



## Evaluation of Changing Pattern in Livestock Types in Sokoto-Rima River Basin, a Tropical Semi-Arid Region of Nigeria

\*<sup>1</sup>ADEJUWON, JO; <sup>2</sup>ODUSANYA, AE; <sup>1</sup>ADEKITAN, AA

*Department of Water Resources Management and Agrometeorology, Federal University of Agriculture, Abeokuta*

<sup>2</sup>*Institute for Hydrology and Water Management, University of Natural Resources and Life Sciences, Vienna (BOKU), 1190 Vienna, Austria*

\*Corresponding Author Email: [adejoseph2003@yahoo.com](mailto:adejoseph2003@yahoo.com)

**ABSTRACT:** The study examined the changing pattern in livestock types in Sokoto Rima-River Basin, semi-arid Nigeria. Clustered sampling technique was used to administer questionnaire to 450 respondents from 15 agricultural settlements in 15 Local Government Areas in the basin. Data were analyzed using frequency counts, percentages and pairwise t-test. Seventy-one percent (70.7%) of the farmers reared livestock in the 1970s, out of which 10.2 to 13.6% reared only cattle, sheep and goats while the combination of cattle and sheep, cattle and goats, sheep and goats, and cattle, sheep and goats varied from 3.6 to 20.2%. In the 2000s, 80% of the farmers reared livestock, with a variation of 10.4 to 11.6% for cattle, sheep and goats only, and 2.9 to 26% for cattle and sheep, cattle and goats, sheep and goats and cattle, sheep and goats respectively. The total of 39.6 to 45% farmers in the basin reared cattle, sheep and goats in the 1970s while 44.7 to 55.1% reared it in 2000s. The rearing of cattle only, sheep and goats, and cattle, sheep and goats together increased by 0.2% to 6.6% while sheep only, goats only, cattle and sheep, and cattle and goats decreased by 0.3% to 2%. The total cattle reared has increased by 5.1% over time, while that of sheep and goats increased by 10.1% and 11.4% respectively. Sheep are 2.4% more than goats and 10.4% more than cattle. Livestock rearing has increased by 9.3% during the study period. A pairwise t-test showed no significant difference between the livestock types in the 1970s and 2000s in the study period.

DOI: <https://dx.doi.org/10.4314/jasem.v23i4.27>

**Copyright:** Copyright © 2019 Adejuwon *et al.* This is an open access article distributed under the Creative Commons Attribution License (CCL), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Dates:** Received: 17 February 2019; Revised: 21 March 2019; Accepted 09 April 2019

**Keywords:** livestock, goat, sheep, cattle, Sokoto Rima River Basin

Livestock constitutes one of Africa's major economic resources and accounts for one-third of Nigeria's agricultural Gross Domestic Products. It produces meat, milk, and other products as well as income, employment, food, farm energy and manure, fuel, transport and revenue for the government through taxation and export earnings from hides and skins. Most poor African farmers depend on livestock which provides cash income through the sale of animals and its products; a form of savings through herd growth; and insurance through the sale of animals to provide immediate cash to deal with significant or unexpected expenditures especially when crop fail (Fafchamps *et al.*, 1998; Seo and Mendelsohn, 2008; International Union for Conservation of Nature (IUCN), 2010; Pica-Ciamarra *et al.*, 2011). Livestock system in the developing world is characterized by quick transformation due to urbanization and population expansion in the request for livestock products as income rises (Thornton *et al.* 2007). They are adversely affected by the detrimental effects of extreme weather. Sejian (2013) reported that climatic extremes and seasonal fluctuations in herbage quantity and quality affect the well-being of livestock, lead to declines in

production and reproduction efficiency. Heat stresses which result in a decrease in milk, meat production, reproductive efficiency and animal health are the most significant direct impact of climate change on livestock production. Koubkovam, *et al.* (2002) noted heat stress as one of the environmental variables affecting livestock production in many geographical locations around the globe. Parons *et al.* (2001) have argued that high temperatures may reduce feed intake, lower milk production, lead to energy deficits that may lower cow fertility, fitness and longevity. Climate change impacts on livestock are being witnessed all over the world, but developing nations like Nigeria are more vulnerable due to the dependence of about 70% of the population relying on this sector for livelihood. Livestock is a major component of agriculture and this sector provides sustainability and stability to the national economy by contributing to farm energy and food security (Singh *et al.*, 2011). According to UNFCCC (2007), agricultural production including access to food in many African countries is severely compromised and this would further adversely affect food security and exacerbate malnutrition.

\*Corresponding Author Email: [adejoseph2003@yahoo.com](mailto:adejoseph2003@yahoo.com)

In spite of the importance of livestock in supporting livelihood through the provision of multiple socio-economic benefits, no study has been carried out on the changing pattern in livestock types in Sokoto-Rima River Basin, semi-arid Nigeria. This study intends to fill the gap created by the lack of literature in the study area. The study aimed at assessing the changing pattern in livestock types in the Sokoto-Rima River Basin, Nigeria.

**MATERIALS AND METHOD**

**The Study Area:** Sokoto-Rima River Basin is situated between latitude 10.8° N and 13.58° N and longitude 3.30° E and 7.13° E (Figure 1. It is bounded by the Niger Republic to the north, Niger and Kaduna States to the south and southeast, the Benin Republic to the west and Katsina State to the east. Sokoto-Rima Basin experiences a tropical climate, governed by the Inter-tropical Discontinuity (ITD; Adejuwon, 2015).

The ITD marks the boundary line between two air masses - the tropical maritime (mT) air mass from the Atlantic Ocean and the dry tropical continental (cT) air mass from the Sahara Desert (Adejuwon, 2016). The prevailing air mass at a particular period has a strong influence on the climate.

The climate exhibits a definite and marked the wet and dry season. The mT dominates during the wet season while the cT air mass predominates during the dry season. The wet season is between May and September in the southern part and June to September in the north (Iliya and Kwabe, 2000; Mamman, 2000; Adejuwon, 2012a). Annual rainfall amount varied from about 1013 mm in the southern part to about 650 mm in the northern part and is single maxima in character (Adejuwon, 2018).

The rainfall decreases in both duration and amount from the south northward. High humidity is experienced in the wet season while low humidity is experienced in the dry season (Emielu, 2000). The dry and dust-laden northeast trade winds called 'Harmattan' that blow from the Sahara desert under cloudless but dusty conditions dominate the entire area during the first half of the dry season. This period is marked by very low temperatures and thick fog. The mean annual temperature range is between 5°C and 10°C while the mean annual temperature is 34.5°C (Emielu, 2000; Adejuwon, 2015).

The extremes diurnal and seasonal range is affected by seasonal and latitudinal variations. The highest temperatures are normally in the hot season, March to April while the minimum temperatures are usually recorded in January to February.

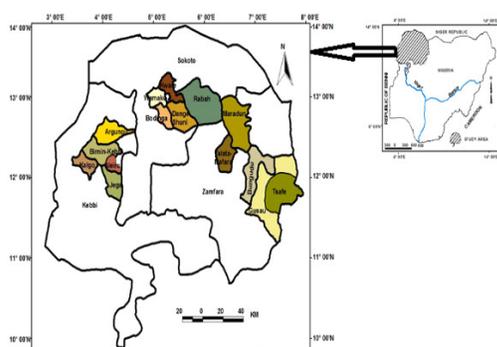


Fig 1: Selected local governments where the questionnaire was administered.

**Data Collection and Analysis:** Data for this study were obtained from primary sources. It was the result of field investigations, involving direct interaction with the respondents. The data were collected from farmers with structured questionnaires. Cluster sampling technique was used for the study. Five agricultural settlements from five Local Government Areas each from 3 zones of Sokoto, Kebbi and Zamfara states were selected for this study (Table 1). Thirty copies of questionnaires were administered to extract information on agricultural practices in each settlement, making a total of four hundred and fifty questionnaires. Data were analyzed using frequency counts, percentages and pairwise t-test.

Table 1: Locations of data collection in Sokoto-Rima River Basin

State	Local Government	Communities
Sokoto	Wamakko	Gumbi
	Bodinga	Mil Goma
	Kware	Durbawa
	Dange Shuni	Dange
	Rabah	Maikujera
Kebbi	Kalgo	Kalgo
	Birmi-Kebbi	Gulumbé
	Aliero	Dakala
	Jega	Basaura
Zamfara	Argungu	Alwasa
	Talata Mafara	Tunfafiya
	Gusau	Madidi
	Maradun	Dosara
	Bungudu	Tazame
	Tsafe	Tsafe

**RESULT AND DISCUSSION**

Table 2 shows the seven categories of livestock reared in Sokoto-Rima River Basin. There are 360 (80%) respondents' rearing livestock in Sokoto-Rima River Basin. in the River Basin (Table 2), Out of 318 (70.7%) respondents that reared livestock in the 1970s, 10.2% to 13.6% reared only cattle, sheep and goats, 5.6% reared cattle and sheep, 3.6% reared cattle and goats, 5.6% reared sheep and goats while the remaining 20.2% reared cattle, sheep and goats. In the 2000s, 80% of the farmers reared livestock, with a

variation of 10.4 to 11.6% for cattle, sheep and goats only, 5.3% for cattle and sheep, 2.9% for cattle and goats, 12.2% for sheep and goats and 26% for cattle, sheep and goats together. Cattle, sheep and goats are the bulk of livestock and the major species of domesticated animals in Sokoto-Rima River Basin (Usman Danfodiyo University Consultancy Services (UDUCONSULT), 1990). Livestock rearing has increased by 9.3% over time in the study area. However, the increment does not apply to all categories of livestock reared. The number of farmers rearing cattle only, sheep and goats, and cattle, sheep and goats together increased by 0.2% to 6.6% (Table 3). Conversely, farmers rearing sheep only, goats only, cattle and sheep, and cattle and goats decreased slightly by 0.3% to 2%. The increase in the number of farmers rearing the former categories resulted from increased farmer's personal interest in livestock

rearing, influence from neighbours, income and more importantly by the increased awareness on the need of livestock dung to be used as manure as well as farmers increased interest in agropastoralism. The highest number of farmers rearing livestock in the River Basin raised the combination of cattle, sheep and goats together. Though some pastoralists don't rear goats, some reared goats with their herds. According to RIM (1992), Sahel goats are generally preferred by pastoralists in Nigeria. The goat is well adapted to its habitat, those environmental factors have little influence on the body weight, age at first conception, litter sizes and proclivity to year-round breeding (Wilson and Durkin, 1983; Wilson, 1987; Wilson and Sayers, 1987). The increase in the number of farmers rearing cattle only may have been caused by the increased need for cattle for ploughing and milking for family sustenance

**Table 2:** Type of livestock (Cattle sheep and goats) reared in the Sokoto-Rima River Basin

S/N	Type of livestock	Reared in the 1970s		Reared in 2000s	
		Number of respondents	Percentage	Number of respondents	Percentage
1	Cattle only	46	10.2	47	10.4
2	Sheep only	61	13.6	52	11.6
3	Goats only	1	12.0	52	11.6
4	Cattle and sheep	25	5.6	24	5.3
5	Cattle and Goats	16	3.6	13	2.9
6	Sheep and Goats	25	5.6	55	12.2
7	Cattle, Sheep and Goats	91	20.2	117	26.0
	Total	318	70.7	360	80

**Table 3:** Differences in the percentage in livestock types in the Sokoto-Rima River Basin

Type of livestock	Percentage in the 1970s	Percentage in the 2000s	Difference (%)
Cattle only	10.2	10.4	0.2
Sheep only	13.6	11.6	-2
Goats only	12.0	11.6	-0.4
Cattle and sheep	5.6	5.3	-0.3
Cattle and Goats	3.6	2.9	-0.7
Sheep and Goats	5.6	12.2	6.6
Cattle, Sheep and Goats	20.2	26.0	5.8

The sizable number of farmers reared cattle only, sheep only and goats only. Farmers usually rear them under village seasonality system of livestock farming. Cattle and goats were the least livestock reared in the River Basin. The decrease in the rearing of these latter categories was as a result of farmers shift to other categories.

They added a different livestock type (sheep, goats or cattle) to their herds, depending on the type they have before. It was discovered that some of the farmers rearing cattle and sheep, cattle and goats now rear cattle, sheep and goats while most of those rearing sheep only and goats only now rear sheep and goats. Generally, the total of 39.6 to 45% farmers in the River Basin reared cattle, sheep and goats in the 1970s while 44.7 to 55.1% reared it in the 2000s (Table 4). The

rearing of cattle has increased by 5.1% over time, while that of sheep and goats increased by 10.1% and 11.4% respectively. Sheep are more common than other livestock - 2.4% more than goats and 10.4% more than cattle. Compared to some part of Africa, goats are more common. For instance, Anteneh *et al.* (2004) studied goat production and livelihood systems in Sekhukhune district of the Limpopo province in South Africa and maintained that goats are more common than other livestock - twice as many as sheep and almost three times as many as cattle. Table 5 shows the result of the pairwise t-test for the study. It is stated as follows:  $t(5) = -6.000$ ,  $p < 0.05$ ,  $CI_{0.95} -20.02, 8.02$ . This indicates that there is no significant difference between the livestock types in the 1970s and 2000s as observed during the study period.

**Table 4:** Total livestock (Cattle sheep and goats) reared in the Sokoto-Rima River Basin

Type of livestock	Reared in the 1970s		Reared in the 2000s		Difference (%)
	Number of respondents	Percentage	Number of respondents	Percentage	
Cattle	178	39.6	201	44.7	5.1
Sheep	202	44.9	248	55.1	10.2
Goats	186	41.3	237	52.7	11.4

**Table 5:** Pairwise t-test for livestock types in the 1970s and 2000s in the Sokoto-Rima River Basin

Livestock Rearing Method	Paired Differences 95% Confidence Interval of the Difference						
	Mean	Std. Dev.	Lower	Upper	T-Value	df	Significant (2-tailed)
Livestock types	-6.00	15.38397	-20.22780	8.22780	-1.032	6	0.342

**Conclusion:** The study has shown that livestock rearing varied from 10.2 to 13.6% for only cattle, sheep and goats, and 3.6 to 20.2% for livestock combination in the 1970s while in the 2000s, 10.4 to 11.6% reared each of the livestock solely and 2.9 to 26% for the combinations. The rearing of cattle only, sheep and goats, and cattle, sheep and goats together increased by 0.2% to 6.6% while sheep only, goats only, cattle and sheep, and cattle and goats decreased by 0.3% to 2%. The total of cattle, sheep and goats has increased by 5.1%, 10.1% and 11.4% respectively over time. Sheep were 2.4% more than goats and 10.4% more than cattle. Livestock rearing has increased by 9.3% over time

## REFERENCES

- Adejuwon, JO (2012). An Assessment of the Effect of Climate Variability on Selected Agricultural Practices and Yields in Sokoto-Rima River Basin, Nigeria. Unpublished PhD. Thesis, Obafemi Awolowo University, Ile-Ife, p. 312
- Adejuwon, JO (2015). An assessment of the changing pattern in the choice of vegetable varieties in Sokoto-Rima River Basin, Nigeria: Pepper. *Int. J. Ecol. Env. Studies*, 3(2): 7-15.
- Adejuwon, JO (2016). Effect of Climate variability on school attendance: A case study of Zamfara State in the Semi-arid zone of Nigeria. *Weather*, 71 (10): 248-254.
- Adejuwon, JO (2018) Assessment of the changing pattern in Maize cultivation in Sokoto-Rima River Basin, Nigeria. *J. Appl. Sci. Environ. Manage.* 22 (9): 1433-1437.
- Anteneh, NT; Mekala, DG; Mnisi, PE; Mukisira, C; Muthui, M; Murungweni, C; Sebitloane, O (2004). *Goat Production and Livelihood Systems in Sekhukhune District of the Limpopo Province*. International Centre for development oriented Research in Agriculture (ICRA), Working Document Series 118, South Africa
- Emielu, SA (2000). Senior Secondary Geography. Geographical Bureau Nigeria Limited, Ilorin. Pp 71-72.
- Fafchamps, M; Udry, C; Czukas, K (1998). Drought and savings in West Africa: Are livestock a buffer stock?, *Journal of Development Economics*, Vol. 55, pp. 273-305.
- Iliya, MA; Kwabe, SA (2000). Kebbi State. In A.B Mamman, J.O Oyeibanji, S.W. Petters (Eds): Nigeria: A People United, A Future Assured. Survey of States (Millenium Edition). Vol. 2. Federal Ministry of Information, Abuja, Nigeria, 305-320
- International Union for Conservation of Nature (IUCN) (2010), "Building climate change resilience for African livestock in sub-Saharan Africa - World Initiative for Sustainable Pastoralism", (WISP): a program of IUCN - The International Union for Conservation of Nature, Eastern and Southern Africa Regional Office, Nairobi, March 2010, viii + 48pp.
- Koubková, M; Knížková, I; Kunc, P; Härtlová, H; Flusser, J; Doležal, O (2002). Influence of high environmental temperatures and evaporative cooling on some physiological, haematological and biochemical parameters in high-yielding dairy cows. *Czech Journal of Animal Science* 47: 309318.
- Mamman AB (2000a). Sokoto State. In A.B Mamman, J.O Oyeibanji, S.W. Petters (eds). Nigeria: A People United, A Future Assured. Survey of States (Millenium Edition), Vol. 2. Federal Ministry of Information, Abuja, Nigeria. pp 499-514.

- Mamman, AB (2000b). Zamfara State. In A.B Mamman, J.O Oyebanji, S.W. Petters (eds). Nigeria: A People United, A Future Assured. Survey of States (Millenium Edition), Vol. 2. Federal Ministry of Information, Abuja, Nigeria. pp 547-560.
- Parons, DJ; Armstron, AC; Turnpenny, JR; Matthews, AM; Cooper, K; Clark, JA (2001). "Integrated models of livestock systems for climate change studies", *Global Change Biology*, Vol. 7, pp. 93-112.
- Pica-Ciamarra, U; Tasciotti, I; Otte, J; Zezza, A (2011). "Livestock assets, livestock income and rural households Cross-country evidence from household surveys", ESA Working Paper No. 11-17; Food and Agriculture Organization of the United Nations, 2011
- Resources Inventory and Management Limited (RIM) (1992). *Nigerian Livestock Resources, Volume I: Small Ruminants*. Report by Resources Inventory and Management Limited, U.K. to FDLPCS, Abuja, Nigeria
- Sejian, V (2013) Climate Change: Impact on production and reproduction, adaptation mechanisms and mitigation strategies in small Ruminants: A Review. *The Indian Journal of Small Ruminants*, 19(1): 1-21
- Seo, N; Mendelsohn, R (2008). "Animal husbandry in Africa. Climate change impacts and adaptation" *African Journal of Agricultural and Resource Economics*, 2(1): 65-82.
- Singh, SV; Upadhyay, RC; Ashutosh; Hooda, OK; Vaidya, MM (2011). Climate change: impacts on the reproductive pattern of cattle and buffaloes: A review. *Wayamba Journal of Animal Science*, WJASID 1322125457
- Thornton, P; Herrero, M; Freeman, A; Mwai, O; Rege, E; Jones, P; McDermott, J (2007). Vulnerability, climate change and livestock - Research opportunities and challenges for poverty alleviation. *SAT eJournal* 4 (1), 1-23.
- UNFCCC (2007). Climate Change Impacts, Vulnerabilities and Adaptation in Developing Countries. [http://unfccc.in/resources/docs/publications\\_5/5/2012](http://unfccc.in/resources/docs/publications_5/5/2012).
- Usman Danfodiyo University Consultancy Services (UDUCONSULT) (1990). *A Survey of Livestock Potentials in Sokoto State*. Gamji Bank of Nigeria Limited Project. Preliminary Report submitted to Coopers and Libran Associates.
- Wilson, RT (1987). Livestock production in central Mali: environmental factors affecting weight in traditionally managed goats and sheep. *Animal Production* 45: 223-232
- Wilson, RT; Durkin, JW; (1983). Livestock production in central Mali: reproductive components in traditionally managed sheep and goats. *Livestock Product. Sci.* 19:523-529.
- Wilson, RT; Saryers, AR (1987). Livestock production in central Mali: effects of climatic variables on the period of birth and on litter size in traditionally managed goats and sheep. *Agric. Forest Meteorol.* 40: 31-36.