

## Factors influencing migrations and settlement among pastoralists in Kaduna state, Nigeria

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### ABSTRACT

This study was carried out to investigate the factors influencing migration and settlement of pastoralists in Kaduna State, Nigeria focusing on Ladduga Grazing Reserve and Kwanan Dutse a pastoralist village both located in Kachia Local Government Area (LGA) of Kaduna State Nigeria. Purposive and randomised sampling techniques were used to select participants inside the grazing reserve; while a purposive and exponential snowballing sampling technique used to gather data outside the grazing reserve (KwananDutse), resulting in a sample size of 116 and 57 respectively. This study is based on choice model which gives a data-driven nuanced understanding of factors that influence pastoralist's decision making and utility as they choose between settling in grazing reserves or traditional pastoralism. Thereafter, the study employed close-ended questionnaires to collect the data and analysed using binary logistic regression model. The findings show that pasture and water, livestock pests and diseases and conflict were the key drivers of migration (permanent and temporary) both inside and outside reserve. Specifically, herders with access to pasture and water had 26.7% and 13.2 % higher odds of permanent migration both inside and outside reserve compared to those without access, respectively. Likewise, herders who experienced livestock pests and diseases had 21.7% higher odds of migration inside the reserve and 1.1% higher odds outside the reserve compared to those without pest and diseases. In the same manner, herders who experience conflict had 44% and 14.2% higher odd of permanent migration both inside and outside reserve compared to those who do not experience, respectively. On the other hand, alternative market emerges as a non-significant factor both inside (odd ratio=0.196,  $p=0.131$ ) and outside (odd ratio=0.316,  $p=0.524$ ) reserve, possibly due to availability of local markets and informal value chains.

**Keywords:** Pastoralist migration, Settlement pattern, Grazing reserves.

### INTRODUCTION

Pastoralism is a livestock production system that seeks to maximize productivity by exploiting landscapes, using the traditional knowledge, skills and experience acquired over many years (Nyariki & Amwata 2019, Wafula, et,al, 2022). Estimates indicate that there are about 120 million pastoralists/agro pastoralists worldwide, of which 50 million reside in sub-Saharan Africa (FAO, Rass,2016). Many African communities, including the Maasai in East Africa, the Fulani in West Africa, the Somali in the Horn of Africa, and many others, have strong cultural and historical ties to pastoralism. Pastoralism supports more than 200 million pastoralist households globally, contributes significantly to the Gross Domestic Product (GDP) of several countries, and employs over 1.3billion actors in livestock-related value chains worldwide (De Haans, 2015).

Pastoralism is classified into three categories: nomadic, sedentary, and transhumance. These categories are largely defined by the extent of pastoralists search for pasture and water for cattle, as well as their vulnerability to threats and shocks to their means of livelihood (Badejo, 2017). It doubles as an economic activity and as well as cultural identity, even though the latter does not necessarily imply the former as such, there is no clear divide on its definition as far as the pastoralist is concerned (Krätli, Huelsebusch, Brooks and Kaufmann, 2016). The major pre-requisites for pastoralist production are livestock,

labour, access to grazing and water resources (Homewood, 2012, Tamou, 2017).

Though it is often dismissed and viewed as an unstable and unsustainable livestock production system (Kratli *et al* 2012), it is a major contributor to livestock production in Nigeria, which is predominantly in the hands of "the Fulbe ethnic group," also referred to as "Fulani" in Hausa language. This ethnic group makes up a sizable portion of the nation's socioeconomic strata. Approximately 90% of the nation's estimated herd, consisting of 76 million goats, 43.4 million sheep, and 18.4 million cattle are produced by them (Federal Ministry of Agriculture and Rural Development, 2017, Food and Agricultural Organization, 2022), along with significant holdings of several other livestock species.

Theoretical frameworks such as the Push-Pull Theory, proposed by Lee Everett in 1966, have been widely used to explain migration patterns. This theory suggests that people migrate due to a combination of push factors that drive them away from their original location and pull factors that attract them to new destinations. In the context of pastoralist migration and settlement in Kaduna State, Nigeria, push factors may include environmental degradation, conflict with farmers, and government policies limiting pastoralist rights. Conversely, pull factors may encompass environmental factors such as better grazing lands and water resources, economic factors like proximity to markets and competitive prices for livestock, and areas with improved security and stability.

Empirical studies have investigated various aspects of pastoralism, migration, and settlements. For instance, a study by Duijne *et al.* (2024) examined the well-being outcomes of ex-pastoralists in northern Kenya who migrated to towns. Similarly, a study by Wafula *et al.* (2022) in Nairobi, Kenya, identified search for pasture and water resources, and alternative markets, as the main reasons for pastoralists' migration to the city. Other studies have analysed the urban and peri-urban pastoral herd composition, land use changes, and drivers of pastoralism, highlighting the complexities of pastoralist migration and settlement patterns (Tamou 2017; Munishi 2013; Ducrotoy *et al.* 2018; Roessler *et al.* 2016).

Despite the enormous economic contribution of pastoralism both locally and globally, it has been experiencing a myriad of challenges that undermine productivity and survival of the system. Increased land use and associated competition for natural resources in the wake of high human and livestock population pressures have been major challenges confronting pastoralists of West Africa. This is especially true in Nigeria where Fulani make up 4% of the national population and prevailing national insecurity issues are impacting on pastoral livelihoods, including violent conflicts over land and ethnic, religious and political disparities (Ducrotoy, Majedunmi, Shaw and Bagulo 2018).

Population growth has triggered other challenges such as competition for land that has become a major source of conflict between pastoralists and crop farmers, this persistent conflict has also spilled over to lower productivity of crop outputs due to fear and suspicions of attacks and reprisal by both parties (Tamou, 2017, Sayedi and Ndagi, 2020). Second, is the problem of land use and land tenure systems of 1978 which completely left out pastoralist out the land tenure dynamics, thus diminishing land available for grazing (Ayantunde, 2011, Okello 2012).

Migration, settlement and resettlements of pastoralists have been a major feature of pastoralist production and lifestyle influenced by a complex interplay of environmental, socio-economic, political, and cultural factors. Pastoralists in Kaduna State, Nigeria are not any different. Pastoral migration is a complex phenomenon influenced by a multitude of factors which shape pastoralist mobility. Understanding the underlying causes of such migrations and settlement patterns among pastoralists is fundamental in addressing the challenges facing the pastoral systems as a whole. It is against this background that this study attempts to examine factors influencing migration and settlements of pastoralists in and outside the grazing reserve in Kaduna state, Nigeria through the lens of a choice model, using Ladduga grazing reserve and KwananDutse in Kaduna State as a microcosm. In

addition, since the federal government of Nigeria is promoting intensive cattle production (Grazing Reserves or Ranching). Due to the challenges posed by traditional pastoralism over the years and its impacts.

## METHODOLOGY

The study was conducted in Ladduga Grazing Reserve and Kwanar Dutse. Ladduga Grazing Reserve is located in Kachia local government, southern Kaduna senatorial district of Kaduna state, Nigeria, and is situated in the sub-humid zone. Established in 1965, the reserve was designed to settle nomads in one location to improve their standards of living and avoid conflict between nomads and farmers. The reserve has approximately 777 households, with over 10,000 Fulani pastoralists and more than 40,000 cattle.

Kwanar Dutse is a small Fulani pastoralist village located on the land of the Nigerian Army School of Artillery in Kachia local government area of Kaduna State, Nigeria. The village is inhabited by Fulani pastoralists who relocated from southern Kaduna and neighbouring states due to persistent farmers/herders conflicts and post-election crises of 2011. The settlement is home to approximately 60 households and 500 pastoralists, with over 4,000 cattle, sheep, and goats, and is characterised by an agro-pastoralist system.

### Ladduga Grazing Reserve

Purposive and randomised sampling was used to select participants at different phases. The selection of participants was a two-phase process, commencing with a pre-survey phase, where key informants were purposively selected from local government areas, including agricultural extension workers, veterinarians, and stakeholders, who have worked closely with the pastoralists. Subsequently, in the main survey phase, participants were purposively selected from the resident pastoralists in the grazing reserve, based on specific criteria, which includes being male heads of households, given the patrilineal nature of the Fulani family structure, and having been cattle farmers in the reserve for at least one year, except for transhumance pastoralists who temporarily stay in the reserve. Ultimately, this selection process resulted in a sample size of 116 participants

### Kwanan Dutse

An exponential snowball sampling technique was used for this study area, this enables participants to refer multiple individuals they knew who might be a good fit for the study, thereby facilitating a faster expansion of the sample size. This technique was particularly effective following an initial interview with the Ardo (the head of the community), who played a crucial role

in mobilising and introducing heads of households or their representatives in the settlement to participate in the research, ultimately resulting in the administration of questionnaires to a total of 58 heads of households, providing valuable quantitative data for the study.

The main method of data collection used in the research was a questionnaire. Structured questionnaires and focus group technique that is utilised within a homogenous group of participants mainly heads of households (Men) or a deputy in the absence of the head (6-12) to discuss selected topics assisted by a moderator.

Copies of the questionnaire were distributed to scholars and subject matter experts outside the study population, and they were validated. Thereafter, reliability test was conducted using Cronbach's Alpha test to ascertain whether the items in the questionnaire would consistently measure the variables being studied with findings suggesting a good level of internal consistency among the items in the scale.

$$\text{Log In} \left( \frac{P1}{1-p1} \right) = \text{logit} (P1) = \delta + \beta_1 x_1 + \epsilon_1 \dots\dots\dots (1)$$

$$Y = \text{In} \left( \frac{P1}{1-p1} \right) \dots\dots\dots (2)$$

The regression model for pastoralist migration was specified as follows:

$$\text{Log} \left( \frac{P1}{1-p1} \right) = \alpha + \beta_o + \beta_1 \text{HS} - \beta_2 \text{APW} + \beta_3 \text{ALTMK} \pm \beta_4 \text{LPD} \pm \beta_5 \text{AGE} \pm \beta_6 \text{HHS} \pm \beta_7 \text{CONFL} \pm U_i(3)$$

Where: P1 is the probability of migrating permanently, (1-P1) is the probability of migrating temporarily,  $\left( \frac{P1}{1-p1} \right)$  is the odds ratio, Y is the dependent-categorical variable, xi is the ith predictor variable,  $\alpha$  and  $\beta_i$  are the estimated coefficients for predictor variables and  $\epsilon_t$  the error terms in the model. The predictor variables in Eq. 3 are specified as HS = Herd size, APW = access to pasture and water, ALTMK = alternative markets, LPD =, livestock pests and diseases, AGE = age of respondent, HSS = household size, CONFL= Farmer/herders Conflict

**RESULTS AND DISCUSSION**

**Nature of migration inside and outside grazing reserve**

According to the results, inside grazing reserves, 72.4% of migrations were permanent, while 27.6% were temporary, while outside grazing reserves,

**Method of data analysis**

The study employed both descriptive and inferential statistics to analyse the data. Descriptive statistics involved the use of tables and percentages to summarize and describe the characteristics of the respondents. Inferential statistics, specifically binary logistic regression analysis, was used to determine the factors that influence the migration and settlement of pastoralists to other locations. The binary logistic regression model was chosen due to the categorical nature of the dependent variable, migration pattern (permanent and temporary).

**Model Specification**

The model for the study is in line with the study of Wafula *et al*, 2022 which is presented in logit model form as follows:

93.0% of migrations were permanent, and only 7.0% were temporary. The findings indicate that migration both inside and outside reserves appears to be more permanent, signifying that an overwhelming majority of pastoralists are beginning to embrace a more sedentary lifestyle and stability. They are opting for permanent migration due to either conflict, resource scarcity, or other factors. This is in line with the findings of Ducrotoy *et al*. (2018) who found that pastoralists were increasingly adopting sedentary lifestyles due to factors such as conflict, climate change, and resource scarcity, leading to a shift away from traditional nomadic practices. Similarly, Sayedi *et al*. (2020) observed that permanent migration was becoming a more common phenomenon among pastoralists, driven by factors such as environmental degradation, conflict, and economic instability, which were forcing them to abandon their traditional ways of life and adopt more settled lifestyles Ducrotoy *et al* 2018 and Sayedi *et al* 2020

**Table1: Nature of Migration**

Inside Grazing Reserve					Outside Grazing Reserve			
S/N	Item	Response			Response			
1	Migration	Temporary Migration	Permanent Migration	Total	Migration	Temporary Migration	Permanent Migration	Total
		32(27.6%)	84(72.4%)	116(100%)	4(7.0%)		53(93.0%)	57(100%)

Source: Author's computation (2024)

### Factors influencing migration settlement within and outside the grazing reserves

Access to pasture and water emerged as a critical factor in both contexts. Inside grazing reserves, 98.3% of respondents cited access to pasture and water as a reason for migration and settlement, while outside reserves, 96.5% of respondents similarly identified pasture and water access as a key factor. The significance of access to pasture and water can be attributed to the fact that these resources are essential for the survival and well-being of pastoralists' livestock, and their availability or scarcity can have a profound impact on pastoralist migration decisions. This result is consistent with previous studies, such as those conducted by Tugjamba *et al.* (2023) and Safari and Wambua (2024), which have also highlighted the significance of access to pasture and water in shaping migration patterns among pastoralists.

Similarly, livestock pests and diseases also significantly influenced migration settlement. Inside reserves, 71.6% of respondents cited livestock pest and diseases as a reason for migration, while outside reserves, 66.7% of respondents similarly identified disease concerns. One possible explanation for this finding may be due to the fragile ecosystem and limited resources available to pastoralists. The high concentration of livestock in these areas creates an ideal environment for the spread of diseases, while the lack of access to veterinary services, inadequate disease control measures, and poor livestock management practices exacerbate the problem, ultimately making pests and disease a persistent threat to pastoralist livelihoods, both inside and outside reserves. This finding is supported by previous research, such as the work of Chacha (2024) which have shown that disease outbreaks can have far-reaching consequences for pastoralist communities, including reduced livestock productivity, increased mortality rates, and decreased household income

More so, conflict is also a primary driver of migration settlement in both contexts. Inside the reserves, 96.6% of respondents cited conflict as a reason for migration, while outside reserves, 89.5% of respondents similarly identified conflict as a key factor. A plausible explanation for the significant impact of farmer-herder conflict on migration decisions is that these conflicts disrupt the livelihoods of herders, rendering it challenging for them to sustain their traditional practices. As a result, migration emerges as a coping mechanism for herders to escape the persistent conflicts and explore new opportunities in other regions or countries. This finding is consistent with the a priori expectation that farmer-herder conflicts can profoundly influence permanent migration decisions and is also corroborated by Wennström's (2024) study, which revealed that violent conflicts between pastoralists and farmers in Uganda resulted in increased migration and livelihood disruption.

Alternative markets, however, have limited influence on migration settlement. Inside reserves, 16.4% of respondents cited alternative markets as a reason for migration, while outside reserves, 28.1% of respondents similarly identified alternative markets. The insignificant role of alternative markets in predicting permanent migration among herders may be attributed to the inherent characteristics of the herding industry, where traditional markets and informal networks often take precedence over formal alternative markets, rendering them less influential in migration decisions. Furthermore, herders may have diversified income streams or support systems that reduce their reliance on alternative markets, making migration unnecessary, a finding that diverges from Barry's (2021) study, which highlighted the significant impact of alternative market access on migration patterns.

**Table 2: Factors influencing Migration Settlement**

SN	Item	Inside Reserve		Outside Reserve	
		Yes	No	Yes	No
1.	Access to pasture and water	114(98.3%)	2(1.7%)	55(96.5%)	2(3.5%)
2.	Livestock pest and diseases	83(71.6%)	33(28.4%)	38(66.7%)	19(33.3%)
3.	Conflict	112(96.6%)	4(3.4%)	51(89.5%)	6(10.5%)
4.	Alternative market	19(16.4%)	97(83.6%)	16(28.1%)	41(71.9%)
5.	Age of the respondents	18-35 Years 30(25.9%)	>35 Years 86(74.1%)	18-35 Years 17(29.8%)	>35 Years 40(70.2%)

Source: Author's computation (2024)

### Binary logistic regression estimates on factors influencing migration decisions within and outside the grazing reserves

One notable finding was the significant impact of herd size on migration decisions inside grazing reserves (odd ratio=1.223,  $p=.043$ ), suggesting for every unit increase in herd size, the odds of migration increase by 22.3%. This finding is consistent with expectations as,

the larger the herds size, the faster the depletion of available pasture increases the chances of migrating permanently or temporarily to new locations. However, this relationship is not significant outside of reserves. A possible explanation for this difference is the availability of resources within grazing reserves compared to outside areas. Inside reserves, there may be a limited amount of grazing land and water sources, making it more challenging for large herds to be sustained. As a result, pastoralist with larger herds may be more likely to seek out better opportunities elsewhere, leading to higher rates of permanent migration which is in line with the findings from the study of Ducrottoy *et al.* (2016). In contrast, outside of reserves, there may be more abundant resources available for herds of all sizes because they are not confined to a limited space and this could reduce the need for migrants to move in search of better opportunities permanently, regardless of the size of their herd.

Furthermore, access to pasture and water was a significant factor in both models. Inside reserves, the results reveal that herders with access to pasture and water had 26.7% higher odds of permanent migration compared to those without access. Similarly, outside reserve, the results indicate that herders with access to pasture and water had 13.2% higher odds of permanent migration compared to those without access. This finding is in line with a priori expectations, as access to pasture and water resources is a crucial factor in the livelihood and mobility of herders. This is supported by a study of Wafula, *et al.* (2022) who found that search for pasture and water resources, and alternative markets especially during droughts, are the main reasons for pastoralists' migration to the city.

On the other hand, the alternative market was a non-significant factor in both models. Inside reserves, the odd ratio was 0.196 with value of 0.131, implying that herders with access to alternative markets had 19.6% lower odds of permanent migration than those without alternative markets. Likewise, outside reserve, the odd ratio was 0.316 with value of 0.524, implying that herders with access to alternative markets had 31.6% lower odds of permanent migration than those without alternative markets. This finding may seem surprising at first; especially considering that previous research has suggested that access to alternative markets can have a significant impact on migration patterns (Barry, 2021). One possible explanation for the lack of significance of alternative markets in predicting permanent migration could be the nature of the herding industry itself. In some regions, herders may rely on traditional markets or informal networks for their livelihoods, rather than formal alternative markets. Additionally, herders may have other sources of income or support that make migration

unnecessary, regardless of their access to alternative markets.

The study also found that livestock pests and diseases had a significant impact on the likelihood of migration inside reserves (odd ratio=1.243,  $p=.042$ ), suggesting that herders who experience issues with livestock pests and diseases were 21.7% more likely to migrate compared to those without such problems within reserve areas. The finding is in line with the a priori expectations and consistent by a study of Lelenguyah *et al.* (2021) who reported that the loss of livestock due to pests and diseases was a key factor in the decision to migrate. However, this impact is not significant outside of reserves (odd ratio=1.132,  $p=.931$ ). One possible explanation for this finding is that inside reserves, herders may be more reliant on their livestock for their livelihood. If their livestock is affected by pests and diseases, it can have a detrimental effect on their ability to continue their way of life. This could lead to a decision to migrate permanently in search of better opportunities outside of the reserve. In contrast, outside of reserves, herders may have more options for dealing with livestock pests and diseases. They may have access to veterinary services, resources for pest control, or alternative sources of income.

Furthermore, the age of respondents also was non-significant factor in both models. Inside reserves, the odd ratio was 0.356 with an insignificant  $p$  value of 0.99. In the same manner, outside reserve, the odd ratio was 0.295 with an insignificant  $p$  value of 0.334. This finding was surprising, as one might expect younger individuals to be more mobile and open to migration opportunities. For example, a study by Simpson (2022) found that younger individuals were more likely to migrate in search of better economic opportunities than the older men. One possible explanation for this finding could be younger herders may still be learning and developing their skills, making them more reliant on migration to maintain their livelihoods.

Findings also show that farmers/herders' conflict significantly increased migration likelihood in both models. Inside reserves, the odd ratio was 1.44 with value of 0.024, suggesting that herders experiencing farmers/herders' conflict have 44% higher odds of permanent migration compared to those without conflict. Likewise, outside reserve, the odd ratio was 1.142 with value of 0.049, suggesting that herders experiencing farmers/herders' conflict had 14.2% higher odds of permanent migration compared to those without conflict. One possible explanation for this finding is that farmers/herders' conflicts disrupt the livelihoods of herders, making it difficult for them to continue their traditional practices. Migration becomes a way for herders to escape the ongoing

conflicts and find new opportunities in other locations. This result aligns with the a priori expectation that farmer-herder conflicts can significantly influence the decision to migrate permanently which is also

consistent with a study by Wennström, (2024) who found that violent conflicts between pastoralists and farmers in Uganda led to increased migration and disruption of livelihoods.

**Table 3: Estimated Binary Logistic Regression Model**

Inside Grazing Reserve Model			Outside Grazing Reserve Model				
	B	Sig.	Exp(B)		B	Sig.	Exp(B)
HS	.202	.043**	1.223	HS	.113	.483	1.120
APW (1)	.237	.036**	1.267	APW (1)	.124	.041**	1.132
ALTMK (1)	-1.630	.131	.196	ALTMK (1)	-1.152	.524	.316
LPD (1)	.217	.042**	1.243	LPD (1)	.124	.931	1.132
AGE (1)	-1.033	.099	.356	AGE (1)	-1.220	.334	.295
HSS	.102	.958	1.107	HSS	-.112	.613	.894
CONFL (1)	.365	.021**	1.44	CONFL (1)	.133	.049**	1.142
Constant	3.510	.004	33.445	Constant	3.113	.003	22.488

Source: Author's computation. Where: APW= Access to pasture and water, HS= Herd Size, ALTMK=Alternative Markets, LPD=Livestock Pest and Diseases, AGE= Age of the Respondents HSS= Household Size, CONFL=Farmers/Herders Conflict, \*, \*\* indicate significance at 1% and 5% respectively

## CONCLUSION AND RECOMMENDATIONS

This study examined the major factors that influence pastoralists' migration and settlement pattern in Kaduna State, Nigeria. As pastoralists are confronted with the choice of being confined within the government approved grazing reserve or not, given the utility they aim to derive from this decision. The findings revealed that pastoralists mainly migrate and resettle temporarily or permanently (within the reserve and outside) due to search for pasture and water to sustain their herd size, as such pastoralist with larger herds size are likely to migrate temporarily in the grazing reserve as competition for grazing field becomes stiff during the dry season in most parts of northern Nigeria, than those outside the reserve due to absence of restrictions of grazing land. Furthermore, there is a significant impact of livestock pests and diseases on migration likelihood inside reserves, and the destabilizing effect of farmers/herders conflict on herder communities outside the grazing reserve. However, Pastoralists in the grazing reserve still face problems of insecurity, cattle rustling, kidnappings and conflicts due to seasonal transhumance practices in the dry season, which goes against the major reason for the grazing reserve initiative in Nigeria. In Addition, the non-significant impact of alternative markets, age, and household size on migration decisions suggests that these factors may not be as critical in shaping migration patterns among herders in Nigeria, and therefore, may not require immediate policy attention.

The following recommendations were provided based on the findings:

- i. Policy makers and stakeholders should invest in a more efficient feeding system for pastoralists and teach them how to grow feed to sustain their livestock during the dry season. This will reduce transhumance which is the major cause of farmer/herder conflicts and insecurity.
- ii. Governments should take proactive measures to address the underlying causes of conflict and promote peaceful coexistence between farmers and herders through setting up mediation processes, establishing community peace committees, and providing training in conflict resolution and negotiation skills. In addition, governments should also promote dialogue between farmers and herders organizing forums, workshops, and other events where members of both groups can come together to discuss their concerns, share their perspectives, and work towards finding common ground.
- iii. Stakeholders should also invest in education and training programs for herders on disease prevention and control measures through partnering with local agricultural extension services and veterinary clinics to provide workshops and training sessions on best practices for disease prevention and control. These programs can cover topics such as proper hygiene practices, vaccination schedules, and recognizing signs of illness in livestock. In addition, the government should also ensure that herders have access to veterinary services and medication by setting

up mobile veterinary clinics in rural areas where herders reside.

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