



## Research Article

# Seasonal Variation in The Cost of Livestock Rearing in Maiduguri Metropolis, Borno State, Nigeria

\*<sup>1</sup>Alhaji Mukhtar, <sup>1</sup>Yagana Mohammed Aji, <sup>2</sup>Baba Zanna Abdulkarim and <sup>3</sup>Tijjani Abubakar Ladan

<sup>1</sup>Department of Geography, University of Maiduguri, P.M.B 1069 Maiduguri, Borno State

<sup>2</sup>Multi Sectoral Crisis Recovery Project, Maiduguri, Borno State

<sup>3</sup>Department of Integrated Science, School of Science, Kashim Ibrahim College of Education P.M.B 1469 Maiduguri

Corresponding Author: [agmukhtar75@gmail.com](mailto:agmukhtar75@gmail.com), [doi.org/10.55639/607jihg](https://doi.org/10.55639/607jihg)

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### ABSTRACT

The use of Livestock feeds for livestock rearing is a function of a season. This study examined the seasonal disparity in the cost of livestock rearing in Maiduguri metropolis, Borno State, Nigeria. Census of the study area revealed that there are two thousand, four hundred and seventy-nine livestock rearers. The instrument of the research was tested in a pilot survey. The respondents of the pilot survey were approached through accidental sampling. The outcome of the pilot survey helped in redesigning the research instrument. Three hundred and forty-six people engaged in livestock husbandry were chosen at random from all administrative districts in the metropolis using a stratified random sample approach. They were randomized using the Microsoft Excel software, and a sample from each ward was chosen. Data collected were analyzed using descriptive and inferential statistic tools. It is practised throughout the year, with the maximum stock during the dry season. Livestock rearing is mostly dependent on supplemental feeding. Articulation noticed is most likely due to geographical or economic factors.

**Corresponding author:** Alhaji Mukhtar, Email: [agmukhtar75@gmail.com](mailto:agmukhtar75@gmail.com)  
Department of Geography, University of Maiduguri, P.M.B 1069 Maiduguri, Borno State

## INTRODUCTION

Livestock rearing in an urban area is all-year activity, unlike other farming activities (like the rising of staple food crops during the rainy season), which are purely seasonal in Maiduguri. Non crop farmers who engage in livestock rearing in Maiduguri purchase farm residues and conserve it for future use. Livestock rearers in Nigeria, particularly in semi-arid locations, employ a variety of off-farm feed resources to support livestock production, particularly during the fattening process, which includes the utilization of non-conventional feed resources (Mutimura *et al.*, 2015). Among the residue purchased to rear livestock include millet and guinea corn husk, and groundnut haulms among others. This is in addition to supplementary feeds like wheat offal and coconut bran.

Livestock feeds are used for livestock rearing on a seasonal basis. Seasonal severity in raising costs is caused by variations in demand and output. Price fluctuations are one of the factors that contribute to the risk of livestock rearing. The four key cost-raising drivers are Long-term patterns, seasonal fluctuation, cyclical movements, and irregular changes.

Commodity prices are those that are expected to prevail at the time commodities are sold and are utilized in making judgments about switching businesses or making changes within current businesses. To anticipate price changes, you'll need to know what factors influence prices. As a result, individuals must stay current on commodity production and marketing quantities, as well as overall supply and demand situations. Turmel *et al.* (2015) were of the view that livestock rearers may change their operations to some extent to take advantage of seasonal fluctuation; primarily the cost of rearing livestock regarding seasons is the focal point of this research.

## Research Problem

Peri-Urban Agriculture (PUA) and Urban Agriculture (UA) have been practised for a long, especially in developing countries as essential livelihood options for many families living in urban areas, as stated by Shettima, Mustapha, and Sulumbe (2017), that livestock (cattle, sheep, and goats) rearing within Maiduguri metropolis has increased from 10,352 as at 2007 to 26,877 in 2014, thus suggestive that the practice is gaining ground. This is taxing for a non-agricultural settlement with a population density of 5,539 persons per square kilometre. Being a non-agricultural city, most of the feed used in rearing livestock is sourced from the fringes of the settlement and other yonder rural areas. In most cases, the cost of such agricultural products rises and falls frequently, faster than prices received for processed goods. The same is likely to be true of water availability and prices. As a consequence, the farmer finds it difficult to plan production in response to price changes. The teaming part-time workforce is likely to be affected by the fluctuating price. The recent influx of people into Maiduguri from rural areas is likely to compound the problem of the livestock feeds. Hitherto, greater percentages of the inputs are sourced from within the state. With this development, possible changes in the prices of inputs are discernable, hence the need to investigate the variation in the cost of livestock husbandry in Maiduguri for the sector's long-term growth.

## METHODOLOGY

### Data collection and analytical procedures

The research was conducted in the Maiduguri metropolis area of Borno state, Nigeria. The dumping of the livestock excretes at a close range from the sites; noise from the livestock as well as odour from the sites makes the location

of livestock easily identifiable. Livestock rearing households amidst the heterogeneous population were reached with the aid of residents of the various districts.

To develop a sample frame, an exploratory survey was conducted in all thirty-two (32) administrative wards in the study area. A reconnaissance survey of the study area was carried out to help the researcher have a synopsis of the study area and the prevalent

types of livestock species in the area. During the reconnaissance visit, ethical authorization was sought from Wards heads and the mission of the researcher was spelt out. A quick census of the entire households engaged in livestock rearing in all the 32 administrative wards reveals that there are 2479 livestock rearers in the Maiduguri metropolis. The study sample was arrived at using the Yamane (1967) formula which states as follows:

$$n = \frac{N}{1 + N(e)^2}$$

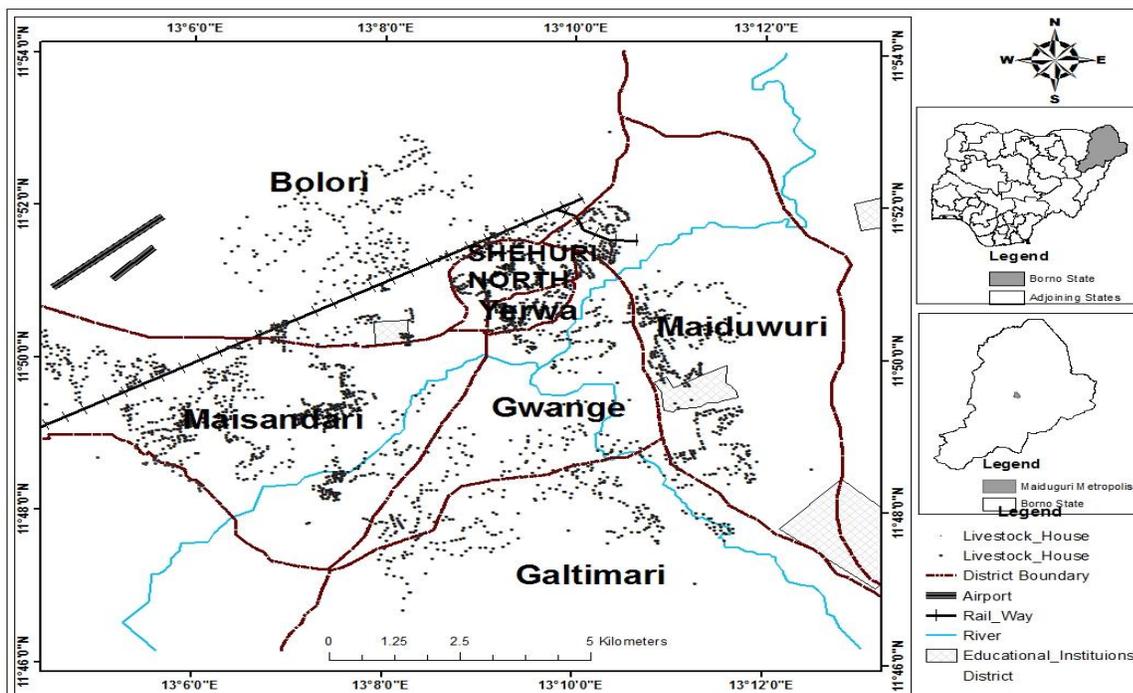
Where:

n= Desired sample size

N= Total population

e= Accepted error limit (0.05 based on 95% degree of confidence)

$$n = \frac{2479}{1 + 2479(0.05)^2} = \frac{2479}{1 + 2479(0.0025)} = \frac{2479}{1 + 6.20} = \frac{2479}{7.20} = 345.6 \sim 346$$



**Figure 1:** Maiduguri Metropolis showing the locations of Households rearing livestock

Source: *Field Survey, 2022*

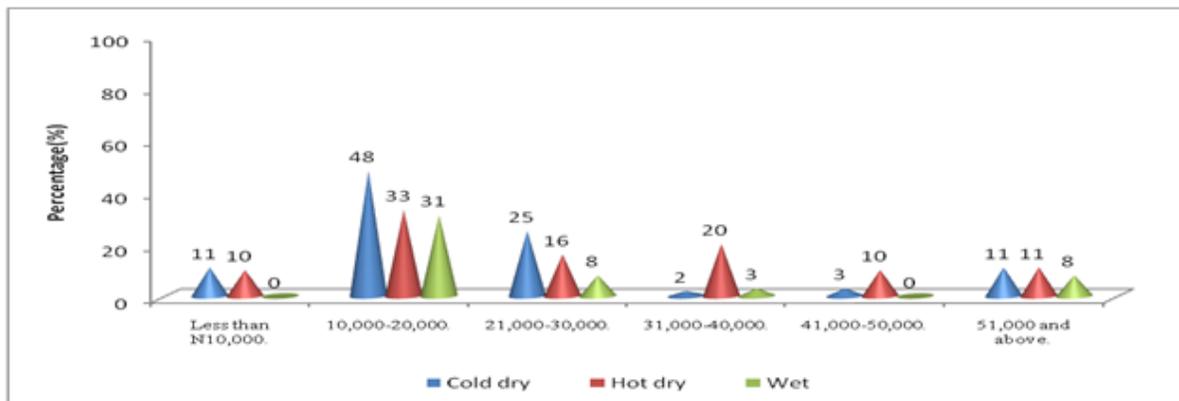
The reconnaissance survey was followed by a pilot survey. The pilot survey was carried out to test the instrument of the research (interview schedule) before the real field exercise. For the pretest survey, copies of interview schedules were administered to livestock rearers through accidental sampling. The result of the pretest survey helped the researcher in two ways: (i) remodel the research instrument from a technical to a more plausible one, and (ii) how to track down the respondents. Afterwards, as dictated by the sample size, 346 livestock rearers were reached through a stratified sampling technique. The rationale behind the choice of stratified sampling technique is that the study area is made up of homogeneous information, differentiated by some relevant characteristics. One of the common reasons for utilizing stratified sampling is the illustration of its value as shown in figure 1. It also guarantees that the number of units taken from distinctive

strata is proportional to their true size in the population. The method adopted is also known as proportionate stratified sampling.

The facts collected from the respondents were compiled, revised, and tagged to guarantee that any evident problems were fixed by reviewing specific areas and respondents. The field statistics were analysed using the descriptive and inferential statistics tools.

**RESULTS AND DISCUSSION**

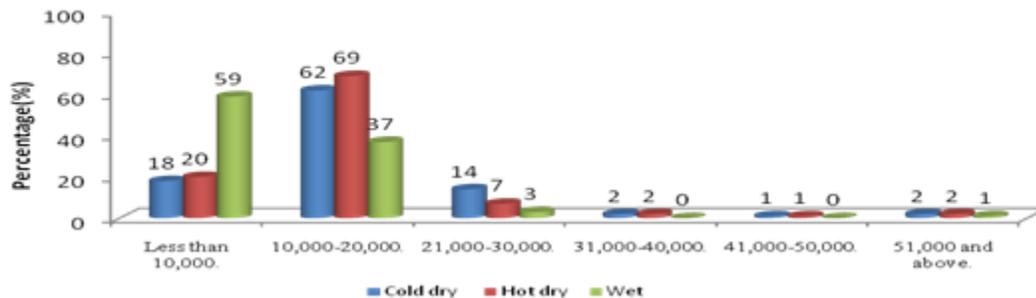
Through observation and enquiry of data on the seasonal utilisation of fodder was obtained. Figures 2, 3 and 4 depict the seasonal variation in the cost of Cattle, Sheep and Goat rearing in the Maiduguri metropolis.



**Figure 2:** Seasonal Variation in Cost of Rearing Cattle  
**Source:** Field Survey, 2022

Figure 2 reveals that cattle rearing takes place throughout the year. On a broad scale, the rearing cost of cattle is highest during the harmattan season. This has to some extent been due to the fact it coincides with the season of high sales of roasted meat (*suya*) and pepper soup (David, 2012). In addition, retail meat sale improves considerably during the harmattan season,

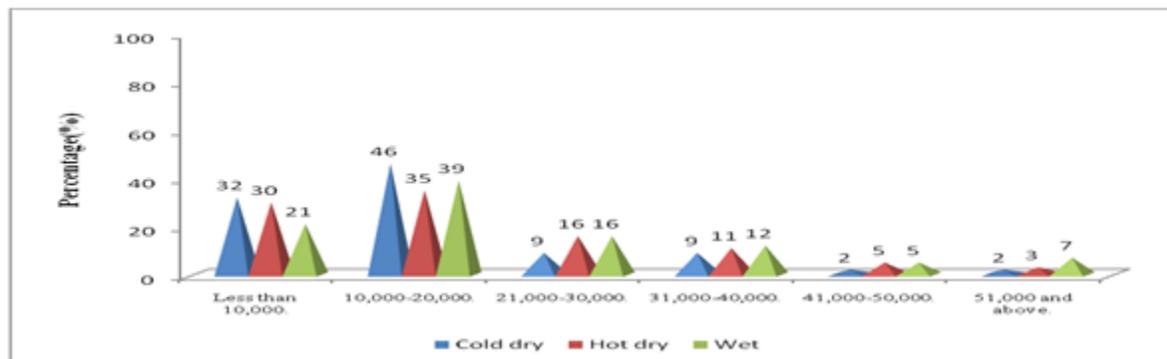
and it is largely linked to the tradition of closed cohabitation of humans of the opposite sex and the demand for high protein and fatty foods. During the dry season, the cost of rearing livestock is considerably high and as a result of the high cost of feeds and scarcity of water. Some 48% of the cattle rearers spend between ₦10,000- ₦ 40,000.



**Figure 3:** Seasonal Variation in Cost of Rearing Sheep  
**Source:** Field Survey, 2022

Figure 3 reveals that sheep rearing is also an all-year-round activity within the metropolis. All the respondents indicated that the cost of rearing sheep is highest during the hot, dry season. This is contrary to that of cattle rearing costs. One factor that may explain this variation is because of

the preference for small ruminant livestock meat by the aged on medical grounds and the fact that sheep is the most preferred livestock for Sallah and naming ceremonies. A more significant percentage of sheep rearers spend between ₦10, 000- ₦ 30,000 per sheep per season.

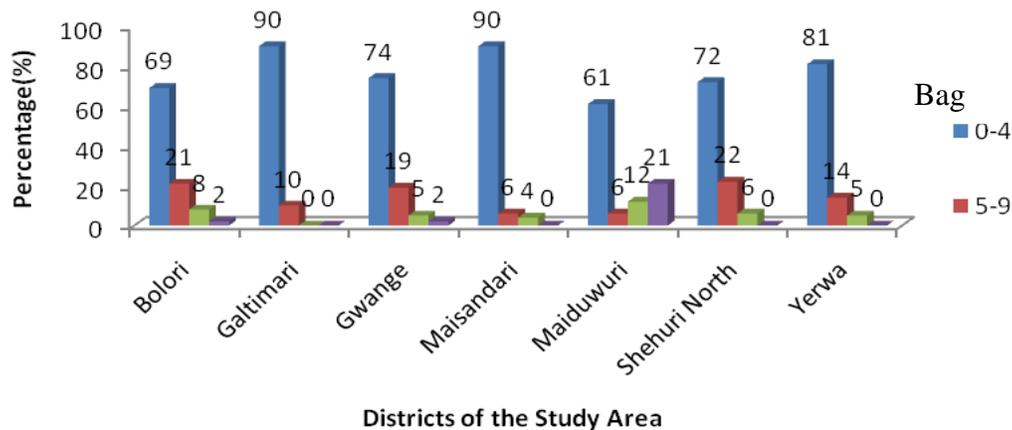


**Figure 4:** Seasonal Variation in Cost of Rearing Goats  
**Source:** Field Survey, 2022

Goats are most expensive to rear during the wet season (Figure 4). If one can recall an assertion made that goat is the nastiest livestock due to its stray habit. During the wet season, such habits are seriously curtailed by other land users, especially crop farmers. This might be one of the factors responsible for the hike in the price of goat feeds during the wet season. This is in tandem with the findings of Welearegay, Yilma, and Tekle-Giorgis (2012) who stated that Hawassa city's urban goat farmers (Ethiopia) spent more on feedstuff during the wet season as the movement of livestock is highly restricted. Figure 3 reveals that on average, livestock rearers spend between N10,000 - N20,000 per season on three (3) healthy goats.

**Seasonal Variation in the Quantity of Husk Used in Livestock Rearing**

Husks are derivatives of hulled grains. The separation of shell from grain which is mostly done at the farm sites is popularly known as *Kariri* (Kanuri) or *Kayyi kayi* (Hausa). Husks are used as animal feed in the metropolis. It is most often offered to livestock when mixed with other feeds such as bran and offal among others. Though husk is being sold in 50 kilogrammes (kg) bags, at most of the selling points it weighs 40±1kg. It is also weighed and sold in measures such as large basins (*Darro*), and smaller ones popularly refer to as *Mudu*.

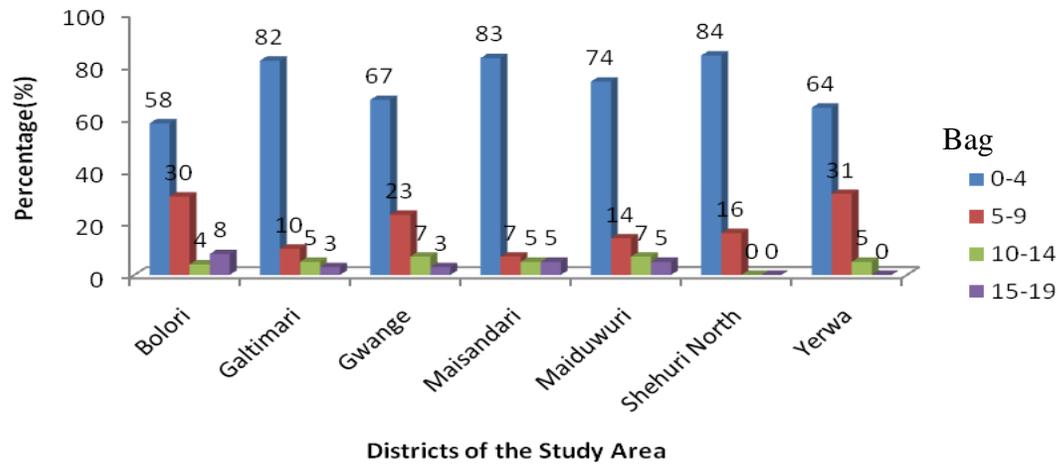


**Figure 5: Bags of Husk Used by Livestock Rearers During Harmattan Season**  
**Source : Field Survey, 2022**

From Figure 5, it is apparent that in all the districts, livestock rearers use husk during the Harmattan season for the upkeep of their stock as indicated by 78% of the respondents who reported they use up to 0 to 4 of 50 kg bags during the Harmattan season for an average of two (2) cattle. Others use varying quantities of husks from

5 and above bags within the same period. Low quantity intake during the harmattan season is linked to the problem of digestibility which affirms the findings of Okoruwa, Omoragbon, and Eguabor (2014) which reveals that digestibility and rasping characteristics are the limiting factors in the

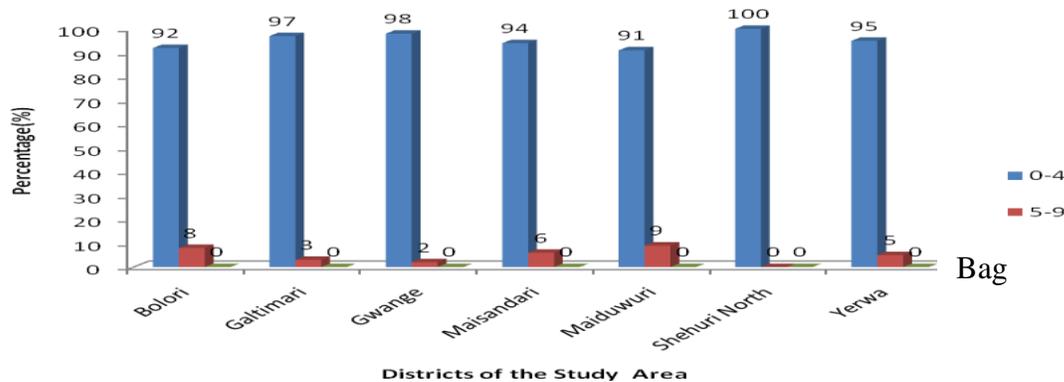
utilization of husk in most tropical countries during the harmattan season.



**Figure 6:** Bags of Husk Used by Livestock Rearing Districts During Hot Dry Season  
**Source:** Field Survey, 2022

Exposure to dry air, fermentation and soaking of husk in hot water are methods employed in reducing indigestion during the hot season. It is evident from Figure 6 that 79% of the respondents affirmed that the husk is greatly utilized during the hot season. There is a slight increase in the

utilisation of husks during the hot season of between 5-9 bags per stocking by 16% of the respondents. This is in tandem with the views of Okoruwa *et al.* (2014) that found ensiling and fermentation as a limiting factors to the utilization of husk.



**Figure 7:** Bags of Husk Used by Livestock Rearing Districts During Raining Season  
**Source:** Field Survey, 2022

Figure 7 shows that on average 94 % of the respondents across the districts use less than four bags of husk for the upkeep of

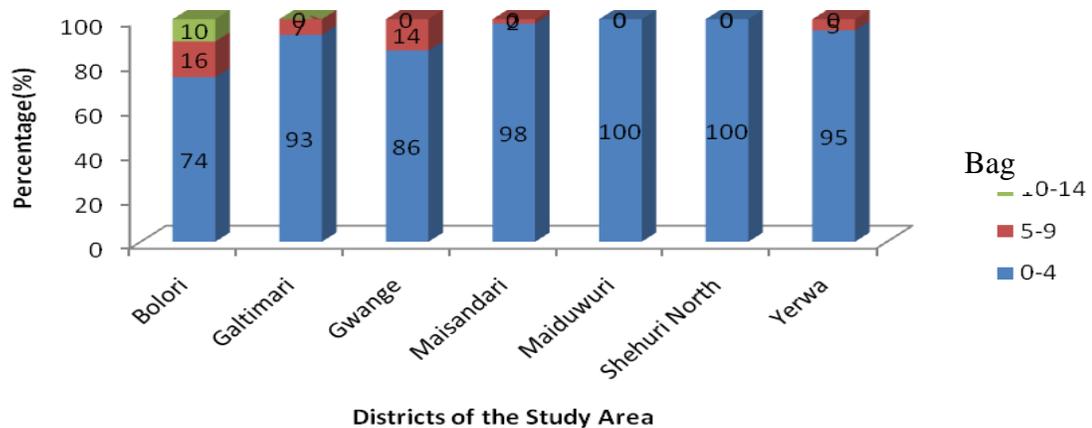
their livestock during the rainy season. Generally, the number of ruminants kept at the fattening centres reduces during the

rainy season. Livestock is mostly taken out to the fields to graze daily and return to their homes in the evening indicative of low use of husk during the rainy season.

**Seasonal Variation in the Quantity of Bran Used in Livestock Rearing**

Bran is a husk obtained from a cereal that is removed during milling. It is referred to as *Binna* (Kanuri) or *Dussa* (Hausa) in the metropolis. According to Tolera (2008),

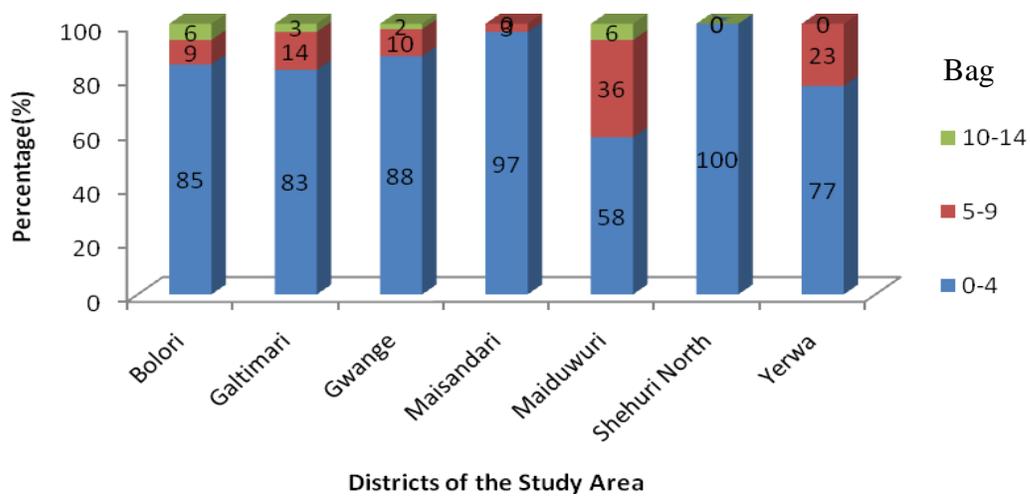
most cereal brans are rich in the concentrations of calcium (Ca) and phosphorus (P). Calcium is good in strengthening bones while phosphorus helps as a drying agent during the metabolic process. Brans are sold similarly to that husk, but the weight of the sack at most selling is 50±1kg. Below are the variations in the quantity of bran used in livestock rearing portrayed in Figures 8, 9 and 10.



**Figure 8:** Quantity of Bran Used in Livestock Rearing During Harmattan Season  
 Source: *Field Survey, 2022*

As revealed in Figure 8, 93% of respondents use either the maize or guinea corn bran in feeding their livestock during harmattan season. Bran is a good source of calcium and phosphorus explains why its preference as a feed for stocks. This

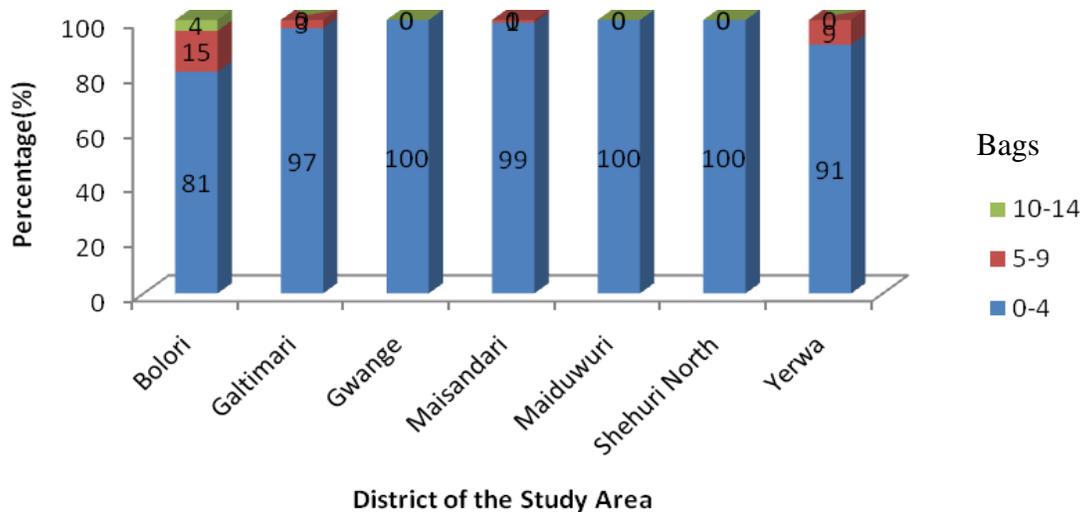
corroborates the findings of Yahaya and Kibon (2013) that, bran is functional in the fattening of livestock, especially during the harmattan season.



**Figure 9:** Quantity of Bran Used in Livestock Rearing During Hot Dry Season  
**Source:** Field Survey, 2022

During the hot season, there is an increase in digestibility, feed intake and consumption of other nutrients, thus improving livestock quality. More livestock is owned during this season than the others. Figure 9 shows that on average 85% of the respondents use up to 4 bags while only 12% use 5.0 bags and above per

stocking period compared to the harmattan season. The bran is usually mixed with other routine feeds to improve the quality of feeds. This result is, however, not in tandem with the findings of Donkoh and Attoh-Kotoku (2009) in Ghana where much lower attention is given to maize bran by livestock during the dry season.

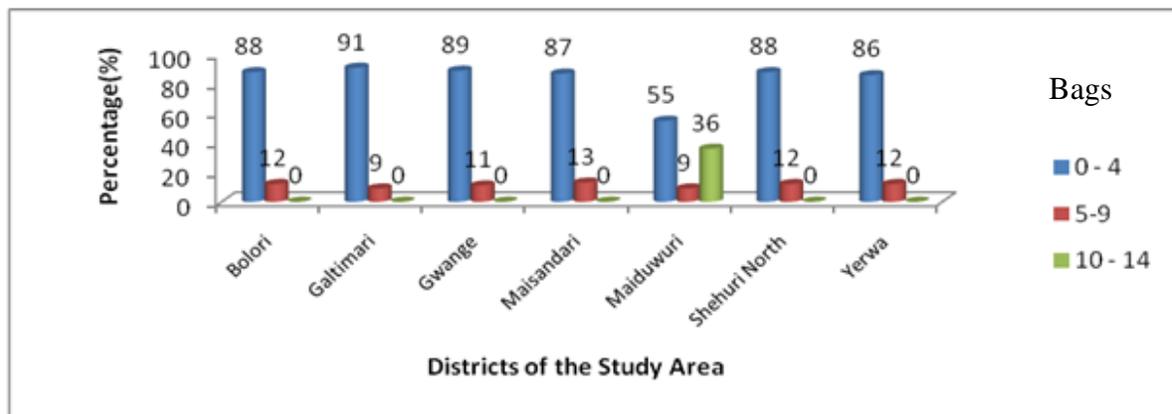


**Figure 10:** Quantity of Bran Used in Livestock Rearing During Raining Season  
**Source:** Field Survey, 2020

Across the pixels(districts) in the metropolis, respondents all agreed that bran is a staple throughout the year. At the onset of the rainy season, it is offered to livestock at an incremental rate with other feeds. This is done to curtail too much watery defecation sensed. Figure 10 shows that 96%t of the rearers still maintain using up to 4 bags during raining season. This finding is in agreement with Katongole, Sabiiti, Bareeba, and Ledin (2009) who observed that during the rainy season, farmers in developing nations frequently utilize bran as a supplement feed for small ruminants, at a proportion ranging from 10 to 25 percent of the overall diet.

**Seasonal Variation in the Quantity of Offal Used in Livestock Rearing**

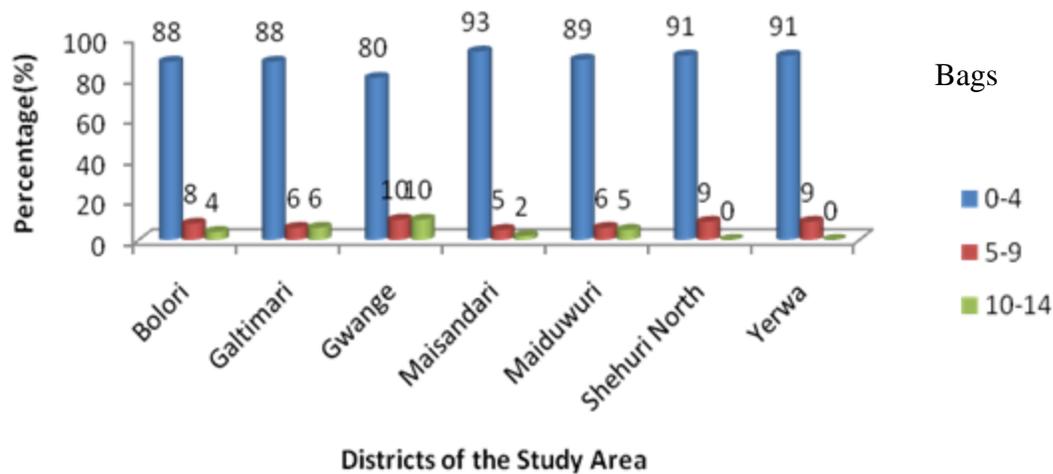
Offal is a byproduct obtained after milling wheat into flour or durum into semolina. It is commonly marketed as wheat offal. According to Dhuyvetter, Hoppe, and Anderson (2010), wheat offal contains higher levels of fibre, protein, and minerals than the parent grain. In addition, Offal irrespective of type is a good source of many traces of minerals such as copper, zinc, magnesium and selenium that are often not available in forages. In the study area, it is mostly sold in 50 kg sacks. It is retailed in smaller measures. The seasonal variations in the usage of offal in livestock rearing are shown in Figures 11, 12 and 13.



**Figure 11:** Quantity of Offal Used in Livestock Rearing During Hot Dry Season  
**Source:** Field Survey, 2022

Figure 11 shows the percentage of respondents that use offal during hot dry season. An average of 82% of the respondents used up to 4.0 bags of offal as part of feedstuff for their stock during hot dry season. Offal is also offered in accordance with the stability of the

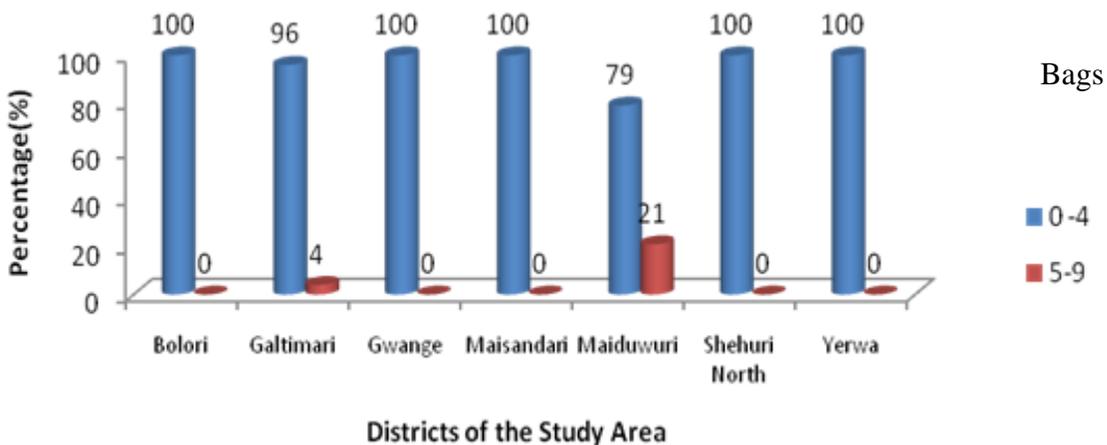
metabolic process of a newly acquired livestock. According to the livestock rearers, they do use other alternatives such as bran or husk as major feeds for the livestock.



**Figure 12:** Quantity of Offal Used in Livestock Rearing During Harmattan Season  
**Source:** Field Survey, 2022

As revealed in Figure 12, 90% of the respondent use wheat offal for the upkeep of their stock during the harmattan season.

While only 7% use 5 to 9 bags. From Figure 12 it is apparent that all the respondents used offal.



**Figure 13:** Quantity of Offal Used in Livestock Rearing During Raining Season  
**Source:** Field Survey, 2020

An attempt was made to quantify the use of offal by the livestock rearers during raining season. This, when compared with the use of husk and bran shows a substantial reduction in the quantity of offal usage during the rainy season. Out of the 346 livestock

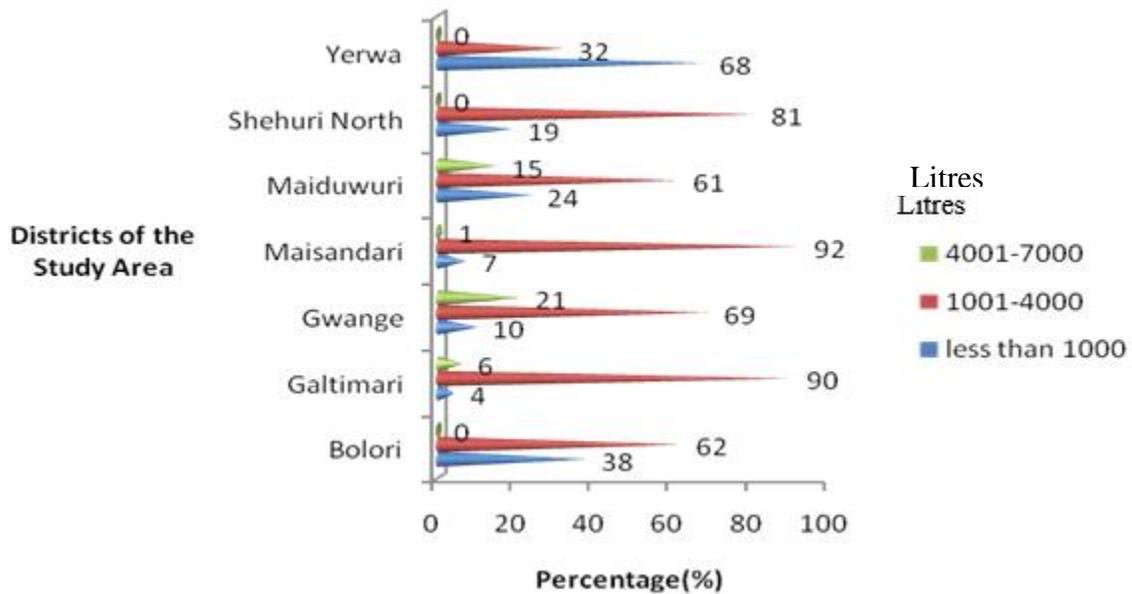
rearers, 96% affirmed that offal is an important component of their livestock feed meals.

**Seasonal Variation in Quantity of Water Used in Livestock Rearing**

According to Schlink, Nguyen, and Viljoen (2010), the liquid refer to as water constitutes approximately 98% of all molecules in livestock. It is essential: to regulate body temperature, as well as for increment, reproduction and lactation. It also aids in the metabolism, digestion; and excretion of protein, fat and carbohydrates. Several factors influence water requirements, including the rate and composition of weight gain, pregnancy, lactation, type of diet, feed intake, and

lowering the environmental temperature, among others (Schlink *et al.*, 2010).

Water requisite for livestock in urban and peri-urban settlements has never been considered in urban planning, and as a result, animals are often forced to consume contaminated and polluted water with high health risks (Sileshi, Tegegne, & Tsadik, 2003). This section reveals the seasonal variation in the quantity of water used in livestock rearing in the metropolis. Figures 14, 15 and 16 depict variations in the quantity of water used in livestock rearing.



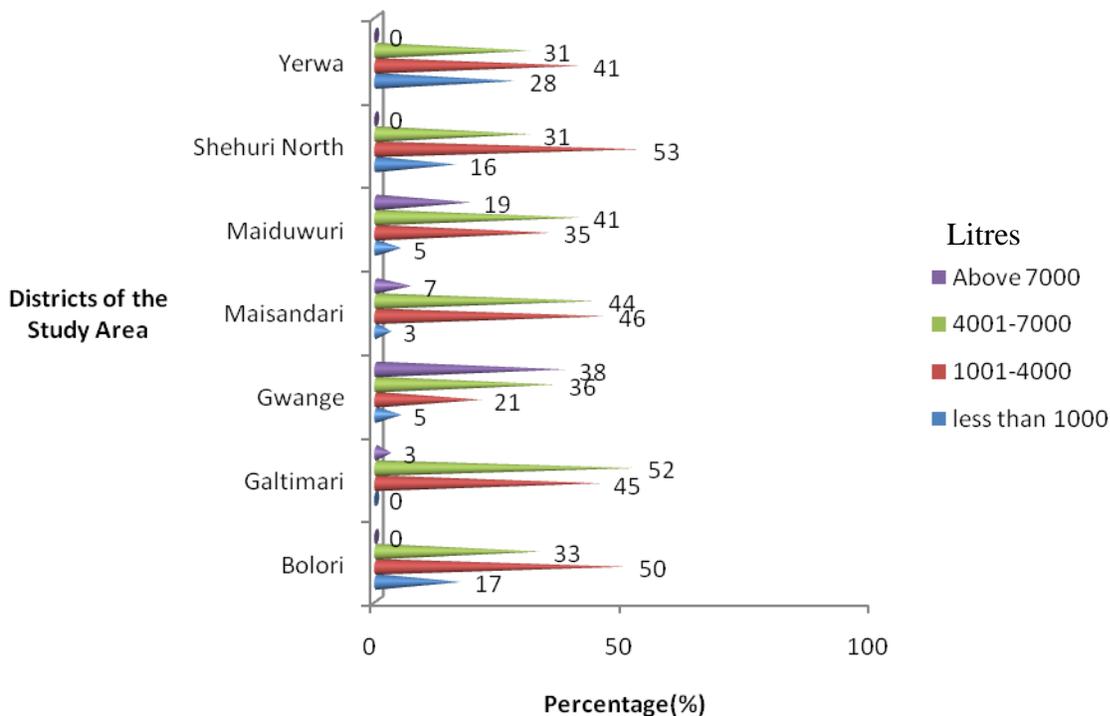
**Figure 14:** Litres of Water Used by Livestock Rearers During Harmattan Season  
**Source:** Field Survey, 2022

Water required by livestock for metabolism appears to vary with the individual (male or female) and specific characteristics such as size and rate of movement. The water component of any feed is a critical determinant of whether or not livestock

needs supplemental water. With indoor housing situations fed with dry feeds, all livestock will need access to a fluid water source, regardless of temperature. It is apparent from Figure 14 that, 74 % of the livestock rearers use a quantity of water that

ranges from a thousand litres to almost four thousand litres for the upkeep of their livestock during harmattan season. The others (26%), use either less or higher than the stated quantity. The quantity of water used is calculated by referring to the volume of a jerry can (20 litres) of water. A

thousand litres are equal to  $1000/20= 50$  jerry cans. The fifty jerry cans are the minimum quantity used by livestock rearers for about fifteen (15) livestock provided they are confined to a location with limited orbital extent.



**Figure 15:** Litres of Water Used by Livestock Rearers During Hot Dry Sesaon  
**Source:** Field Survey, 2022

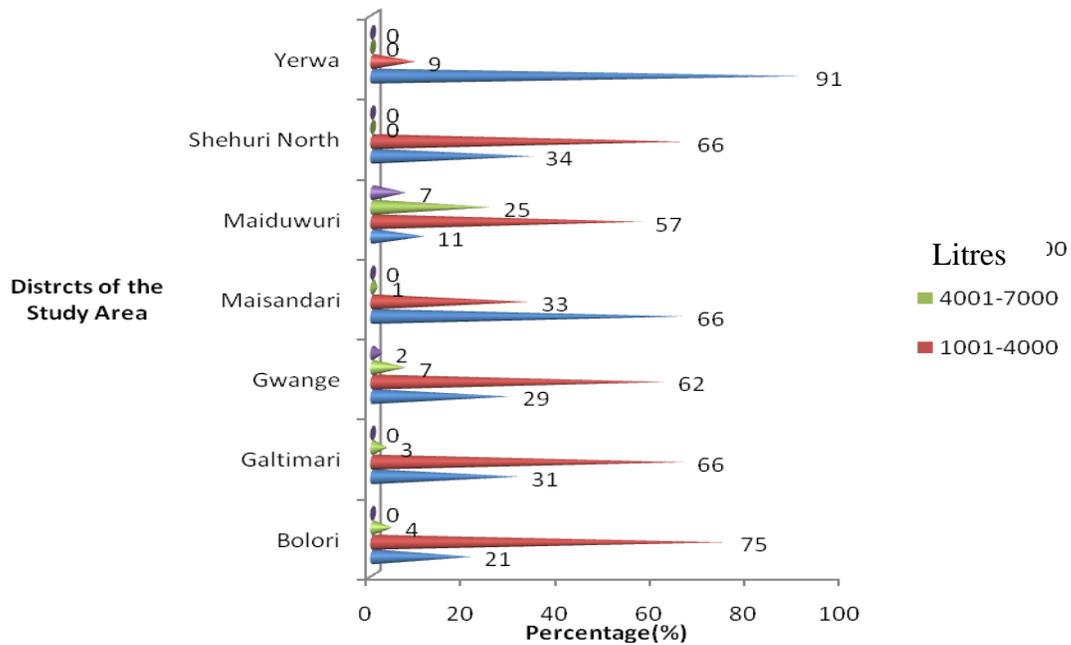
The percentage of water in feed is highly variable and may range from as low as 5% in some dried grains or seeds to about 90% in moisture-laden feeds (Schlink *et al.*, 2010). During the hot season, feeds that contain a large volume of water are very scarce, rigorously managed livestock are, for the most part, therefore fed with dry rations. The missing percentage of water has to be filled in with a large quantity of potable water. It is apparent from Figure 15 that 50% of the respondents use between 4001 and 7000 litres for the upkeep of their

livestock. This high intake of water the during hot season could also be linked to environmental temperatures of up to 43°C or higher that draw much of water into the atmosphere from living things. In most fattening centres for large ruminants, provisions were made for boreholes that supply the water needs based on demands. Plate 1 is a measure to curtail water shortage in one of the fattening centres. It shows a generator, water lifting device and water storage facility. A tent to reduce evaporation of water stored.



**Plate 1:** Borehole Meant to Meet Water Needs of Fattening Centre (Cattle market sites)

**Source:** Field Survey, 2022



**Figure 16:** Litres of Water Used by Livestock Rearers During Raining Season

**Source:** Field Survey, 2022

It is obvious from Figure 16 that water consumption is high during the hot season (March to May) due to the high-

temperature condition of the atmosphere. The rainy season (June to September) with alternating temperatures is second in water

consumption ranking. Harmattan season (November to February) is the least in

terms of water consumption as far as livestock rearing is a concern.

**Table 1:** Test for Seasonal Variation in Livestock Rearing in the Metropolis

Statistics	Value	F	Hypothesis	Error df	Sig. df	
Intercept	Pillai's Trace	1.000	1878514787829321	3.000	341.000	.
	Wilks' Lambda	.000	0000000000000000 0.000 <sup>b</sup>	3.000	341.000	.000
	Hotelling's Trace	16526523060082 0270000000000000 000.0	1878514787829323 7000000000000000 0.000 <sup>b</sup>	3.000	341.000	.000
	Roy's Largest Root	16526523060082 0270000000000000 000.0	1878514787829323 7000000000000000 0.000 <sup>b</sup>	3.000	341.000	.000
	Pillai's Trace	1.000	114.000	6.000	684.000	.000
	Wilks' Lambda	.000	1744098963517628 48.000 <sup>b</sup>	6.000	682.000	.000
Seasons	Hotelling's Trace	23543769619189 1970000000000000 000.0	1334146945087387 9000000000000000 0.000	6.000	680.000	.000
	Roy's Largest Root	23543769619189 1970000000000000 000.0	2683989736587568 2000000000000000 0.000 <sup>c</sup>	3.000	342.000	.000

**Source:** *Field Survey, 2022*

The test is based on the pairwise correlation that is linearly independent. Seasons with high stock were noted and subjected to the Analysis of Variance (ANOVA) tool at a 95% confidence level. It indicates that the calculated F going by Pillai's trace is 114 under the degree of freedom of 6. The predictor is significant at the five percent significance level. Livestock rearing is all year of practice regardless of the season, yet it is progressively articulated during the

harmattan season most likely due to geographical or economic factors.

## CONCLUSION

Livestock rearing in Maiduguri metropolis is practised all year round, irrespective of the season. This is because rearers of livestock depend largely on supplementary feeds whose supply is not affected by seasonal variations as in the case with

pastoral nomadism that moves according to seasons in search of pastures. But the severity of fodder use differs with seasons. The experience of livestock rearer is important in the management of stock. Livestock rearers provide feeding facilities within their compound and make available feed throughout the year, a practice that maximizes feed and yields. Pens (livestock rearing location) were stocked with fodder that comes directly from rain-fed agricultural fields in preparation for livestock keeping. Overall, the number of feed resources available for cyclic feed utilization varied across all districts. Nevertheless, all districts suggest that feed availability is based on niches and seasonal crop harvesting.

## RECOMMENDATIONS

On the research findings, the following recommendations are hereby forwarded:

- i. Research must be conducted to discover the key factors and links that exist within the urban system since they are crucial in influencing feed availability. This should begin with the gazetting of feed producing regions to determine their present state in terms of acreage and forage production potential.
- ii. The metropolis is mostly a non-agricultural community; the outdated Native Authority Ordinance Act of 1943 must be revised to meet current needs. Bills enabling urban livestock husbandry in the city's centre are likely to be supported by citizens.

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