

Sokoto Journal of Geographical Studies (SJGS)



Volume 3, Issue 1, December, 2025 Edition



Sokoto Journal of Geographical Studies (SJGS)

Volume 3, Issue 1, December, 2025 Edition

*Published by the Department of Geography, Sokoto State
University, Sokoto P.M.B. 2134, Along Birnin Kebbi
Road, Sokoto State-Nigeria*



**Department of Geography, Sokoto State University, Sokoto
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(December, 2025 Edition, Issue 1, Number 2)

E-ISSN: 3115-5812, PRINT ISSN: 3034-551X

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Acknowledgements

The sources of financial grants and other funding must be acknowledged, including a frank declaration of the authors, commercial links and affiliations. The contributions should also be acknowledged.

Assessment Fee (Non-Refundable) & Publication Fee

Account Name: Sokoto Journal of Geographical Studies

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ASSESSMENT OF LIVESTOCK FEED RESOURCES AND MANAGEMENT PRACTICES IN GUMEL LOCAL GOVERNMENT AREA, JIGAWA STATE, NIGERIA

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Abstract

<https://doi.org/10.65760/sjgs.v3.i1.6>

Livestock production plays a pivotal role in food security and rural livelihoods across semi-arid Nigeria, yet feed scarcity and management inefficiencies continue to constrain productivity. This study assessed the availability, utilization, and management of livestock feed resources and feeding systems in Gumel Local Government Area (LGA), Jigawa State. A mixed-method design using structured questionnaires and field observations was employed among 75 respondents across five (5) purposively selected wards. Data were analysed using descriptive statistics (mean, percentage) and inferential tests (Chi-square and one-way ANOVA) at the 0.05 significance level. Results revealed that crop residues (46.7%), forage grasses (21.3%), and natural pastures (18.7%) were the dominant feed resources. Free grazing (38.7%) and herding (24.0%) were the prevailing feeding systems. High feed costs (36.0%) and feed shortages (32.0%) were the most critical constraints. Chi-square tests showed significant relationships between farmers' education level and livestock ownership type ($\chi^2 = 10.24, p < 0.05$). Despite adaptive strategies such as hay conservation (78.7%), feed supply remains inadequate. Policy-driven interventions in feed resource development and improved forage cultivation are recommended to enhance livestock productivity and rural sustainability.

Keywords: Livestock, Feed Resources, Feeding Systems and Feed Management.

Introduction

Livestock production is a mainstay of Nigeria's agricultural economy, contributing 8-10% of the national GDP and sustaining millions of rural households through income, employment, and nutrition (FAO, 2023; National Bureau of Statistics [NBS], 2024). Despite this significance, the sector's potential is constrained by persistent challenges, key among them being feed scarcity and inefficient feeding systems, particularly in the semi-arid regions of northern Nigeria. Erratic rainfall, desertification, and cropland expansion have substantially degraded the availability and quality of natural pastures, which form the foundation of traditional livestock rearing (Obayelu, 2023).

In this regard, smallholder farmers primarily depend on crop residues, forage grasses, and natural pastures. However, the high seasonal variability of these resources often leads to widespread nutritional stress, weight loss, and diminished livestock productivity (Alimi *et al.*, 2024). These challenges are compounded by population pressure and climate variability, which intensify competition for land and force farmers to rely on low-quality residues or costly commercial feeds (Boudalia *et al.*, 2024; Okoli, 2023). Consequently, the traditional smallholder systems, characterized by mixed farming and free grazing are increasingly unsustainable, hampered by limited adoption of feed conservation techniques and shrinking grazing lands (Amole & Ayantunde, 2014; Alimi *et al.*, 2024).

Addressing this feed crisis requires an in-depth understanding of local conditions. Therefore, this study aims to assess the availability, utilization, and management of livestock feed resources at the local level. By analysing feed resource types, prevailing feeding systems, and key constraints, this research will generate evidence-based recommendations to enhance sustainable livestock production and support rural livelihoods in northern Nigeria.

Theoretical Framework

This study chooses an integrated theoretical approach that combines the Sustainable Livelihoods Framework (SLF) with principles from Feed Resource Management Theory. This is to provide a comprehensive picture for analysing the complex challenges of livestock feed systems in the study area.

The Sustainable Livelihoods Framework (SLF), as advanced by the UK's Department for International Development (DFID, 1999), posits that households construct their livelihoods by leveraging a portfolio of assets across five capitals: natural, human, financial, social, and physical. Within this context, livestock are a critical form of financial and physical capital, while the feed resources, constitute the essential natural capital upon which livestock productivity depends. The SLF is instrumental in this study for understanding how households' access to and combination of these assets, supported by the prevailing social, institutional, and policy context, that shapes their vulnerability to feed shortages and their capacity to adapt.

Feed Resource Management Theory provides a focused, systems-level perspective on the specific linkages between feed and productivity. This theory explains how the availability, accessibility, quality and efficient utilization of feed resources are direct determinants of livestock health, and the overall system sustainability.

By integrating these two frameworks, this research moves beyond a purely technical analysis of feed. It enables a holistic examination of how socio-economic factors interact with and constrain feed management practices. This is essential for conceptualizing why certain feed technologies are adopted, while others are not, and how interventions can be effectively targeted within the specific livelihood context of Gumel LGA to enhance both resilience and productivity.

Materials and Methods

Study Area

Gumel Local Government Area lies between latitudes 12°20'N-12°42'N and longitudes 9°15'E-9°35'E. The study area is approximately 148 km away from the state capital Dutse and 120 km Northeast of Kano State. It lies about 30 km South of Nigeria's northern border with Republic of Niger. It shares boundaries with Maigatari Local Government in the North, Gagarawa LGA in the South-East, and Sule-Tankarkar LGA in the Southwest (Figure 1).

Gumel LGA is featuring a tropical wet-dry climate with annual rainfall 221-358 mm and temperatures 21-31°C. Soils are sandy loams in the study area, the vegetation is of Sahel Savanna vegetation, dominated by grasses and shrubs with scattered, thorny tree species (Jigawa State Government, 2011). The drought resistant trees found in the area include *Parkia biglobosa*, *Vitellaria paradoxa*, *Azadirachta indica*, *Tamarindus indica*, *Adansonia digitata*, *Diospyros mespiliformis*, *Ficus platyhylla*, *Mangifera indica*, *Acacia nilotica*, *Faidherbia albida*, *Balanites aegyptiaca*, *Ficus spp.*, *Acacia siberana*, *Borassus aethiopum*. (Abdulmajid, Ahmad & Muhammad, 2025).

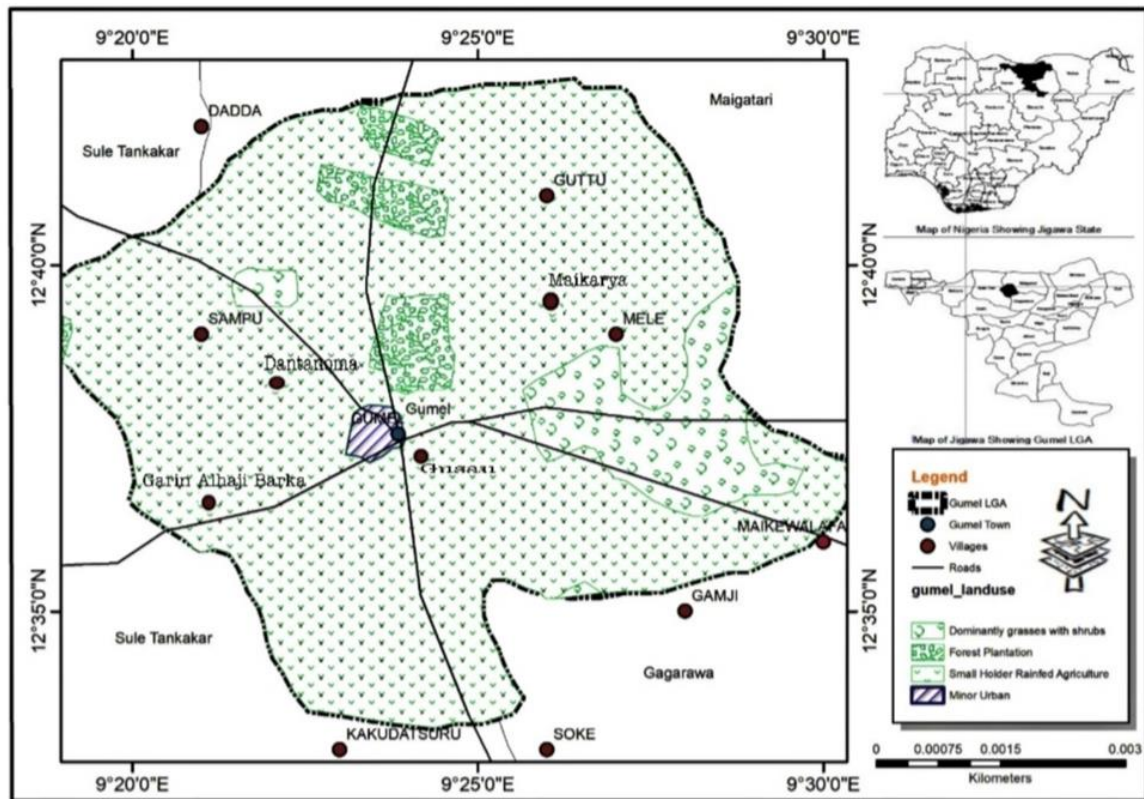


Figure 1: Map of Gumel Local Government Area (Inset: Maps of Nigeria and Jigawa State Showing the Study Area)

Source: Abdulmajid *et al.* (2025)

Research Design

A cross-sectional survey design was employed. Five wards; Baikarya, Dan'ama, Garin Barka, Garin Gambo, and Hammado, were purposively selected due to high livestock farming activity.

Sampling Procedure

A multi-stage sampling technique was utilized. First, five wards; Baikarya, Dan'ama, Garin Barka, Garin Gambo, and Hammado, were purposively selected due to their high density of livestock farming activity. Subsequently, from each of these wards, 15 livestock-keeping households that are into livestock farming for five years and above were selected. This yielded a total sample size (n) of 75 respondents.

Data Collection

Data were collected through a combination of methods. A structured questionnaire was administered; to gather quantitative data on household socio-economic characteristics, livestock ownership, feed sources, feeding systems, and perceived constraints. Direct field observations were conducted on feed storage facilities, grazing conditions, and feeding practices.

Data Analysis

Data were analysed using Excel and SPSS (v27). Descriptive statistics (frequency, mean, percentage, pie-chart) summarized and illustrate the data. Chi-square tests were used to examine associations between categorical variables, such as education level and livestock diversity, while

a one-way Analysis of Variance (ANOVA) was conducted to test for significant differences in the availability of feed resources across the different study wards. For all inferential tests, a probability value of $P < 0.05$ was considered statistically significant.

Ethical Consideration

Participation was voluntary. Verbal informed consent was obtained, and confidentiality was maintained throughout the study.

Results and Discussion

Socio-Demographic Characteristics

The findings from this study (Table 1) provide critical insight into the demographic structure of livestock management in the study area. The most prominent pattern is the overwhelming dominance of male participation (88%) compared to females (12%). This gender imbalance reflects deeply rooted socio-cultural and economic norms that shape labour roles and resource control within rural farming systems in Northern Nigeria.

Evidence from intrahousehold studies in Northern Nigeria indicates that although women may own certain livestock, particularly small ruminants such as goats and sheep or poultry, the ownership and control of higher-value assets, especially cattle, remain largely under male authority (Umaru & Van der, 2018). This dynamic reinforces long-standing patterns of gendered resource control and decision-making.

Similarly, socio-economic research among Sahelian pastoralists has highlighted persistent barriers that limit women's effective participation in livestock systems. These constraints include restricted access to productive resources, entrenched cultural expectations, and limited decision-making power within households and communities (Verere & Johnson, 2024).

Studies from smaller-scale livestock production contexts in Nigeria further support this pattern. Men tend to dominate both livestock ownership and the core management functions, while women are more commonly involved in supportive roles such as feeding, watering, and routine animal care, particularly for smaller species (Alonge, Makinde, Owolade, Martins, & Adegbite, 2016).

Table 1: Distribution of Respondents by Sex

Characteristic	Category	Frequency	Percentage (%)
Sex	Male	66	88
	Female	9	12
Total		75	100

Source: Fieldwork, 2025

The results of the study reveal a predominantly middle-aged to older farming population, with the largest age cohort comprising individuals aged 42-52 years (38.7%), followed by those aged 31-41 years (25.3%) (Table 2). Together, these two groups represent nearly two-thirds of the respondents. In contrast, younger individuals are markedly underrepresented in livestock production, with only (14.7%) falling within the 20–30 years age bracket.

This demographic pattern aligns closely with the “aging farmer” phenomenon widely documented across sub-Saharan African agricultural systems. Muyanga and Jayne (2019) report that farming activities in the region are increasingly concentrated among older age groups, indicating a continued reliance on a generation that has accumulated extensive indigenous

knowledge on animal husbandry, local feed resources, and seasonal management practices (Jayne *et al.*, 2019).

However, the limited involvement of individuals under 30 years of age raises significant concerns regarding succession and the transfer of agricultural knowledge. Rural youth in Nigeria are increasingly migrating to urban centres in pursuit of formal education and employment opportunities, a trend that is reshaping the rural labour landscape and contributing to a declining interest in agriculture among young people (Adeyanju *et al.*, 2023).

The implications of this rural youth outmigration are substantial. It threatens not only the intergenerational transmission of essential livestock management skills but also the long-term availability of labour required to sustain livestock production systems.

Table 2: Distribution of Respondents by Age Group

Characteristic	Category	Frequency	Percentage (%)
Age Group (years)	20-30	11	14.7
	31-41	19	25.3
	42-52	29	38.7
	53-63	11	14.7
	>63	5	6.7
Total		75	100.0

Source: Fieldwork, 2025

The results of this study indicate that a majority of respondents possess a low level of formal education (30.7%) reported having no formal education, while (36.0%) completed only primary schooling. (21.3%) attained secondary education, and just (12.0%) had tertiary qualifications (Table 3). This educational pattern is characteristic of smallholder livestock systems in rural Nigeria, where access to formal schooling remains limited. Mafimisebi, Oguntade, Fajemisin, and Aiyelari (2012) similarly reported that approximately (77%) of livestock farmers in southwestern Nigeria had no formal education, reflecting a broader structural challenge across the livestock sector.

The limited educational attainment contributes to the continued reliance on indigenous knowledge systems for animal health management and general husbandry practices.

While these indigenous knowledge systems remain invaluable for navigating local ecological conditions, low formal education can hinder farmers' ability to adopt improved technologies, interpret extension recommendations, and engage effectively with modern livestock innovations. This presents a critical barrier to the long-term transformation and productivity growth of the livestock sector.

Table 3: Distribution of Respondents by Educational Qualification

Characteristic	Category	Frequency	Percentage (%)
Education Level	Informal	23	30.7
	Primary	27	36.0
	Secondary	16	21.3
	Tertiary	9	12.0
Total		75	100.0

Source: Fieldwork, 2025

Livestock Ownership Patterns

Livestock ownership data, presented in (Table 4), reveal that small ruminants were the most commonly reported assets. Sheep were the most prevalent (29.1%), followed closely by goats (25.8%) and cattle (24.2%). Poultry was reported (19.2%) and others animals by (1.7%). Chi-square analysis ($\chi^2 = 10.24$, $p = 0.037$) indicated a significant association between education level and livestock owned.

The prevalence of sheep, goats, and cattle in the study area aligns with existing literature on agro-pastoral systems in semi-arid regions. The dominance of these small ruminants indicates their role as critical, resilient assets, likely due to their adaptability to harsh climatic conditions, lower maintenance costs, and their functions as a liquid financial reserve (Alimi *et al.*, 2024).

Table 4: Types of livestock owned by respondents

Livestock Type	Frequency*	Percentage (%)
Cattle	63	24.2
Sheep	76	29.1
Goats	67	25.8
Poultry	50	19.2
Others	05	1.7
Total	261	100.0

Source: Fieldwork, 2025

Feed Resource Availability and Utilization

The analysis of feed resources revealed that crop residues were the predominant feed source, accounting for (46.7%) of responses, followed by forage grasses (21.3%) and natural pastures (18.7%) (Table 5). A one-way Analysis of Variance (ANOVA) indicated that the availability of these feed resources differed significantly across the wards ($F = 3.89$, $p = .03$).

The heavy reliance on crop residues as the primary livestock feed is a well-documented characteristic of smallholder mixed-farming systems across the West African semi-arid zone, consistent with findings from Nigeria and Niger (Amole & Ayantunde, 2014; Makinde, 2025). This dependency indicates an integrated crop-livestock system where agricultural by-products are efficiently utilized. The significant variation in feed availability between wards, can be largely attributed to spatial factors such as local cropping patterns and proximity to grazing reserves.

Table 5: Distribution of Feed Resources Utilized by Respondents

Feed Type	Frequency	Percentage (%)
Crop Residue	35	46.7
Forage Grass	16	21.3
Natural Pasture	14	18.7
Agro-Industrial By-products	10	13.3
Total	75	100.0

Source: Fieldwork, 2025

Livestock Feeding System

The results in (Table 6), indicates that extensive feeding systems were predominant in the study area. Free grazing was the most common practice (38.7%), followed closely by herding (24.0%). The combination of these two systems accounts for nearly two-thirds of all reported practices. Stall feeding represented a notable minority (17.3%), with supplementary feeding and tethering being less common.

The overwhelming reliance on free grazing and herding is characteristic of traditional pastoral and agro-pastoral systems across West Africa, as noted in similar contexts (Boudalia *et al.*, 2024). These systems are deeply embedded in the local socio-ecology, leveraging communal land resources and requiring lower immediate capital inputs. However, the significant presence of stall feeding (17.3%) signals an important socio-economic transition, particularly in rural areas. This shift is likely driven by multiple factors, including shrinking grazing lands due to agricultural expansion.

Table 6: Distribution of Livestock Feeding Systems in the Study Area

Feeding System	Frequency	Percentage (%)
Free Grazing	29	38.7
Herding	18	24.0
Stall Feeding	13	17.3
Supplementary Feeding	9	12.0
Tethering	6	8.0
Total	75	100.0

Source: Fieldwork, 2025

Feed Constraints

The study identified several critical constraints hindering sustainable livestock feeding (Figure 2). The most pressing challenges were the high cost of feed, reported by (36.0%) of respondents, and general feed shortage by (32.0%). These two issues combined affected the majority (68.0%) of the livestock keepers surveyed.

The predominance of high feed costs and shortages as primary constraints is a well-documented challenge in West African agro-pastoral systems, consistent with findings from Obayelu (2023) and Sime (2025). These issues are intrinsically linked to the commercialization of crop residues, competition for arable land from expanding agriculture, and degradation of common grazing areas collectively drive up the price and reduce the availability of feed resources.

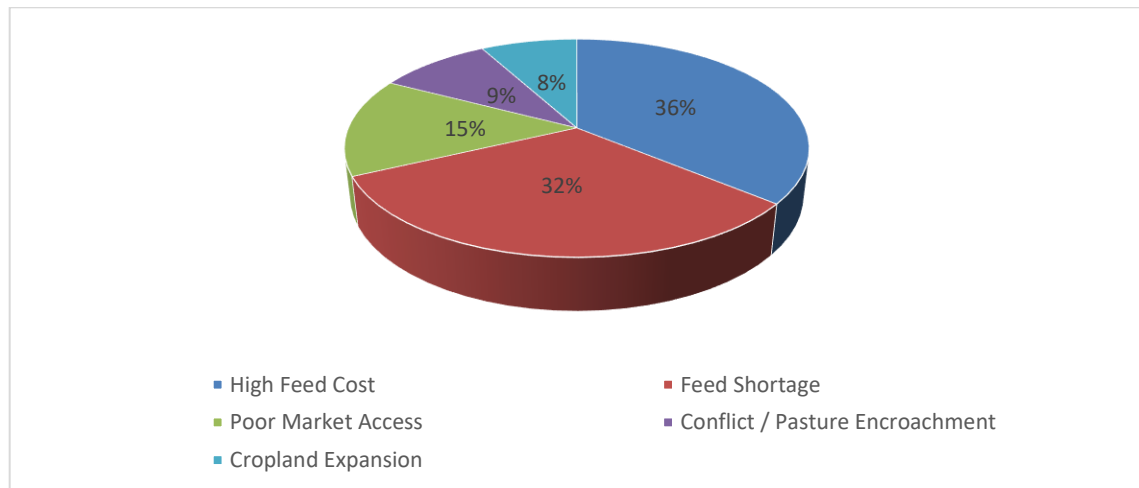


Figure 2: Major Feed-Related Constraints Reported by Livestock Keepers

Feed Management Practices

The assessment of feed management practices revealed a heavy reliance on a single, traditional method. As shown in (Table 7), hay conservation was the predominant practice, adopted by the vast majority of respondents (78.7%). All other practices, including feed storage (8.0%), feed formulation (6.7%), and rotational grazing (4.0%), were reported by only a small fraction of the livestock keepers.

The overwhelming dominance of hay conservation as an adaptive strategy is consistent with findings from smallholder systems in Ethiopia and West Africa (Alimi *et al.*, 2024). This practice is a pragmatic and low-cost response to seasonal feed scarcity, allowing farmers to preserve roughage for the dry season.

The very low adoption rates of feed formulation, rotational grazing, and modern techniques like hydroponic fodder techniques (Okoli, 2023) indicate a significant technological and knowledge gap. While hay conservation addresses the issue of feed availability, it does little to improve the nutritional quality of the diet, which is a key limitation to achieving higher livestock productivity. The minimal use of feed formulation, for instance, suggests that animals are often not receiving balanced rations, limiting growth, milk yield, and overall health.

Table 7: Feed Management Practices Adopted by Respondents

Practice	Frequency	Percentage (%)
Hay Conservation	59	78.7
Feed Storage	6	8.0
Feed Formulation	5	6.7
Rotational Grazing	3	4.0
Pollarding and Crop Residue Utilization	2	2.8
Total	75	100.0

Source: Fieldwork, 2025

Conclusion and Recommendations

The study concludes that livestock feed resources in the study area are largely derived from crop residues, natural pastures, and forage grasses, with free grazing and herding as the primary feeding systems. The core challenges of high feed cost and scarcity are persistent, and the heavy reliance on hay conservation as a coping strategy is insufficient to bridge the gap in feed quality or long-term sustainability. Enhancing livestock productivity thus requires policy interventions in feed resource management, forage development, and training on feed conservation technologies. The following recommendations were made:

1. The state government should promote low-cost technologies that enhance feed quality (basic feed formulation) to complement existing hay conservation practices.
2. All relevant stakeholders should help in promoting cultivation of drought-resistant improved forage species compatible with semi-arid climates.
3. The government should facilitate access to subsidies or microfinance to encourage establishment of small-scale feed processing.
4. The state government should integrate feed resource management into state agricultural investment agendas.
5. There is need for enhancement of agroforestry initiatives promoting fodder tree cultivation to diversify feed bases.

Acknowledgements

The author appreciates the assistance of community leaders and livestock farmers in Gumel LGA for their cooperation during data collection.

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