



## ASSESSMENT OF FARMERS' AND PASTORALISTS' PERCEPTION OF DESERTIFICATION IN JIBIA LOCAL GOVERNMENT AREA OF KATSINA STATE, NIGERIA

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### ABSTRACT

This study assessed farmers' and pastoralists' perception of desertification in Jibia Local Government Area of Katsina State. Structured Interview and Focus Group Discussion (FGD) were used to collect data for the study. A total of 180 respondents were sampled using snowball sampling from Jibia, Magama, Daddara and Kukar Babangida communities. This study employed descriptive statistics to assess the perceptions on forms, causes and effects of desertification. Chi-square test of independency was used to test the association between the socio-demographic characteristics of the respondents and their perception of forms, causes and effects of desertification. The results revealed that majority of the respondent's perceived high presence of sand in farmlands and loss of soil fertility as the action of desertification. Furthermore, the results revealed that desertification is caused by both natural and anthropogenic factors including selective logging, drought, deforestation; persistent dry spell, overgrazing and over cultivation. The effects of desertification as perceived by the respondents are more on crop production, water sources, animal production and biodiversity. Chi-square test of independency results revealed that the association between the perception of the effects of desertification and gender, age, family size and occupation is positive and moderate. Moreover, there is no association between the perception of the effects of desertification and farming experience. The study recommended that the knowledge of local people should be considered when addressing desertification. There should be public enlightenment on the dangers of deforestation and desertification for proper mitigation in the area of concerned.

**Keywords:** Farmers, Pastoralists, Desertification, Perception, Adaptation

### INTRODUCTION

Desertification is one of the 21<sup>st</sup> centuries' most devastating global environmental challenges. The hilarious phenomenon has been a leading trigger of environmental resource scarcity as well as social crises many parts of the world hence the United Nation Environment Program. UNEP, (1977) defined it as degradation of land in arid, semi-arid and sub-humid areas, largely caused by climatic changes and human activities. It leads to reduction of natural potential of land and depletion of surface and underground water resources. United Nations Convention to combat Desertification in 1977 during the conference, the United Nations agreed on the plans and actions to combat desertification at all levels or even halt it by the year 2000. Since then, the phenomenon has pushed millions of smallholder farmers and pastoralists to the brink. Desertification is a global phenomenon that affects both developed and developing nations.

Desertification has been caused by several human and natural factors such as changing land use, extensive cultivation, deforestation, bush burning, overgrazing, mining, climate change and many others. It is also accelerated by drought as well as other underlying social, economic and political factors which have direct effect on plant and animals' lives (Katsina State, 2003). It can also be said that climatic variation is both cause and effect of desertification, just as climatic variations have been acclaimed as underlying drivers or triggering factors of land degradation and desertification, so also do they remain the underlying and usually not easily observable effects or impacts and imprints of land degradation and desertification (Ndabula, 2015).

Desertification is serious in Nigeria as in most African countries across the Sudano-Sahelian n Zone. According to Katsina State government report in Nigeria (1998); that between 50% and 75% of Bauchi, Borno, Gombe, Jigawa, Kano, Katsina, Kebbi, Sokoto, Yobe and Zamfara states are being affected by desertification. It is one of the most serious problems facing northern Nigeria with 580,841 km<sup>2</sup> out of the 927,892km<sup>2</sup> total land area of Nigeria and with about 62 million Nigerians directly or indirectly affected by desertification (Audu and Adie, 2018).

Katsina State being one of the State's worst affected by desertification in Northern Nigeria, the Katsina State Ministry of Environment admitted in the Leadership newspaper of 1 March, 2012 that desert control remains one of the major challenges facing the State particularly Jibia Local Government Area which is one of the local governments in Nigeria worst hit by this environmental disaster.

### MATERIALS AND METHODS

#### Study Area

The study area (Jibia Local Government Area of Katsina State) lies between Latitudes 12°40'0" and 13°10'0" North of the Equator and Longitudes 7°5'0" and 7°35'0" East of the Greenwich meridian. (Figure 1). It is located at the northern part of Katsina State at about 40 kilometers from the State capital. It is bordered to the north by Niger Republic, to the south by Batsari and Batagarawa Local Government Areas, to the west by Zamfara State and to the East by Katsina and Kaita Local Government Areas of Katsina State (Figure 1). It occupies a total land area of about 1,037km<sup>2</sup>.

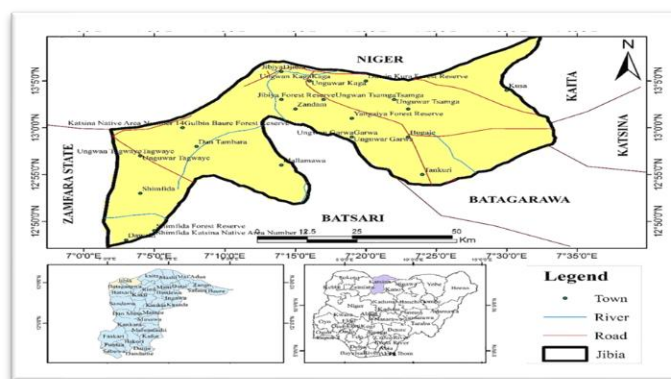


Figure 1: Map of the Study Area  
Source: Author's work, 2023

The study area falls within the tropical continental (wet and dry) climate which is characterized by low amount of rainfall. The mean annual rainfall is about 600mm per annum and low humidity (Abaje, Ati and Igusi, 2012). The area is characterized by unimodal rainfall pattern with most of the rain received between May to September, annual average below 700mm (Abaje, Ati and Igusi, 2012). Temperatures are high in most parts of the year with the mean daily maximum ranging between 27°C to 40°C occurring between March and May. The mean minimum ranging between 18°C to 25°C experience in the month of November to early February. The area has four different seasons; namely: 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).

Being found in the Sudano-Sahelian region, the study area's vegetation is generally grasses with scattered trees, this makes the area good for livestock rearing. The vegetation type of the study area is that of Sudan savannah. It composed of variety of trees scattered over an expanse of grassland. The trees are usually characterized by smaller leaves, thick barks, taproots, thorny leaves, broad canopies and are hardly taller than 20 meters. Ahmed *et al* (2018). The peculiar tree is *Adansonia digitata* (*Kuka*) which is taller and larger than others. The various tree species that could be found include *Acacia nilotica* (*Bagaruwa*), *Faidherbia albida* (*Gawo*); *parkiabiglobosa* (*Mangwaro*), *Acacia seyal* (*Farar kaya*), *Azadirachta indica* (*Bedi*) and many shrubs such as *Piliostigma reticulatum* (*Kalgo*) *acassia singuana* (*Runfu*), *Gueira senegalensis*, *Annona senegalensis* which are adapted and resistant to drought (NEWMAP, 2020).

The study area falls within the Chad formation, made up of sedimentary rocks of co-cetaceous origin. The relief of the area is of the lowest Chad plain with average relief of about 400 meters. However, it is not uncommon to find deposits of sand dunes of varying degrees especially when one moves towards Daddara village northwards (Field work, 2023). As a result, the soil of this area is characterized with sandy soil constituting about three quarter of the soil type while clay and loamy soil constitute the rest of the one-quarter of the soil type (Ahmed *et al*, 2018).

The variability of rainfall in the study area is still below average, therefore, primary river drainage in the area is the Jibia River having its source from the Rima River and its

tributaries Gada, Magama and Mazanya Rivers. The river drains its water in Jibia Dam, which is one of the sources of portable water supplies to Jibia town and neighboring communities, and where irrigation activities are being carried out in the area.

The study area has a total population of 299,200 people according to 2022 projected population estimate (NPC, 2011). The main occupation in the area is agriculture, which is estimated to have taken about 85% of the total population. These farmers engage in various agricultural practices from farming, livestock, poultry and fish farming. The people engaged in other occupations such as trading, carpentry, blacksmithing (Ahmed *et al* 2018). Poor soil fertility encourages the use of expenses of land for crop production, with adverse effects of clearing already low vegetation.

#### Data and Method

The research design method employed was descriptive survey approach. Primary data was collected from field survey, likewise FGD and structured interviews with farmers were conducted, which included the participation of pastoralists, farmers/local communities' and stakeholders.

#### Sampling of Communities

Purposive sampling technique was adopted to select the study locations the choice of purposive sampling technique here is based on the security challenges facing the area which did not allow access to certain communities in the study area. Therefore, Jibia, Magama, Daddara and Kukar Babangida were considered because of their easy access and security status (See figure 2).

Snow balling sampling technique was employed to select participants because the study targeted people with same characteristics, the initial respondents referred to other individuals who have knowledge or experience with desertification and agree to provide valuable insights.

#### Procedure for Data Collection

The data for this study were collected through questionnaires and FGDs. Questionnaires were administered to a total of 180 respondent sampled using snowballing method from the four remote farming communities. The map below shows the location of the selected communities (Figure 2) while the respondents' categories are listed in Table 1.

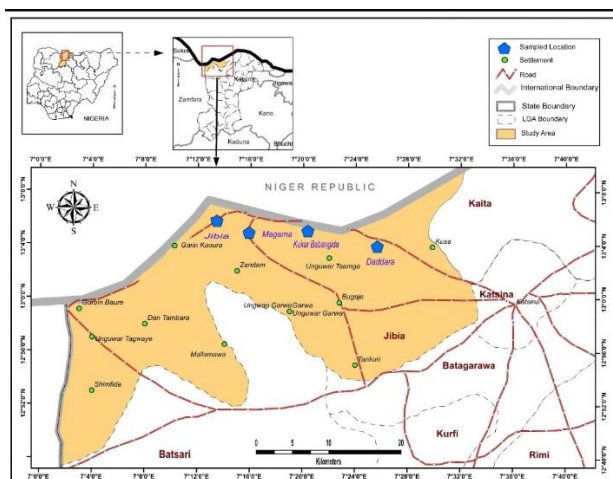


Figure 2: Map of the Study Area Showing the Communities  
Source: Author's Work, 2025

Eight people in each village were sampled for the FGD which aimed to elaborate on some key areas of the study. The eight participants comprise of four experienced farmers and four pastoralists of 45-60 years of age to have more insight on the subject matter. The FGD was conducted in each of the

communities selected for farmers (45-60 years) and pastoralists (45-60 years). The FGD was conducted in a reclusive but neutral ground to avoid digression on influence of other parties. The discussion lasted for 45 minutes with the assistance of trained colleagues.

Table 1: List of the Respondents

S/N	Study Location	Number of Respondents	
		Farmers	Pastoralists
1	Jibia	42	18
2	Magama	37	23
3	Daddara	10	20
4	Kukur Babangida	15	15
	Total	104	76

Source: Field work, 2023

**Procedure for Data Analysis**

The Statistical Package for Social Sciences (SPSS) (Version: 25) was used to process and analysed the quantitative data, which was presented using frequency distribution tables and percentage where necessary, while the FGD data was coded and transcribed using Nvivo 14 software. Chi-square test of association was used to test the association between the socio-economic characteristics of the respondents and their perception of forms, causes and effects of Desertification. To measure the strength of the chi-square test of association, Cramer's V was used.

$$\sum \chi^2_{i-j} = (O-E)/2E$$

Where:

O=Observed (the actual count of cases in each cell of the table)

E=Expected value (calculated below)

$\chi^2$ =The cell Chi-square value

$\sum \chi^2$ =Formula instruction to sum all the cell Chi-square values

$\chi^2_{i-j}$

$i-j$  is the correct notation to represent all the cells, from the first cell ( $i$ ) to the last cell ( $j$ ); in this case Cell 1 ( $i$ ) through Cell 6 ( $j$ ).

**RESULTS AND DISCUSSION**

**Socio-Demographic Characteristics of the Respondents**

The educational level of the respondents revealed that majority (30.56%) of the respondents attended Islamic schools, 26.67% attended primary school, 29.44% attended secondary school, while the remaining 13.33% attended tertiary institutions (Table 2). The study findings could be highly relevance because it was reported by a particular study that "the level of education of farmers will directly affect their ability to change and accept new ideas" (Saulawa *et al.*, 2018).

Table 2: Socio-Demographic Characteristics

Socio-Demographic characteristics	Characteristics	Frequency	Percentage (%)
Educational Qualification	Islamic	55	30.6
	Primary	48	26.7
	Secondary	53	29.4
	Tertiary	24	13.3
	TOTAL	180	100
Occupation	Farmer	104	57.8
	Pastoralist	76	42.2
	TOTAL	180	100

Socio-Demographic characteristics	Characteristics	Frequency	Percentage (%)
Farming Experience	5-10	65	36.1
	15-20	66	36.7
	25-above	49	27.2
	TOTAL	180	100
Gender	Male	140	77.8
	Female	40	22.2
	TOTAL	180	100
Age	18-25	37	20.6
	26-50	71	39.4
	>50	72	40
	TOTAL	180	100
Family Size	≥5	91	50.6
	6-15	61	33.9
	>16	28	15.5
	TOTAL	180	100
Position in Family	Household head	79	43.9
	Housewife	44	24.4
	Son/Daughter	57	31.7
	TOTAL	180	100

Source: Field work, 2023.

This result has shown that the highest percentage (57.8%) of the respondents are farmers, while 42.2% were pastoralists. Farming experience matters a lot in perceiving desertification and taking good adaptation measures to the problem of desertification, because farmers most of the time use the previous experience acquired in making decisions to cope with the problems of desertification. Farmers have a vital role to play in reducing the effects and adapting to desertification problems, as clearly stated that years of experience in agriculture plays a major role in enhancing productivity and application of conservation measures (Saulawa *et al.*, 2018).

### Forms of Desertification

The forms of desertification as perceived by the respondents vividly show that majority (27.2%) identified low land productivity as a form of desertification, while soil erosion is the second highest form of desertification in the study area. Likewise, loss of soil fertility is also perceived as a form of desertification by some local and experienced farmers (Table 3).

**Table 3: Forms of Desertification as Perceived by the Respondents**

Forms	Jibia Frequency	%	Magama Frequency	%	Daddara Frequency	%	Kukar Babangida Frequency	%	Overall Total	Overall %
Soil erosion	5	2.7	17	9.4	11	6.1	1	0.5	34	18.9
Change of soil text	8	4.4	6	3.3	6	3.3	9	5	29	16.1
Loss of soil fertility	7	3.8	12	6.6	6	3.3	5	2.7	30	16.7
Loss of trees	14	7.7	7	3.8	1	0.5	4	2.2	26	14.4
Low land Productivity	21	11.6	17	9.4	4	2.2	7	3.8	49	27.2
Declining crop output	5	2.7	1	0.5	2	1.1	4	2.2	12	6.7
Total	60	32.9	60	33	30	16.5	30	16.4	180	100

Source: Field work, 2023.

About 16.1% of the total respondents perceived change of soil texture as a form of desertification, some believed that overgrazing is a form of desertification, while few (6.7%) of the respondents believed that declining of the crop output is a form of desertification (Table 3). Some participants of the FGD confirmed that low land productivity is the major form of desertification in the area, and this result corroborates with another research finding that: almost exclusively, the respondents referred to low/poor crop yield as a form of land degradation (Osman and Fuseini, 2014).

### Causes of Desertification

The results on the causes of desertification as indicated by the respondents show that majority (37.8%) identified selective

logging as the main or major cause of desertification in the study area (Table 4). This can be true because when a tree is cut and the roots are removed, this leads to the total death of that tree. The continuous process leads to the exposure of the soil of the area to soil erosion, and subsequently makes the actions of desertification frequent.

The second largest cause of desertification identified in the study location is drought with 30%. While another significant group of people believed that 'Deforestation' is the major cause of desertification, while very few (14.4%) of the respondents believed that 'Overgrazing' is the major causative agent of desertification in the study area. This result shows that majority of the local people perceived that selective logging is the major cause of desertification in the

study area. However, desertification is mostly observed to be persistent and progressive in the most climatically sensitive areas especially the Moderate, High and Very High Micro-climatic Sensitivity Areas (Ndabula *et al.*, 2023).

**Table 4: Causes of Desertification**

Causes	Jibia	%	Magama	%	Daddara	%	Kukar Babangida	%	Total	%
	Frequency		Frequency		Frequency		Frequency			
Drought	26	14.4	15	8.3	3	1.6	10	5.5	54	30
Deforestation	11	6.1	2	1.1	14	7.7	5	2.7	32	17.8
Overgrazing	4	2.2	8	4.4	7	3.8	7	3.8	26	14.4
Selective Logging	19	10.5	35	19.4	6	3.3	8	4.4	68	37.8
Total	60	33.2	60	33.2	30	31.4	30	16.4	180	100%

Source: Field work, 2023

A participant in the FGD pointed out that:

*Due to rising insecurity in the area, people cannot go deep into the forest to search for fuel wood, instead, they prefer to dig already cut trees and shrub roots to collect firewood and to earn a living.*

Trees and shrubs in villages are being cut down on daily basis, and the roots are being removed and taken to areas like Magama, Jibia and Katsina city for sale. This process is one of the major causes of soil erosion and desertification in the area. This is because every tree and shrub is being held firmly to the ground by its roots; when the roots are removed, the tree dies and the soil is been exposed to soil erosion and finally desertification ensues. It is well-known that climatic variability, deforestation and overgrazing are among the major causes of desertification (Audu and Adie, 2018). The

rate of cutting down trees for fuel wood and over-cultivation of land pave way to the occurrence of climate change and other extreme climate related events such as desertification (Sule *et al.*, 2020).

The results of this study also revealed how the causes of desertification were ranked by the respondents according to their causing power (Table 5). The ranking was based on the frequency and percentage of the responses gathered. Selective logging was ranked the most, as revealed. About 29.4% of the respondents ranked drought as their perceived main causes of desertification. Likewise, deforestation was ranked third with 27.8%, while the least (8.9%) of the respondents ranked overgrazing as the main cause of desertification in the study area (Table 5).

**Table 5: Causes of Desertification As Ranked By the Respondents**

Causes	Rank	Jibia	%	Magama	%	Daddara	%	Kukar Babangida	%	Total	%
		Frequency		Frequency		Frequency		Frequency			
Deforestation	3 <sup>rd</sup>	17	9.4	21	11.6	6	3.3	6	3.3	50	27.8
Selective Logging	1 <sup>st</sup>	19	10.5	17	9.4	14	7.7	11	6.1	61	33.9
Drought	2 <sup>nd</sup>	18	10	20	11.1	7	3.8	8	4.4	53	29.4
Overgrazing	4 <sup>th</sup>	6	3.3	2	1.1	3	1.6	5	2.7	16	8.9

Source: Field work, 2023

According to this study findings, selective logging is highly perceived as the major cause of desertification, followed by drought, deforestation and then overgrazing. It was also agreed by most of the FGD participants that removal of tree and shrub roots (selective logging) is the major cause of desertification in the study area.

#### Effects of Desertification on Resource Base

The result from the perceived effects of desertification on resource base shows that some of the respondents (Table 6) were of the opinion that water resources suffer most, while majority believed that biodiversity suffers most from the effects of desertification. This result is in conformity with a report that listed; water scarcity, reduced agricultural productivity, loss of vegetation cover and biodiversity as the adverse effects of desertification (Chibueze, 2015).

**Table 6: Resource Base that Suffers most from Desertification**

Resource Base	Jibia	%	Magama	%	Daddara	%	Kukar Babangida	%	Total	%
	Frequency		Frequency		Frequency		Frequency			
Soil	15	8.3	19	10.5	7	3.8	5	2.7	46	25.6
Biodiversity	24	13.3	20	11.1	13	7.2	12	6.6	69	38.3
Water	21	11.6	21	11.6	10	5.5	13	7.2	65	36.1
Total	60	33.3	60	33.3	30	16.7	30	16.7	180	100%

Source: Field survey, 2023

On the other hand, 25.6% (mostly farmers) opined that soil is the most affected resource base that suffers from desertification and its actions in the study area (Table 6). This

signifies how important fertile soil is to farmers, and how soil fertility is been affected from the frequent action of desertification. Due to such effects, nowadays, small-holder

farmers in semi-arid are reported to have always considered adopting crop cultivars with minimum nutrient requirement because the soil in their farmlands needs regular nutrients supplement of either local manure or chemical fertilizer, despite the high cost in obtaining fertilizer (Abdullahi and Salisu, 2025).

#### Association of the Socioeconomic Characteristics of the Respondents and Perception of Desertification

Perception of the forms of desertification has a strong association with; gender, position in the family, occupation and farming experience. The Cramer's V indicates that a strong association exists between perception of forms of desertification and occupation, while a moderate association with gender, position in the family and farming experience was found. However, there is no association between the perception of forms of desertification and age, education and family size. This suggests that occupation is associated with perception of forms of desertification, and this maybe because

of what farmers refer to as desertification on the basis of the growth and development of plants quietly differs from what pastoralists call it in relation to available pasture for their animals.

The results also suggest that gender contributes to the perception of desertification, and this may be associated with the fact that male are more exposed to the outdoor economic activities including farming and livestock management and therefore they may perceive forms of desertification better than females. Farming experience also moderately contributes to the perception of forms of desertification, maybe because people with long-term experience of farming or pastoralism may have better understanding of their surrounding environment than those with short-term experience. The role of the head of a family determine how he works hard to provide for the family by working and understanding the immediate environment and therefore understands forms of desertification more than those who are either sons, daughters or housewives in the family.

**Table 7: Association of Socioeconomic Characteristics and Perception of Desertification**

Variables	Forms			Causes			Effects		
	Chi-square	Cramer's V	Significance level (<0.05)	Chi-square	Cramer's V	Significance level (<0.05)	Chi-square	Cramer's V	Significance level (<0.05)
Gender	48.79	0.52	0.000	16.77	0.31	0.001	20.23	0.34	0.000
Age	1.93	0.06	0.72	4.34	0.12	0.23	95.44	0.52	0.000
Position in family	102.6	0.53	0.000	81.49	0.48	0.000	13.63	0.19	0.009
Education	2.37	0.09	0.56	59.93	0.33	0.0000	33.30	0.30	0.000
Family size	2.78	0.11	0.60	64.38	0.42	0.000	25.49	0.39	0.000
Occupation	77.66	0.66	0.000	30.94	0.42	0.000	31.63	0.42	0.000
Farming experience	90.93	0.5.0	0.000	56.71	0.40	0.000	2.17	0.08	0.70

Source: Field work, 2023

The results of the chi-square test of association also revealed that there is association between the perceptions of the causes of desertification and gender, position in the family, family size, occupation, and farming experience. The Cramer's V indicates that the association between the perception of the causes of desertification and gender, position in the family, family size, occupation and farming experience is moderate. On the other hand, there is no association between the perception of the causes of desertification and age. As found with the perception of forms of desertification, causes of desertification can be related to the fact that male participate in farming and livestock management than female, thus perceive what causes desertification overtime than females. Occupation is also associated with the causes of desertification while farmers may associate desertification with the acts of pastoralists like overgrazing, on the other hand pastoralists may also believe with the fact that activities of farmers like burning of farmlands cause desertification. However, as family size and position in the family determine the degree at which a person will know what causes desertification, this will contribute to their perception. It is obvious to farmers and pastoralists who work for long to know how desertification evolved over time and what is responsible for it than those with less farming experience or starts recently.

Furthermore, there is association between the perception of the effects of desertification and gender, age, position in the family, family size and occupation. Cramer's V revealed that

the association between the perception of the effects of desertification and gender, age, family size and occupation is moderate while that of position in the family is weak. Conversely, there is no association between the perception of the effects of desertification and farming experience. The results implied that age contributes to perception of effects of desertification and therefore old age may play vital role in understanding past and recent effects of desertification on the environment. Gender also associates with the perception of effects of desertification, and this is apparent that female are vulnerable to many environmental risks than male and therefore their perception may vary. On the other hand, differences between how desertification affects farmers and pastoralists in the study area may cause variation in degree of perceptions, because age, household size, farming status influence farmers' vulnerability to desertification in Katsina State (Yahaya and Malik, 2021). It is also in line with a saying that education associates with perceptions of land degradation in China (Wei *et al.*, 2009).

#### CONCLUSION

The farmers and pastoralists in the study area have demonstrated their own understanding of the desertification and their role in the process of desertification as land users. Most of the reasons and indicators of desertification highlighted by the respondents in the study area largely agreed with the scientific account of these processes. The respondents have good knowledge of desertification in the

study area because they were able to identify the causes, effects and adaptation strategies of desertification in the study area.

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