

IMPACT OF SMALL HOLDER FARMERS LIVESTOCK OWNERSHIP AND GRAZING SYSTEM ON LAND DEGRADATION IN NORHERN KATSINA STATE, NIGERIA

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Abstract

The aim of this study is to investigate the pattern of livestock ownership and herding system among small holder farmers and its impact on land degradation problems in northern Katsina state. Focus Group Discussion (FGD) were conducted with key informants and questionnaire with closed-ended and open-ended questions were administered in the twelve selected villages. Some Participatory Rural Appraisal (PRA) methodological frameworks were also used to enhance the quality of the data generated. It was found that large proportion of small holder farmers kept livestock, up to 78% in Zango local government villages, while Mashi local government villages have the least (68%) ownership. The proportion of population with livestock is a clear indication of extent of overgrazing which contributed enormously to land degradation in the area. Majority of the respondents kept livestock purposely as sources of income, means of saving and a way of enhancing soil fertility from the animals' droppings. It was concluded that overgrazing may continue to contribute to land degradation as long as the villagers were not provided alternative sources of income and effort of desertification control should be intensified through different afforestation programmes.

Keywords: Land degradation, livestock ownership, grazing system, impact, overgrazing

1.0 Introduction

Land degradation is the persistent decrease in the soil and vegetation productivity (Agnew and Warren 1996; Maigari 2002; Stocking 2004). In dry lands, land degradation processes which have a more severe impact on land productivity, include, deforestation, overgrazing, water erosion, wind erosion salinization, alkalinization and soil compaction (UNEP 1992; Dregne 2002; Olofin 2006). These degradation processes take place in three interlocking stages with one stage leading to another; these are: soil physical degradation, chemical degradation, and biological degradation (Maigari 2002).

In Sudano-Sahelian region, degradation is the eventual output or end product of desertification. As noted by Olofin (1993), drought, deforestation and desertification have more in common than the letter “d”, as they are three devils that constitute an unending nightmare to environmentalists and conservationists. They merge to produce another dreaded “d” called degradation.

Globally, about 200,000 square kilometers of productive land is reduced by desertification every year to the point of yielding nothing. Some 15% of the land surfaces of the earth are subject to various degrees of degradation, and 32% of drylands are undergoing processes of land degradation (Abuhussain 2000).

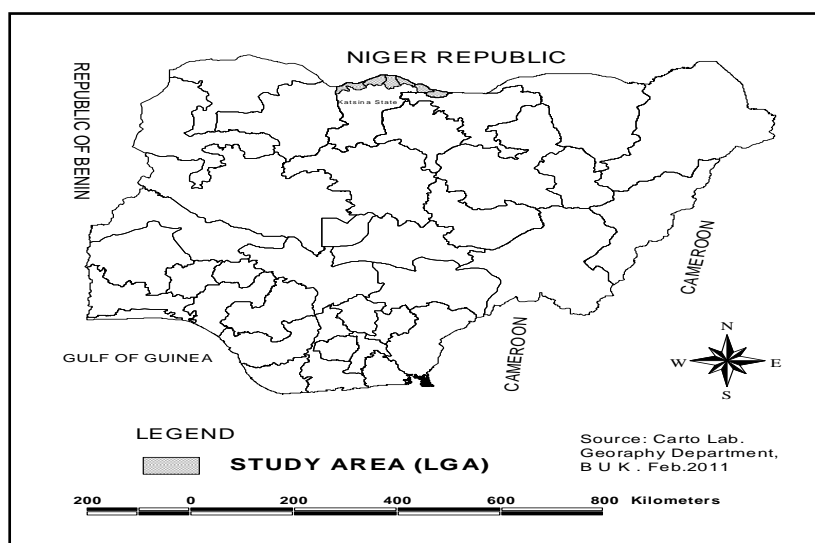
Nigeria’s savanna region covers about 849,496km² or 86% of the country’s land area and contains 60% of the country’s population (Omijeh et al, 1989; Adegbehin, et al., 1990; Mijindadi and Adegbehin 1991). Between 11⁰N and 14⁰N where the Sudano-Sahelian agro-ecological zone lies, is about 40% of the country’s landmass that is very susceptible to land degradation than any other region of the country due to a variety of factors, including overgrazing, deforestation, wind erosion, soil depletion aggravated by continuous cropping, drought and bush fire (Adegbehin, 1990). The rate of land degradation in Nigeria appears to have extended below 11⁰N because of uncontrolled human activities (Otegbeye, 2004).

It has been estimated that Nigeria is losing 350,000m² to desertification every year and the Sahara desert is advancing at an estimated rate of 0.6km per year (Daily Trust, 16, June 2008, quoting Minister of Environment). The sudano- Sahelian region of Nigeria has experienced a 3-4% decrease of rainfall per decade since the beginning of nineteenth century; the number of rainy days in the north has decreased from 150 to 120 in the last thirty years, destroying 20% of crop yield. Apart from desertification threat, the area is facing increasing number of livestock and overgrazing problem. National Agricultural Sample Survey (2011) report indicated that there are 19.5 million cattle, 72.5 million goats, 41.3 million sheep, 28,000 camels and 974,499 donkeys. Large percentages of these livestock are concentrated in northern part of the country. Many studies (e.g Abuhussain, 2000; Dregne, 2002; Reed et al., 2007; Le Houerou, 1996, 2003) have reported the impact of large number of livestock in arid and semi-arid areas in aggravating overgrazing and intensifying desertification which is major environmental problem in northern Nigeria. The aim of this study is investigate pattern of livestock ownership and herding system and its impact in land degradation problem in northern Katsina state.

2.0 MATERIALS AND METHODS

2.1 Profile of the Study Area

The study area is located between latitude $12^{\circ} 52'N$ and $13^{\circ} 19'N$ and longitude $7^{\circ} 16'E$ and $8^{\circ} 43'E$. The area falls within six local government areas (LGA) of Katsina state, northern Nigeria. The landscape is underlain by sedimentary rock, flat with an average of 300 meters above sea level, broken in some parts by hills. Trees and grasses adapt to climate rhythm of long dry season and short wet season. Most trees developed long tap roots, thick bark which enable them to withstand the long dry season and bush fires. The vegetation is subjected to various form of abuse such as fire, wood cutting, cultivation, overgrazing and bush fire. The area is characterized by unimodal rainfall pattern with most of the rain received between May to September, annual average below 800mm. Temperatures are high in most parts of the year with the mean daily maximum ranging between $27^{\circ}C$ to $40^{\circ}C$ occurring between March and May. The mean minimum ranging between $18^{\circ}C$ to $25^{\circ}C$ experienced in the month of November to early February. The area has four different seasons; a cool dry season (December to February), a hot dry season (March to May), a warm wet season (May to September) and a season of falling temperature (September to November) (Tomlinson, 2010). The soils are sandy ferruginous type of the latosols group which is highly weathered and markedly laterised and slightly acidic in reaction with low organic matter content and phosphorous, its total nitrogen rarely exceeds 0.2% (Abubakar, 2006). The subsistence rain fed farming is the common economic activity in the area and fragmented farm land form the dominant feature of the land use pattern. The major crops grown in the area are sorghum, millet, cowpea, pepper and onion. Livestock production is also an important integral part of farming system as both crops grown and the domestic animals are sources of food and income for farmers. The types of livestock kept include goat, sheep, cattle, donkeys and camel and poultry.



2.2 Household Survey

A total of 12 villages were purposively selected and these villages were located few meters away from Nigeria – Niger republic border. A pilot survey was conducted to test the reliability and viability of the research tools and techniques. A baseline questionnaire with open-ended and closed-ended questions which allowed for statistical analyses (some of results are not included here) were used to get information on man-environment relations such as size, land holding, livelihood, farming practices, types and number of livestock own, pattern of grazing in rainy and dry season, observed impact of grazing on the environment. It is important to note that the household were stratified into three (small, medium and large scale farmers), the numbers of samples taken from each category of farmers/herders take into consideration their total percentage in each village.

To complement the interview, other information was gathered through Participatory Rural Appraisal (PRA) methods such as participant observation, timeline and local history, transect walk, daily activity profile, seasonal resources calendars, historical resource matrix, key probe, shared presentation and analysis, etc and a series of Focus Group Discussion (FGD) of 8-12 people were held in each of the selected village. The FGD is aimed at weighing and balancing the information generated through interview with a view of getting a consensus. Selections of members of FGD take into consideration, the age, gender, literacy (western or Arabic/Islamic knowledge) and social status of the participants. As Mogotisi et al. (2011) pointed out that these factors affect variation in knowledge in communities.

3.0 RESULTS AND DISCUSSION

3.1 Land Tenure and the Agricultural Production System

Farming is the major occupation in the study area which reflects the importance and value attached to land. The land tenure in the area has a double ancestry, i.e. the traditional concept of communal land ownership and Islamic law, which recognizes individual tenure. This was reflected in the pattern of land ownership, as shown in table 1, majority of the respondents got their land through inheritance in Zango (70%) and Kaita (71.2%). The pattern of land ownership (largely through inheritance) clearly indicated widespread land fragmentation and the small size of farmlands, on the average 1.5 hectares was found in Baure, 1.7 in Mashu and 1.3 hectares in Mai'adua. While those who own land through forest clearance (owners) were dominantly elderly people. Despite the small size of the respondents' land, most of them felt that the land tenure system is fair to all and land acquisition is not a problem; as long as one has the means of investing in the land, it is easy to get land free or for little rent for crop production.

Table 1: Land Tenure and the Agricultural Production System.

	Baure (n=46)		Jibia (n=53)		Kaita (n=73)		Mashi (n=57)		Zango (n=40)		Maiadua (n=39)		Average %
	Fq.	%	Fq.	%	Fq.	%	Fq.	%	Fq.	%	Fq.	%	
LAND TENURE													
Owner	12	26	22	42	15	21	14	25	11	27	10	25.6	28
Inherited	25	54.3	25	54.	52	71.2	37	65	28	70	25	64.1	63
Purchased	07	15.2	04	07.	05	6.8	06	10	01	2.5	03	7.7	09
Others	02	4.5	02	04	01	1.5	0.0	0	0	0	01	2.6	02
AVERAGE FARM SIZE													
Hectres	1.5		1.5		1.7		1.7		1.4		1.3		1.5
TYPE OF CROPS GROWN													
Millet	44	96	39	74	71	97	53	93	38	95	37	95	92
Sorghum	34	85	38	72	65	89	49	80	32	80	31	87	83
Cowpea	22	48	38	72	39	53	38	67	30	75	22	56	62
Groundnut	13	28	20	38	22	40	26	49	01	27.	19	49	39
Maize	03	07	29	55	05	07	05	09	07	2.5	03	08	15
Others	11	24	13	25	13	18	18	32	16	40	16	41	30
ADEQUACY OF CROP FOR A YEAR CONSUMPTION													
Adequate	22	48	25	47	35	48	24	42	18	45	16	41	46
Inadequate	24	52	28	53	38	52	33	48	22	55	23	59	54

Source: Field Work (2016)

3.2 Rangeland Characteristics

The rangeland in the study area are scattered, differ in size and are mainly uncultivable land with literate soil, locally known as fako. It is characterized by relatively flat grassy landscape during the rainy season, flat sandy in some areas and reddish in other areas during the dry season often with scattered trees and small shrubs.

The area supports diverse plant species that are extensively used for wet and dry season grazing. Since most of the plant species seen in the field are annual species, the surface lack vegetation cover during the long dry season, thereby increasing the susceptibility of the area to wind erosion. Grasses being the major livestock feed in the area, owners of livestock cut and store selected palatable grass species for later feeding of livestock in the dry season, when fodder supplies are insufficient and difficult to get. The raw leaves of some grass are stored, sometimes the fruit and pods of *Faidherbia albida*, *Acacia nilotica*, *Ziziphus spp*, *Acacia sengal*. *A raddiana* and *Balanita aegyptiaca* are collected and stored for livestock use in the dry season.

To find out which among the dominant plants are most preferred by livestock, six herders, one from each of the six local governments, were selected. In the selection process, preference was given to herders who spent many years herding livestock and residing very close to a rangeland, which enhances familiarity with different plant species. The herders were asked to mention and rank the six most common plant species preferred by cattle.



Plate 1: Rangeland near Magama, Jibia Local Government.

3.3 Type of Livestock Kept.

The pattern of livestock ownership centered on all domestic animals such as sheep, cattle, goats, donkeys, camels and poultry. The horses are largely kept by traditional rulers. In terms of number of livestock kept among the local farmers, the population of sheep is higher, followed by goats and cattle respectively. Majority of the respondents in Kaita (85%) and Zango (73%) own sheep, as shown in table 2. Keeping cattle is not restricted only to local Fulani herders, local Hausa farmers also kept cattle for manure generation and for ploughing in the farms. It is important to note that some farmers and pastoralists (the Hausa and the Fulani) have more than one type of livestock, as shown in table 2.

3.4 Reasons for Keeping Livestock

The reasons given for keeping livestock are largely diverse, for Fulani herders, it is a way of life and to the local Hausa farmers, they are a source of income, investment, savings, means of transportation and use in farming activities. Particularly, cattle are used for plough and drawing carts to transport manure and farm produce. Most of the respondents own poultry, used purposely for consumption and sale.

3.5 Sources of Livestock Fodder.

All the study area is experiencing shortage of pasture for livestock, particularly in the dry season, as revealed during the FGD. Most of the respondents attributed the problem to rainfall variability. Despite that, majority depended on natural pasture and crop residue, as shown in table 2. In Baure 70% and 91% of the respondents depend on natural pasture and crop residue, respectively.

Farmers have devised different measures to mitigate pasture and livestock feed shortages. These measures include grazing in a distance place particularly southern part of the country, storage of crops residue by those who kept a small number of livestock at home and grazing in river valleys. A large number of the respondents particularly Fulani pastoralists have no permanent source of water for livestock. A major source of watering is shallow wells on rivers and sand fan.

Overgrazing is one of the major factors fueling land degradation in the study area. Majority (68%) of the respondents believed that land can be overgrazed if the number of livestock out-weights the pasture land. They conceded the occurrence of overgrazing, but argued that since there is no alternative way of feeding their livestock, the existing pasture must be used to save their livestock from perishing. Livestock trampling have aided acceleration of rill and gully erosions along livestock routes and watering points as observed in Birnin Kuka (Mashi LGA) and Sanawa (Baure LGA).

Table 2: The Pattern of Livestock Ownership

	Local Government Areas												Average %
	Baure (n=46)		Jibia (n=53)		Kaita (n=73)		Mashi (n=57)		Zango (n=40)		Maiadua (n=39)		
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
Livestock /Poultry Keeping													
Yes	35	76	29	69	43	72	39	68	31	78	32	83	75
No.	11	24	24	31	30	28	18	32	09	22	07	17	25
Type of livestock/Poultry Kept													
Cattle	22	48	11	21	21	29	15	26	11	27	18	46	33
Sheep	33	72	46	87	62	85	34	68	29	73	62	24	75
Goat	31	67	48	91	65	89	41	72	31	78	32	82	80
Camel	11	24	09	17	07	10	09	16	06	15	09	23	18
Donkey	09	20	04	08	05	07	07	12	03	08	06	15	12
Horse	01	02	01	02	01	02	01	4	01	3	0	0	02
Poultry	41	89	51	96	08	93	52	91	37	93	95	94	92
Others	11	0	48	00	0	00	00	00	00	00	00	00	00
Sources of Livestock Fodder													
Natural posture	32	70	26	49	37	51	26	46	25	63	22	56	55
My crop residue	42	91	47	89	62	85	43	75	33	83	33	85	85
Buy fodder	13	28	11	21	23	32	12	21	10	25	11	28	26
Others	05	11	13	25	02	05	03	05	03	08	05	17	11
Reasons for keeping livestock poultry													
Means of transport	09	20	08	15	09	12	12	21	07	18	11	28	19
Served as saving	43	93	48	90	46	63	45	79	31	78	28	72	79
Used them as food	23	52	11	21	14	19	14	25	13	33	10	26	29
Source of Income	45	98	49	92	55	75	49	86	33	83	34	87	87
Others	04	09	03	25	20	28	18	32	12	30	09	23	21

Source: Field work (2016)

3.6 Characteristics of the livestock Production System

Four types of livestock production systems have been identified in northern Katsina state. This pattern can be attributed to the dynamic nature of the environment. The first groups are those who are involved in herding cattle and small ruminants (sheep and goat), as well as practice crops cultivation. These groups are the settled Fulani; they hardly migrate to a faraway place during the dry or rainy season unless there is a long drought. The Second group herds only small ruminants, they are also involved in crop cultivation. The third group is the pastoralists who settle in the area during the rainy season and migrate to the southern part of the country in the dry season. These pastoralists mainly keep cattle and a few small ruminants, they also kept donkey to assist in transportation and luggage conveyance. This group is alleged to be responsible for most of the clashes between farmers and the pastoralists. The fourth groups are Hausa farmers; apart from crop production, they are also involved in keeping livestock for ploughing and manure generation. The livestock normally consists of two or four cattle for the large scale farmer and small ruminants. The cattle are mainly used for ploughing and cart drawing.

3.7 Pattern of Livestock Grazing in the Rainy Season

During the rainy season between crops planting and harvesting, livestock (cattle, sheep and goats) are grazing in the day-time and penned in the night for fear of destroying cropped land. Herding livestock is done usually using the family labour of both children and adults among the Fulani communities or hired labour among the Hausa communities in households lacking children of herding age. Some Hausa farmers who kept cattle sometimes jointly contract the services of herdsmen to look after their stock. During the dry season, the services of the herdsmen are withdrawn, as the herds are free to roam without fear of destroying crops.

Early in the morning around 5.30am to 6:00am, cattle are taken to the field for grazing. The herds are brought back between 9:00am – 10:00am for milking by calves and owners. At the time of milking, the cattle, sheep and goats are untied to join the cattle for a second round of grazing. The herder takes his breakfast before resuming herding. According to the respondents, small ruminants (sheep and goats) are not included in the early morning grazing because of the dew from the wet grass which is believed to discomfort the animals by causing their legs to crack (Chiroma, 1996). Infant calves are normally left at home in the first two months as they are too weak to withstand the rigours of walking long distance in search of pasture. Hence, they are always penned or tethered around the compound to receive the necessary attention.

The herds are grazed in the few fallowed and uncultivated field (rangeland) until around noon when they walk toward the nearest watering points which are normally water ponds and the river valley. After watering, the herder leads the herds to a nearby shade for resting. They remain under the shade about two hours before resuming herding. The herders sometimes carry an axe to cut grasses, especially in the early days of the rainy season when grasses are not fully grown (Chiroma, 1996; Lawal, 2012).

Animals are given individual names by the herders and each animal, particularly cattle, understand its name. This makes the task of herding much easier. Some herders claim that one only needs to give a command to a particular animal or group of animals to stop, move or change

direction by calling out a name. Herding continues till sunset when the herder starts the journey back to the village. The herds are put in an enclosure constructed from thorny tree branches situated about 30 – 50 meters (depending on the number of livestock and the availability of suitable location) from the backyard of each household. A small hut is usually constructed for sheep and goats to take shelter during the rain.

3.8 Pattern of Livestock Herding in the Dry Season.

After the harvest, animals are free to roam about up to the next crop growing season. Livestock have unrestricted access to cultivated land where remaining crop stubbles and residue are used. However, majority of the herders indicated that grasses in the uncultivated and fallowed lands are the most important source of fodder in the dry season. Hence, forage availability decreases up to the next rainy season both in quantity and quality.

The types of feed used to supplement the existing forage include cotton seed cake, groundnut cake. The choice and use of those supplements depend on the availability and the financial capability of the stock owner. Sometimes high energy supplements i.e. cotton seed cake, groundnut cake, and cereal offal are often restricted to certain animals (donkeys, camels and horses). Donkeys always receive special attention because they are involved in many tasks such as conveying goods, drawing water from wells and manure conveyance to the farm. Old, sick and young animals are also considered because they cannot withstand hunger. Because of unique feeding habit of goats that enables them to graze on fodder that may not be eaten by other animals, they are not considered in the provision of feed supplements. Goats can feed on thorns and bristles in the absence of grasses. This feeding behaviour contributes largely to their survival under the harsh and dry condition (Chiroma, 1996).

The dry season is the period of serious nutritional stress for cattle, as they rarely receive high energy feed supplement, since their main forage is poor quality grasses, very low in protein and energy content. Hence, majority of the cattle in the area hardly meet their nutritional requirements. To encourage cattle to feed on low quality feed, potash is added in their drinking water.

At the end of the dry season when the availability of fodder is at its lowest levels, herders often go to the bush with axes to cut leaves and the fruits of certain trees, e.g. *Faidherbia albida*, *Blantia aegytiaca*, *Bauhinia rufescens* e.t.c.

In drought years, when livestock feed on very scarce fodder, stock owners (the non Fulani) jointly contract the services of herders to lead their stock for pasture in the southern part of the state or other areas where conditions are much better. Small ruminants are not usually allowed to go for distant grazing. They remain in the villages to be managed by the owner or in extreme situation they are sold to buy grains and raise some money to replace the sold stock.

3.9 Herders' Ranking of Plant Species Preferred by Livestock

To find out which among the dominant grass/shrub/trees species most preferred by livestock, six herders, one from each local government, were randomly selected to mention and rank at least the

six most common plant species in order of preference for cattle. The average was calculated to determine the order of preference. The result of the ranking shows that *Faidherbia alabida* and *Commiphora africana* (see table 3) were ranked the highest and the lowest respectively. Many herders believed that a *Faidherbia alabida* pod has a highly nutritious seed. They believed that cattle fed with it, increase weight quickly and become stronger and resistant to many diseases. Most of the ranked plant species can be found in cultivated, uncultivated or planted along farm boundaries. *Adrogon gayamus* and *Alycapu vaginalis* are planted species that wilted at the end of rainy season. Their seeds grow again with the fall of rain in the following season.

Table 3: Ranking of Plant Species Preferred by Cattle

Rank	Botanical Name	Hausa Name	Fulbe Name	Baure LGA	Jibia LGA	Kaita LGA	Mashi LGA	Zango LGA	Maiadua LGA	%
				Bududu	Faru	Gishi-rawa	Majigiri	Yaku-bawa	Bum-bum	
1	<i>Faidherbia alabida</i>	Gawo	Gawari	1	1	1	1	1	1	1
2	<i>Cenchrus Biflorus</i>	Karangiya	Kebba	2	2	3	2	2	2	2.1
3	<i>Aly carpu Vaginalis</i>	Gadagi	Kadagi	3	4	2	5	3	3	2.8
4	<i>Eragrostis Ciriancensis</i>	Komayya	Saraho	4	3	4	4	4	5	3.7
5	<i>Adrogon Gayamu</i>	Gamba	Gamba	6	6	5	2	5	4	4.8
6	<i>Commiphara Africana</i>	Dashi	Dasihi	5	5	6	6	6	6	5.6

Source: Field Work (2016)

4.0 Conclusion

Large proportion of the population in northern Katsina state kept livestock for various reasons which include as a means of saving, source of income and for manure generation to replenish soil fertility. Land degradation due to overgrazing may be likely to continue as long as people in the area were not provided or sustainable way of utilizing their environmental resources. Other ways of generating income and improving soil fertility should be introduced to reduce the villagers' reliance on livestock. Afforestation programmes should be intensified and extended to areas which are to benefit from such projects.

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