underscore the urgency of addressing this situation. These events have led to increased prices for imported goods in the domestic market, contributing to the phenomenon of high living costs (6). However, the impact of these measures has been minimal due to several

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factors. Key among them is the integration of multiple species in most livestock programs and the strategic focus on agriculture's role in GDP and employment, leading to fragmented efforts and a lack of sustainability in utilizing acquired knowledge (7–9). Despite the critical role of livestock farming in the economies of Sahelian countries, including Togo, the Sahel sheep value chain remains underexplored in academic and policy literature. Existing studies primarily focus on general livestock farming systems without delving into the specific organizational and structural constraints of sheep value chains (10–13). This gap is significant, as sheep farming serves as a primary livelihood for vulnerable rural populations, yet faces unique challenges, including informal actor relationships, limited veterinary services, and geopolitical trade barriers. Moreover, there is insufficient research on integrating value chain methodologies, such as Value Links, in the context of small ruminants, particularly in regions prone to food insecurity and sociopolitical instability. This study addresses these gaps by applying the Value Links framework to map the Sahel sheep value chain in Binah prefecture, identify its structural constraints, and evaluate opportunities for improvement. By focusing on actor dynamics, health service provision, and trade networks, the research aims to provide actionable insights into enhancing the value chain's efficiency, sustainability, and resilience. Therefore, achieving significant improvements with lasting impacts in the small ruminant sector in northern Togo requires a clear understanding of the value chain for a specific species, from production to consumption, including valorization and commercialization (14). This necessitates a comprehensive study of the sheep value chain in the Sahel region within the Binah prefecture. This study investigates the Sahel sheep value chain in the Binah prefecture of Togo, with specific objectives to: (i) map and analyze the structural organization and interrelationships among value chain actors, and (ii) identify and evaluate the key structural constraints limiting the efficiency and sustainability of the value chain.

Conceptual Framework of the Study

The value chain is a strategic analysis tool introduced by Harvard Business School professor Michael Porter in his 1986 book "Competitive Advantage". According to Porter, the value chain allows a company to break down its operations into a series of basic activities and identify potential sources of competitive advantage. The value chain, as conceptualized by Michael Porter, provides a framework to analyze a series of interconnected activities that contribute to creating value for consumers while identifying competitive advantages. This study leverages the Value Links methodology, a comprehensive tool that builds upon Porter's framework, offering modular guidance for analyzing and improving agricultural value chains. The Sahel sheep value chain in Binah prefecture is particularly relevant within this theoretical framework due to its informal actor relationships and dependence on sub-regional trade. Additionally, resilience theory is applied to highlight the adaptability of local actors to sociopolitical and environmental shocks, making the analysis highly pertinent to the Sahelian context.

Methodology

This study employs a qualitative approach to explore its objectives, utilizing open-ended questions through focus group discussions and key informant interviews to gather in-depth insights and diverse outcomes.

The study focuses on the Binah prefecture in the Kara region, which is one of the areas most affected by food insecurity in Togo (2). Covering an area of 480 square kilometers, Binah is bordered to the northwest by the Doufelgou prefecture, to the southwest by the Kozah prefecture, and the east by the Republic of Benin. Administratively, it is part of the Kara region and comprises nine cantons, with Pagouda as the chief town.

Data Sampling

An exploratory survey was conducted to gather insights from various stakeholders involved in the Sahel sheep value chain. Key participants included institutions such as the Directorate of Livestock (DE), the Togolese Institute of Agronomic Research (ITRA), the Institute of Advice and Technical Support (ICAT), and veterinarians. In October 2022, a preliminary field survey was conducted in Binah prefecture. This helped identify local farm concerns and refine the survey questions to ensure relevance to the study objectives.

Data collection was carried out in two key locations to ensure a comprehensive

understanding of sheep production, trade, and consumption dynamics. The first location, Binah Prefecture, focused on gathering insights from rural stakeholders who are directly involved in sheep production and trade, offering valuable perspectives from the grassroots level. The second location, was the main consumer markets in Togo, Agoè Nyieve Prefecture, was selected to explore the dynamics of urban terminal markets, providing an in-depth look at sheep trade and consumption patterns in urban settings. This dual approach allowed for a balanced analysis of both rural and urban contexts, ensuring a holistic perspective on the subject.

Participants were selected with assistance from ICAT, DCVP, and CIFPR-TOGO agents. The selection process relied on data from the preliminary survey and input from local small ruminant organizations. This ensured comprehensive representation across the value chain and adequate gender inclusion.

Data Collection

Focus Group Discussion:

- Semi-structured interviews were used to guide discussions.
- Brainstorming and visualization techniques facilitated active participation and comprehensive insights was used.
- Focus group discussions helped establish a typical operational profile for each segment of the value chain.

A total of 9 focus group discussions (FGDs) were conducted, with 7 helped in Binah Prefecture involving breeders, fatteners, livestock traders, feed sellers, and butchers. The remaining 2 were conducted in the urban terminal markets of Gbossimé and Échangeur Agoè in Agoè Nyieve Prefecture, focusing on live livestock traders.

Key Informant Interviews:

- Individual interviews were conducted with meso and macro-level actors, including public agencies and advisory organizations supporting value chain operations.

A structured interview guide was used to gather specific information from six key organizations: ICAT, ITRA, DCVP, UMECTO, CIFPR-TOGO, and CIPEA.

Gender Representation: Out of 121 total participants in this study, 29 were women, representing various roles such as sheep breeders, feed traders, livestock traders, and processors. Both mixed-gender and gender-specific group discussions were conducted to capture diverse perspectives. The Table 1 shows the sample size repartition.

Table 1: Summary of Sample Size by Value Chain Actor

Value Chain Actors		Sample Size by Value Chain Actors
Breeders/Fatteners		46
Livestock Traders		38
Feed Traders		21
Processors/Butchers		10
Support Service Providers	Support Services	5
	Financial Institutions	1
Total		**121**

Data Analysis

The Value Links methodology organizes value chain management into 12 modules throughout the project cycle. It starts with deciding to promote a value chain (Module 0), identifying the target value chain (Module 1), analyzing it (Module 2), and developing an improvement strategy (Module 3). Module 4 guides project operators. Modules 5-10 focus on project implementation in three key areas: business links (Modules 5-6), services (Modules 7-8), and the business environment, including standards (Modules 9-10). Module 11 concludes with impact monitoring and results-based management. Figure 1 shows the relationship between the modules and the project cycle. This research focuses on Module 2 of the Value Links approach, a core element of its methodology (15). Implementing this methodology involved multiple steps based on data from focus groups and individual interviews, addressing economic, environmental, social, and gender aspects of the value chain. The value chain map illustrates its structure and forms the basis for further analysis (15). Figure 2 depicts the illustrations.

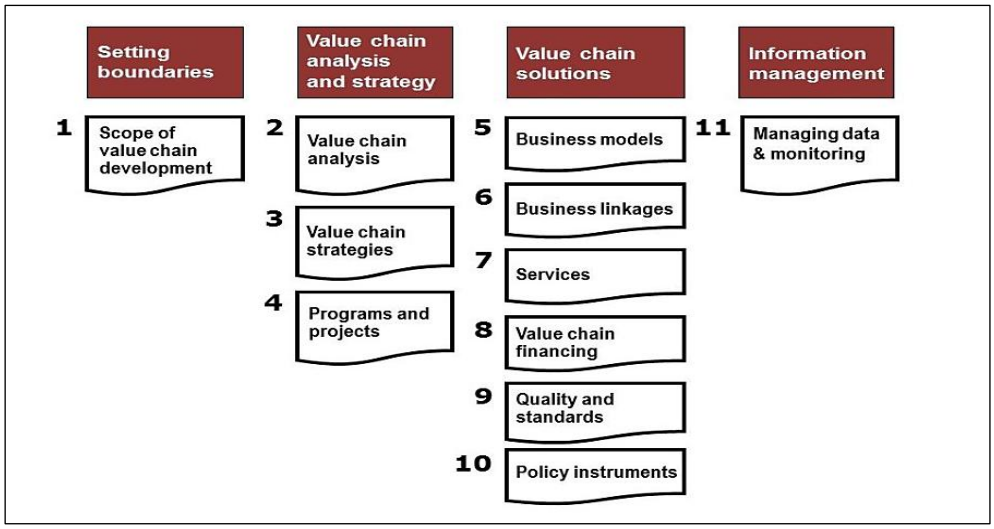

Figure 1: Value Links Approach and Modules

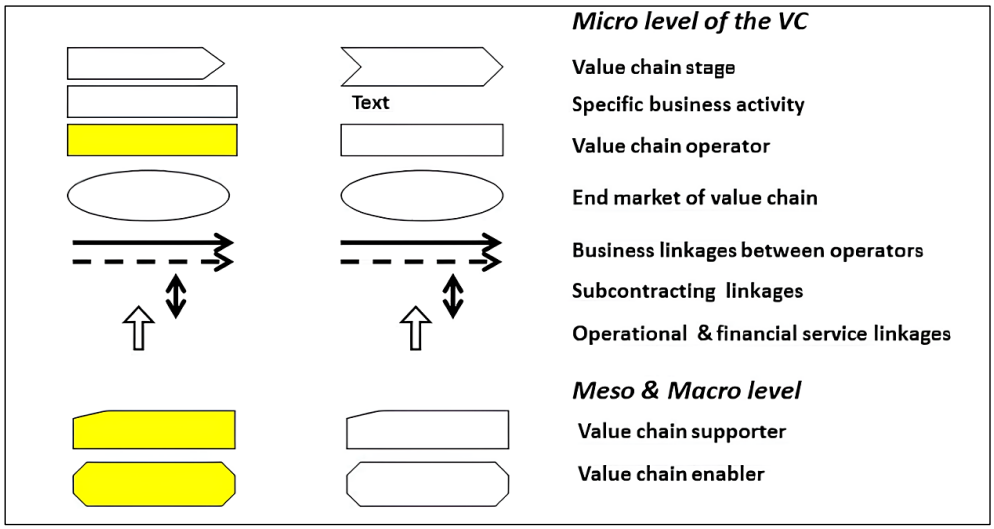

Figure 2: Symbols Used in Value Chain Mapping

This study's diagnosis of the current state of the Sahel sheep value chain involved bibliographic research and fieldwork, including focus groups. It identified key segments and actors in Binah prefecture, their interrelations, and connections with external actors. This descriptive analysis enabled a functional analysis, determining actor roles and visualizing activity flows within the value chain (16). The SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) is employed to understand structural constraints and opportunities, providing a basis for solutions. It is a simple tool applicable at various levels and helps identify areas needing further research. While not precise, SWOT effectively characterizes the current state of the value chain, highlights issues, and stimulates discussions. It identifies strengths, potential resources, weaknesses, and risks that could negatively impact value chain development. Group discussions were recorded using a phone and transcribed with the online tool Speech notes, then imported into Word. Data on actor attributes collected during the field discussion groups were imported into Epidata. After data entry, the information was verified, corrected, and cleaned, then converted to IBM SPSS Statistics 25 and Excel for analysis.

Results

Mapping the Sheep Value Chain in the Sahel Region of Binah

The key segments, channels, and various actors at the micro, meso, and macro levels of the sheep value chain in the Sahel region identified in the Binah prefecture are presented in Figure 3.

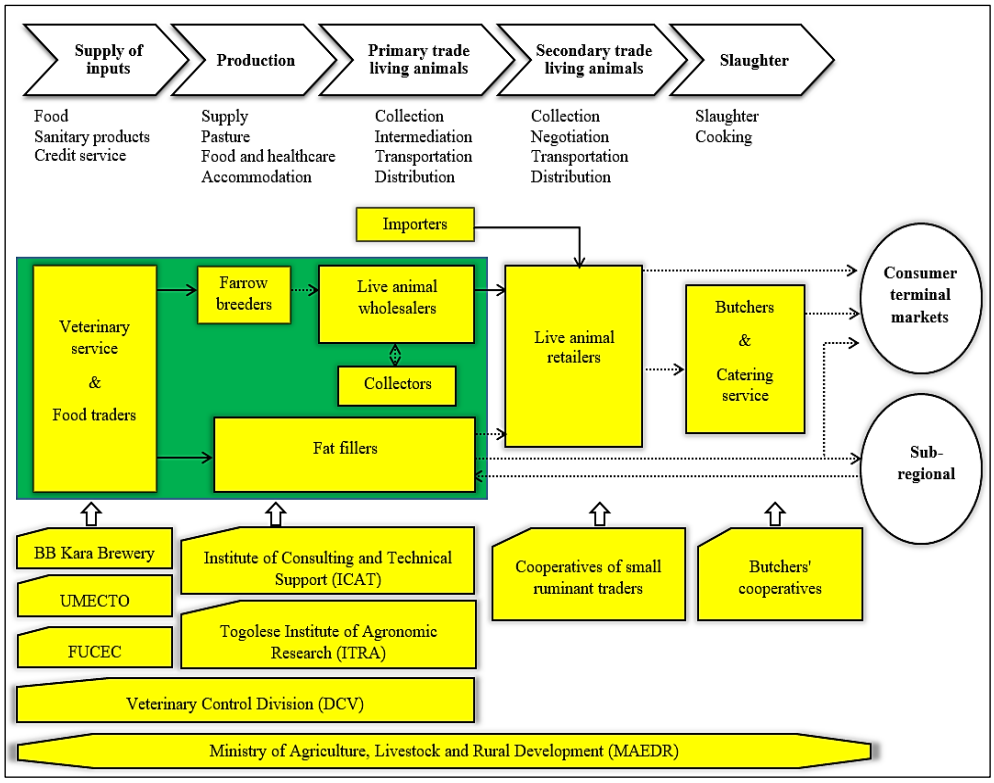

Figure 3: Mapping the Sheep Value Chain in the Sahel Region of Binah Prefecture

Identification of Key Segments in the Sahel Sheep Value Chain

The primary segments of the Sahel sheep value chain identified in the Binah prefecture are: Input Supply, Production, Primary Livestock Trade, Secondary Livestock Trade, and Slaughtering or Processing.

Input Supply:

Credit services: In the Binah prefecture, microfinance institutions provide credit services to the main actors in the value chain. About 73% of actors have received loans to finance their activities, with fatteners being the most dependent, borrowing annually to purchase Sahel sheep. Group discussions revealed that credit services have slowed due to sociopolitical instability in Niger, the main source of sheep. Consequently, farmers are forced to rely on their resources, and the lack of funds negatively impacts production.

Animal health services: Animal health services are provided by the private sector and the Prefectural Veterinary Control Division (DCVP), which oversees animal health and products of animal origin. The DCVP has established village livestock auxiliaries (AVE) in each village for better information management and intervention planning. Currently, there is only one veterinary pharmacy in the study area. Most surveyed farmers report difficulty in finding appropriate medications there, resorting instead to informal vendors. These "black markets" are regularly targeted by DCVP agents for seizures.

Feed Supply:

Forage: There are no specific livestock feed production structures in the study area. The main green forages used by breeders are Panicum and Leucaena. Fatteners primarily use dried peanut haulms and other crop residues like bean pods and cassava peels. Peanut haulms are the most common dry forage for Sahel sheep, often mixed with cereal bran. Farmers collect and dry peanut haulms during harvest season to use as feed during the dry season. The price of a 120 kg bag of peanut haulms ranges from 800 FCFA in the harvest season to 3,000 FCFA from March to May.

Concentrated feed: Concentrated feeds include brewery waste and various cereal brans like maize, soybean, and millet. The only supplier of brewery waste in the study area is Brasserie BB Kara, with strong competition from farmers using it for field fertilization. A truckload costs about 25,000 FCFA. Cereal bran supply is managed by local beverage and porridge sellers. The Pagouda women's soybean processing cooperative provides soybean bran to farmers in Pagouda and Kétao, fostering

informal partnerships between feed sellers and farmers.

Source of Livestock Knowledge: The majority of livestock knowledge is inherited from parents (87%). Only a small number of surveyed farmers (13%) acquired their knowledge through formal training in livestock farming.

Sahel Sheep Supply: The main sources of Sahel sheep in Binah are Niger and Benin (Figure 4). Farmers travel to livestock markets in Bouzou, Konni, and Maradi in Niger to purchase various breeds of Sahel sheep. In Benin, the supply comes from markets in the communes of Malanville, Guéné, and Karimama in the northeast, and the international market of Kassoua in Ouaké.

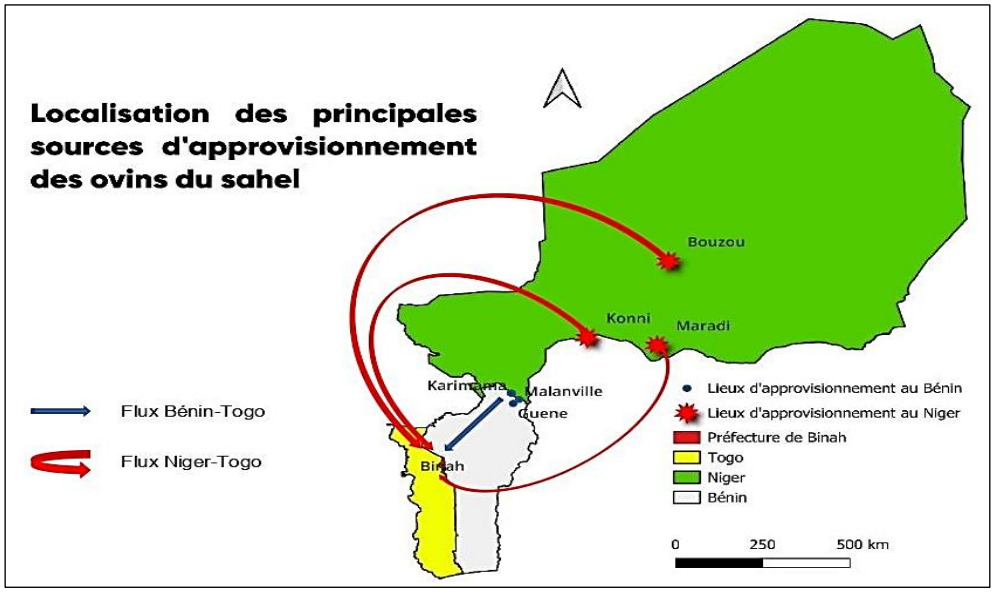

Figure 4: Location of Main Sources of Sahel Sheep Supply

The commune of Malanville in Benin was the main source of supply for the Binah prefecture before the Niger crisis. Farmers noted that most Sahelian breeds from Niger were available in Benin, particularly at the border markets with Niger. However, due to the current diplomatic tensions between the two countries following the regime change in Niger, sourcing from Benin has become complicated. These border markets in Benin are actually aggregation markets for sheep from Nigerien farms. Therefore, farmers are now forced to cross the border to source from collection and aggregation markets in Niger.

Choice of Sahel Sheep Supply Sources

According to group discussions, the choice of supply location often depends on the number of sheep the farmer wants to procure. If the number is ten (17) or more, the farmer will go to Niger or northeastern Benin, where sheep prices are generally lower and the best breeds for fattening are found. For fewer than ten (17) sheep, the farmer opts for the international market in Kassoua, on the border with Togo, despite higher prices. Small-scale farmers, unable to travel to Benin or Niger due to limited resources, often pool their money with larger farmers or form groups to make bulk purchases. Annex 3, Box 2 describes the procedures for sourcing Sahelian sheep from Niger to the Binah prefecture.

Choice of Sahel Breed Production

The choice to produce the Sahel sheep breed is primarily driven by profitability. A significant number of surveyed farmers (80%) stated that they produce the Sahel breed for economic reasons.

Supplied Sahel Sheep Breeds: The most supplied Sahel sheep breed in the study area is the Ara Ara or Targui sheep (69.6%), followed by the Balami and Oudah breeds (10.9%) and the Bali Bali breed (8.7%). Figure 5 shows the distribution of supplied breeds in Binah. Group discussions indicated that the selection criteria for animals included sex, coat condition and color, as well as leg robustness.

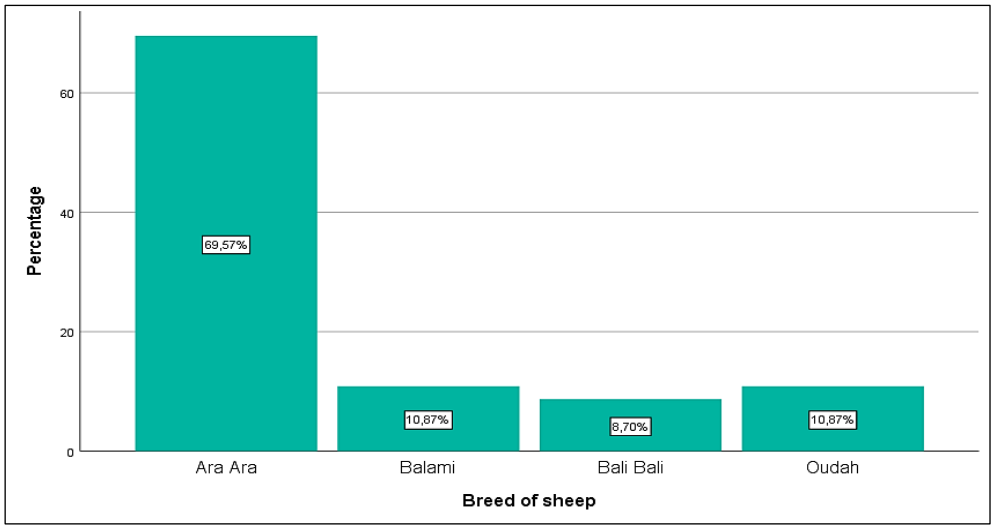

Figure 5: Distribution of Supplied Sahel Sheep Breeds in Binah Prefecture

Production Systems

The production systems for Sahel sheep in the study area are semi-intensive (71.7%) and intensive (28.2%).

Semi-Intensive System: This system is practiced by the majority of farmers (71.7%), including breeders (32.6%) and fatteners (39.1%). In this system, sheep are penned at night and part of the day. For the remaining 3 to 5 hours, they graze freely under the shepherd's supervision. Farmers often provide supplementary feed, which can be forage or concentrates.

Intensive System: This system is exclusively practiced by fatteners (28.2% or 13 out of 46). The animals are kept in pens permanently and only go out to drink. In this system, animals are fed an average of four times a day, including at night, with food provided in the pens. Figure 6 illustrates this output.

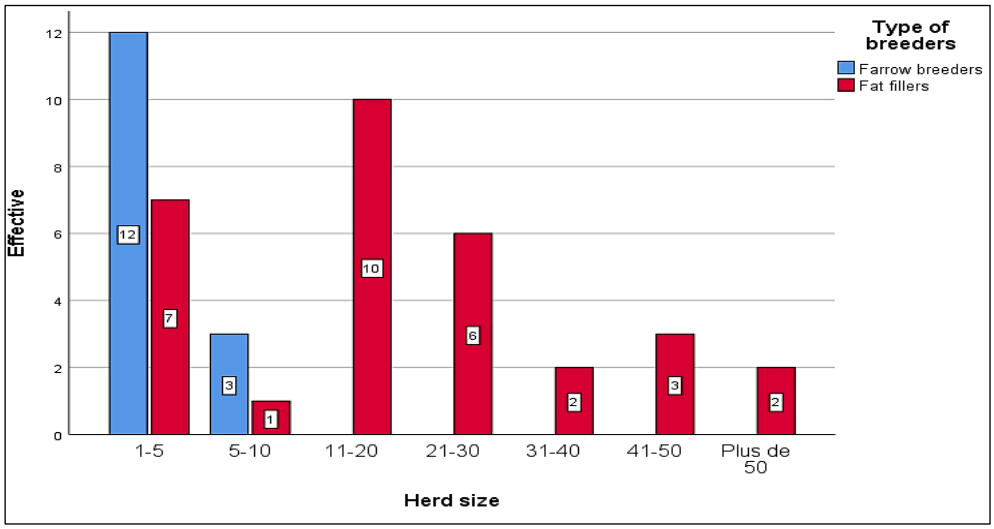

Figure 6: Sahel Sheep Flock Sizes in Binah Prefecture by Farmer Type

Feed Composition and Management

In the study area, crop residues constitute about 40% of the diet for Sahel sheep. The most commonly used residues are peanut haulms, bean pods, and cassava peels. Green forage is more prominent in semi-intensive systems. No forage crops are cultivated, making the storage of crop residues crucial for farmers. This storage is positively correlated with the number of animals, serving as the primary adaptation strategy during the lean season from April to July (Table 2).

Table 2: Seasonal Calendar and Food Availability in Binah Prefecture

Month	J	F	M	A	M	J	J	A	S	O	N	D
Season	Dry season					Wet season					Dry season	
Food availability	■		■					■	■		■	
Rainy season												
Dry season	■											
Abundant												
Sufficient	■											
Moderate												
Shortage	■											

The diet also includes agro-industrial by-products such as brewery waste, which constitutes about 35%, and various cereal brands, which make up about 25%. Water sources for the animals are wells and boreholes. Mineral supplements are rarely distributed; if provided, they consist of table salt mixed with concentrated supplements or water. Some farms use salt licks. The seasonal distribution of feed is presented above in Table 2.

Animal Health Care

Veterinary services are primarily provided by the farmers themselves (65%), who rarely consult animal health professionals (35%) such as the DCVP and veterinarians. Based on group discussions and interviews with veterinarians, several diseases have been reported in Sahel sheep in the study area. The primary diseases reported are ectoparasites (lice and mites) and endoparasites (roundworms and liver flukes). Other diseases such as trypanosomiasis, foot-and-mouth disease, pneumonia, pest of small ruminants (PPR), and food poisoning (bloating and diarrhea) have also been noted.

Live Animal Trade

Marketing Infrastructure: Sahel sheep from Binah prefecture are sold either in terminal consumption markets to secondary livestock traders or directly to households during high-demand periods like Tabaski. Village-level livestock markets, notably the Kétao market held every Wednesday, are also utilized. Animal sales are subject to a market tax, ranging from 200 to 500 FCFA per animal at Kétao, and 15,000 to 20,000 FCFA per truckload at consumption markets. Farmers are responsible for transporting animals to the market, and transportation services are lacking, especially in rural areas. Transporting animals from Binah to terminal markets requires a health pass issued by the DCVP, costing 2,000 FCFA and valid within Togo. Additional taxes are paid en route.

Transportation Modes: Sheep markets are categorized as primary (rural) and secondary (urban). For primary markets, farmers transport animals on foot or using local means such as two- or three-wheeled motorcycles, with costs between 500 and 1,000 FCFA per sheep, depending on distance. For secondary markets, sheep are transported in vans, public transport, or large trucks, costing 3,000 to 5,000 FCFA per animal. Poor transport quality and road conditions lead to animal fatigue and injuries, exacerbated by inadequate market infrastructure and same-day onward transport without proper feeding or watering. Overcrowding in transport vehicles is a concern, with up to 45 sheep loaded into a truck, sometimes with cattle.

Market Information: Farmers and traders have access to market and price information through personal contacts and experience, with mobile phones further aiding information dissemination.

Pricing Mechanism: Prices are determined through negotiation and bargaining in both rural and urban markets. Initial prices are based on the farmer's experience and market price information, influenced by animal attributes such as age, sex, breed, and the farmer's urgent need for cash. Prices are generally higher during festivals and traditional ceremonies when demand is high.

Terminal Consumption Markets: Village markets are moderately used for selling Sahel sheep, typically to meet immediate cash needs. However, farmers prefer selling at terminal consumption markets for economic reasons. Figure 7 shows the main terminal markets for Sahel sheep distribution.

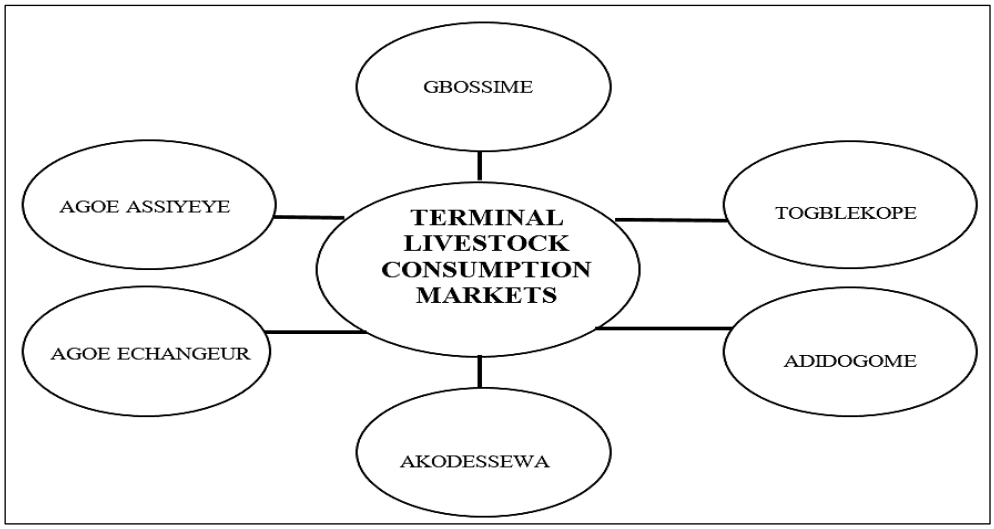

Figure 7: Main Terminal Markets for Distribution of Sahel Sheep from Binah Prefecture

During the focus group discussions with secondary traders, the Adétikopé market was noted as not being a main market since it is seasonal and primarily crowded during religious festivals. Group discussions with farmers highlighted issues of trust abuse, where some traders fail to return and pay the farmers after receiving animals on credit.

Sub-Regional Markets

Group discussions revealed a new trend in the distribution of Sahel sheep. Since the onset of sociopolitical crises in Sahel countries, several livestock traders from sub-regional countries have regularly sourced Sahel sheep from the Binah prefecture. Terrorist attacks in Niger and Burkina Faso have forced many livestock traders to alter their routes and pass through Togo to reach Niger. These traders now maintain informal trade links with Sahel sheep farmers in Binah, who regularly supply them with animals. The main sheep exporters come from Ghana, Senegal, and Nigeria.

Slaughtering and Processing

Slaughtering transforms live animals into meat for consumption. While Sahel sheep are often sold live to final consumers, they are sometimes processed by butchers and food service providers. In the study area, butchers purchase animals at markets or directly from farmers. Kétao canton has an association of butchers, the only form of organization at this stage in Binah prefecture. There are no slaughterhouses in the area; the DCVP head oversees meat quality inspections and collects slaughter taxes for the municipality. The slaughter tax ensures the meat is safe for public consumption, costing 200 FCFA for small ruminants. Annex 3, Box 3 details meat quality inspection in Kétao. Data from urban butchers indicate that meat is sold at 3,500 FCFA per kg and intestines at 2,500 FCFA per kg.

Summary of Constraints and Opportunities in the Value Chain

The constraints and opportunities identified among the actors in the Sahel sheep value chain in Binah prefecture are presented in Table 3.

Table 3: Summary of Constraints and Opportunities in the Sahel Sheep Value Chain in Binah Prefecture

Segments	Actors	Constraints	Opportunities
Input Supply	Veterinary Services	Unavailability of veterinary products Insufficient veterinary services Lack of DCVP personnel Weak Relationship with farmers	Presence of DCVP agents and AVE Presence of AVE in villages
	Credit Services	Insufficient funds Difficulty in obtaining credit	Presence of microfinance institutions
	Feed Traders	Difficulty in conservation	Existence of a distribution market

Production	Breeding Farmers	Terrorism in the Sahel and the Niger crisis	Seasonal availability of agricultural by-products
		Excessive taxes	Availability of soybean bran, millet bran, and maize bran
		Lack of forage production	Existence of loyal clients
		Difficulty buying brewery waste	Ftrong demand for Sahel sheep
		Water problems	Organized sales area
	Fattening Breeders	Feed shortages	Existence of support/accompaniment
		Difficulty accessing veterinary services and products	New sub-regional market
		Trust issues with some traders	Good information sharing
		errorism in the Sahel and the Niger crisis	Good market information
		Transport problems and poor road conditions	New sub-regional market
Live Animal Trade	Primary Traders	Excessive taxes	Improved political situation in Sahel
		Difficulty finding a place in the market	Existence of loyal clients
		Poor market infrastructure	The existence of a distribution market with strong domestic demand
		Price fixing issues	Establishment of CIFPR-TOGO
	Secondary Traders	Numerous sheep from Burkina Faso on the marketsheep from Burkina Faso on the market	Organization of Actors
		Lack of Sahel sheep	
		Lack of specific credit	Existence of DCVP
Processing	Bouchers Services de restauration	Lack of modern materials/equipment	Availability of sheep meat for consumption

Discussion

This study shows that despite the existing potential, the Sahel sheep value chain in the Binah prefecture faces numerous structural constraints. In Binah, the value chain for Sahel sheep includes several key segments: input supply, production, primary live animal trade, secondary live animal trade, and slaughtering or processing. Actors operate at micro, meso, and macro levels. Micro-level actors, who are primary or internal actors, perform generic functions within the value chain, while meso-level actors, who are secondary or external, provide support and accompaniment. This typology is similar to that observed in most small and medium-scale small ruminant value chains (18, 19).

The structural analysis reveals that relationships among internal actors are largely informal. Consequently, these actors operate in an unstable environment, facing difficulties at each segment of the chain. This situation has been reported in Burkina Faso (20). Despite efforts by the DCVP and ICAT to support farmers in animal health monitoring, farmers continue to administer treatments themselves with medications acquired from the black market, bypassing veterinary professionals. This is due to the unavailability of effective veterinary products, insufficient veterinary pharmacies, and inadequate training of some village livestock auxiliaries (AVE) by the DCVP, which hinders healthcare delivery in remote areas. A similar situation has been reported in Pakistan (21). The primary diseases identified in Sahel sheep in Binah are consistent with some research findings (20, 22). The informality extends to production, live animal trade (both primary and secondary), and slaughtering, as there are no service contracts between these internal actors.

Political and tariff barriers affect the production and marketing of Sahel sheep in Binah. Terrorism

in the Sahel directly impacts sheep supply and financial institutions' willingness to fund Sahel sheep farmers, as Niger remains the main source of supply. Tariff barriers, such as numerous roadblocks and both legal and illegal tax collections during transport and marketing, increase costs for actors (4). Food scarcity during the dry season is a major challenge in feeding. The production system for Sahel sheep in the study area is primarily semi-intensive and intensive. This aligns with findings of some author, that in their techno-economic reference on Djallonke sheep farming in Togo (23). Supplementary feeding with crop by-products such as peanut haulms, bean pods, and cassava peels is common, along with agro-industrial by-products like brewery waste and various cereal brans (millet, maize, soybean). This practice is reported by other authors in Togo and Burkina Faso (2, 19).

The supply of Sahel sheep in the Togolese market is managed by a few actors to meet the demand of numerous buyers. Although about 80% of agricultural households rear small ruminants (24), the expertise in Sahel sheep production is mostly held by Togolese farmers of foreign origin (mainly Haoussa from Niger). Livestock knowledge is passed down through generations and supplemented by training sessions. This continuity of local breed production by local farmers and Sahel breed production by foreign-origin farmers as found in previous study (2). The study also reveals a lack of transport services during marketing, especially in villages. Poor transport quality and road conditions between rural areas and primary and secondary markets cause fatigue and suffering for animals, similar results in the Savanes region of Togo (25). Pricing mechanisms rely mainly on negotiation and bargaining in both rural and urban markets. CIFPR-TOGO is making efforts to standardize negotiations based on a unit of measurement (kilogram), although significant challenges (price setting per kilogram, butcher resistance, habitual changes) hinder this system's implementation. A study in Burkina Faso reports that decision-making power over purchase prices favors market actors as long as there is no formal relationship between the animal's weight and its price (19). Livestock marketing in Togo is generally structured around collection, aggregation, and consumption markets (25). This confirms the marketing systems observed for Sahel sheep in Binah, which are primarily sold in terminal consumption markets through collectors and aggregation at the Kétao market. However, farmers have started exporting animals to other sub-regional countries.

According to some research finding, butchers prefer medium-sized animals, particularly females, as large sizes are not economically viable under current sales conditions. This preference aligns with observations of butchers in the Sahel sheep value chain in the study area (10-13, 19). While this study provides valuable insights into the Sahel sheep value chain in the Binah prefecture, certain limitations must be acknowledged. First, while focus groups and interviews provided valuable insights, future studies could benefit from incorporating cross-longitudinal data through quantitative approaches. Second, as the study was conducted over a timeframe, extending the research to cover a full year would allow for a more comprehensive understanding of seasonal variability in production and marketing trends. Third, geopolitical instability in Niger and Benin, key trade partners for Sahel sheep, impacted the comprehensiveness of cross-border trade data. These limitations underscore the need for longitudinal studies and broader data collection to enhance future research. Finally, future research should focus on formalizing actor relationships within the value chain by exploring cooperative models and digital platforms to improve trust, efficiency, and coordination.

Conclusion

The study highlights the structural challenges within the Sahel sheep value chain in Binah, despite its potential. Key issues include informal relationships among actors, inadequate veterinary services, political and tariff barriers, and food scarcity during the dry season. Efforts to standardize pricing and improve transport infrastructure are underway, but significant obstacles remain. Enhancing formalization, support services, and infrastructure could significantly boost the value chain's efficiency and sustainability. The continuation of traditional knowledge and emerging export trends indicate resilience and adaptation among local farmers. To address these challenges, policymakers should prioritize investments in transport and market infrastructure to ease logistical bottlenecks and improve access to terminal markets. Expanding

veterinary pharmacy networks and training village livestock auxiliaries will enhance livestock health and productivity. Additionally, fostering microfinance institutions and tailoring credit services to the needs of smallholder farmers can drive value chain investments. Regional harmonization of trade policies, particularly through ECOWAS, is critical for reducing tariff and geopolitical barriers. Training programs focused on sustainable farming practices, gender inclusivity, and market negotiation skills will ensure equitable participation and long-term resilience. These recommendations provide actionable pathways to strengthen the Sahel sheep value chain's contribution to food security and economic development.

Abbreviations

PNIASAN: National Food Investment and Food and Nutrition Security Program, ECOWAS: Economic Community of West African States, GDP: Gross domestic product, DE: Directorate of Livestock, ITRA: Togolese Institute of Agronomic Research, ICAT: Institute of Advice and Technical Support, DCVP: Prefectural Veterinary Control Division, UMECTO: Microfinance institution, CIFPR-TOGO: Interprofessional Council of the Small Ruminant Sector of Togo, FCFA: Franc of the African Financial Community, BB: Togo Beer Factory Brasserie, PPR: Pest of Small Ruminants.

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Author Contributions

Abdou-Fatao Yaya: Conceptualization, Investigation, Methodology, Data Curation, Formal Analysis, and Correction of the final Manuscript. Atsu Frank Yayra Ihou: Visualization, Writing - Original Draft Preparation, Writing-Reviewing and Editing.

Conflict of Interest

The authors declared that there is no conflict of interest regarding the publication of this manuscript.

Ethics Approval

Ethical standards were strictly adhered to during the data collection process, with all participants providing informed.

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