International Journal of
Advances in Scientific Research and Engineering (ijasre)

E-ISSN : 2454-8006

DOI: http://doi.org/10.31695/IJASRE.2018.32969

Volume 4, Issue 11
November - 2018

An Exploration of the Socio-Economic Desertification Strategies in Katsina State, Nigeria

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Abstract:

The study commenced to scrutinize the socioeconomic desertification strategies in Katsina State, Nigeria. A total of 385 randomly selected farming families from across the three agroecological zones of the state and 18 key informants were interviewed on the desertification strategies. The indicators selected for the study included land ownership type, access to services and infrastructure, and purchase of food from other localities including food importation from neighboring countries. The KTARDA reforestation program, community organizations involved in environmental protection, and desertification campaign by local councils were also included for analysis. In addition, awareness of the GGW, the impact of the annual tree planting campaign, and adequacy of government extension services completed the set of the selected indicators. It was observed that the strategies in vogue have proved ineffectual in the fight against desertification in the study area.

Keywords: Desertification, Control, Sustainable Land Management, Great Green Wall.

1. INTRODUCTION

The international community has long recognized desertification as a major economic, social and environmental problem of concern to many countries in the regions of the world [1]. It has a direct impact on human wellbeing and social welfare [2, 3].

Africa experiences the worst of desertification with more and more of its lands manifesting its effects, hence combating it more efficiently remain one of the most critical challenges of the 21st Century [4]. It is in this region that unsustainable land management practices, including overgrazing, illegal and excessive fuelwood collection and inadequate irrigation technologies have become prevalent, often due to institutional or tenurial barriers [5].

Efforts by African countries, in particular, to combat desertification have been met with limited success [6, 7] and it was clear that these countries have little command of the data on their natural resources [4].

In retrospect, it is unequivocal that drought, unreliable and variable rains are a recurrent problem in the drylands [8]. Thus, following the Sahelian drought of 1972/73, the understanding of the causes and impacts of desertification continued to evolve [3]. It was this incident that provoked the Federal Government of Nigeria in collaboration with the State Governments, to set into motion the establishment of afforestation programs, the construction of dams for irrigation and establishment of appropriate national institutions [9]. Such national organizations include the River Basin Development Authorities (RBDAs), the Forestry Management, Evaluation and Coordinating Unit (FORMECU), and National Coordinating Committees on Desertification Control (NCCDC). Furthermore, to tackle the problem of desertification in 1976 the Federal Government instituted an Arid Zone Afforestation Project (AZAP) and facilitated international intervention in the much of the degraded lands of the Frontline States. Despite the various national efforts, desertification and general land degradation remain a major challenge in Nigeria's sustainable development. Desertification continues to reduce the natural resource base and complicate efforts to reduce pervasive poverty of Nigeria [7].

DOI: 10.31695/IJASRE.2018.32969

Hitherto, the steady deterioration of land in Northern Nigeria has continued largely unchallenged for several years. Jigawa, Kano, Kebbi, and Sokoto initiated hitherto the development of shelterbelts in their northern fringes in the1960s. In the later years, the Federal Government further evolved the Great Green Wall Strategic Action Plan (GGWSAP) in 2012 which was a five-year strategic plan with the goal of improving the well-being of the affected people and reducing their vulnerability to climate change [7].

In Nigeria it could be argued that much of the efforts to control desertification have been focused on afforestation as a solution while giving priority to the establishment of large-scale dams and irrigation projects [10]. Technical solutions were sought for socio-political and socio-economic problems [11]. The Afforestation Programme across the country is situated mostly by the roadside, and when carried out in villages, there has been no post planting management planning.

With a population of nearly 6 million people on a 24,192 km2 of land, pervasive poverty, and unemployment, the pressure on land is growing at an alarming rate in Katsina State [12] Farm holdings are fragmented continuously into economically small areas, with attendant soil fertility loss occasioned by erosion. The fragmentation of the farmlands has a direct bearing on the socio-economic activities of the general population. Sand dunes, gullies and expansive land with little vegetation manifest the severity of desertification in the northern part of the state, particularly in Jibia, Kaita, Mashi, Daura and Mani Local Government Areas [13, 7] The productivity of the land and its ability to provide ecosystem services in the study area where 75% of its population depend on agriculture have now became threatened. Thus, the need to explore the socio-economic control measures of desertification in the study area is crucial as no universal policy for mitigating desertification can be conceived for all dryland areas of the globe [14]. Thus, without accurate data and relevant information, it is impossible to predict, adjust or strengthen actions to curtail land degradation and face the challenge of food security through sustainable agriculture and efficient water management [4].

In furtherance of the collaborative efforts of the Federal Government of Nigeria, the EEC supported a pilot project in Katsina State, which covered a total area of 1.6 million hectares involving the establishment of shelterbelts, windbreaks, and trees on farmland [12]. In Katsina State, the path of the GGW cut across Jibia, Kaita, and Mashi including Mai'adua, Zango and Baure local government areas. In the face of these initiatives the concepts have not yielded much-desired results.

Strikingly the fact that the anecdotal studies and reports were neither clear on the involvement of local farmers in various presentations nor clearly identified the most commonly used combative measures posed a serious challenge to understanding the phenomenon holistically. Moreover, in an effort to understand degradation in Nigeria, little attention has been paid to the farming families who are ultimately faced with the decision and task of implementing various management practices. Indeed, little is known of farmers' perspectives on land management. [15] aptly elucidated that the concerns on desertification have given insufficient attention to people's adaptive response

2. MATERIALS AND METHODS

2.1 Selected areas of study, sample population and sampling technique

Following the methodology of Saulawa [16] the fieldwork for this study was conducted in Katsina State from June 2015 to August 2015. Katsina State, which lies in the semi-arid region of Nigeria [17] is one of the Frontline States which bears the brunt of desertification significantly. Six local government areas across the three agro-ecological zones were purposively selected for the study. The extreme northern part lies within the Sahel Savannah with rainfall on average of less than 600mm per year. The northern part lies within the Sudan Savannah with the rainfall average of about 800mm per year and the southern part in the Guinea Savannah with rainfall averages of 1000mm per annum [16]. This variability in rainfall distribution made the selection from the different agro-ecological zones imperative which gave a broader scope of the investigation and reduced bias. Two categories of respondents were involved in the study, drawn from the sampled local government areas. The respondents constituted the farming families and three community leaders were selected from each of the sampled local government. The primary focus included farming families from the six local government areas because according to [18] 67% of the land in Katsina state is devoted to cultivation. Additionally, [19] observe that for land degradation assessment to be accurate and reliable, it must incorporate multiple perspectives using a variety of methods at multiple scales, including the perspectives of those who manage and/or use the land. Therefore, including the farming families since they are the major stakeholders in land issues became appropriate.

2.2 Sample size distribution: Simple random sampling was used to select farmers from the six local government areas. Applying the [20] formula to a target population of 800,000 farming families in the study area, a total of 385 farming families were selected and interviewed. The 18 key informant interview participants were selected purposively drawn from the sampled coterminous local government areas. As observed by [21] key informant participants by their expertise and mandates are expected to hold rich information or experiences related to the phenomenon under investigation. The selected respondents for this study

DOI: 10.31695/IJASRE.2018.32969

were people who have knowledge and experiences of environmental issues based on their institutional mandates. They had a long-term interaction with the farmers on issues of policy implementation and introduction of new land management practices.

2.3 Statistical analysis: The analysis of the questionnaire responses was done using frequencies, logistic regression and Chi-square. Frequency tables, column charts were used to describe the data. The Binomial Logistic Regression was employed to see whether the response variables can be predicted from the independent variables and also to calculate explained variation. The Pearson Chi-square was employed to indicate the strength of the relationship between the dependent and the independent variables. The interviews were contextually analyzed.

2.4 The socioeconomic indicators

The socioeconomic indicators were selected on the proposition of three criteria, namely: the non-complexity in elicitation of responses from the farming families; the currency of the indicator in the process of desertification combat and the recurrence in general literature.

The following analysis parameters were used in each indicator:

1. Land ownership- Unclear and insecure land titles provoke unwillingness to invest in sustainable land management. The more the fragmentation of land the higher the land degradation.

2. Access to service and infrastructure- Living standard and productivity are compromised where access to service and infrastructure is dismal.

3.Purchase of food from other localities:-Decrease in investment in land management results from low productivity of agricultural lands.

4. Importation from neighbouring countries-A Low productivity level and a decline in arable land is a signal of severe degradation which precipitates remedial actions.

Figure 1 Map of Katsina State showing the selected sites for the study
Source: NASA/NOA Spot Image (2014)

5. KTARDA reforestation programme-The need for projects intervention signals the seriousness of land degradation.

6. Community organization involved in environmental Protection-Land is more degraded where there are no community organizations.

7. Desertification campaign by local councils-degradation is faster where there is no environmental awareness.

8. Awareness of the GGW- The success of the predicated on the participatory approach

9. Impact of annual tree Campaign-Tree planting campaigns fails when there is no post-planting management.

10. Adequacy of government extension Services-Lack of adequate information capacity of the farming families exacerbates the desertification process.

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3.0 RESULT AND DISCUSSION

3.1 Land ownership type : The responses on main land ownership type from the farming families indicated that individually leased farmland was at 17.9% while individually titled ownership stood at 82% as shown in Figure 2. This is an incentive to investment in conservation measures on the land. Similar results were obtained by the [22] household report of the study area. This is because of the tenure practice in the study area where respondents operate land under inheritance. Land ownership rights have been essential for the development of Nigeria's agriculture because assured property rights promote the adoption of conservation measures and sustainable agricultural practices. [23] notes that private land owners are more likely to conserve their land compared to the public lands managed by the government agents and others because land is a major investment that defines wealth for those private land owners. Further, [24] notes that insecure and unclear land titles and other natural resources tenure and access rights are some of the main reasons the natural resources end-users are unwilling to invest in long-term sustainable land management (SLM). For instance, it is reported that in Uganda, insecurity of land tenure in parts of the cattle corridor under mailo and communal tenure systems does not encourage farmers to invest in sustainable land management practices.

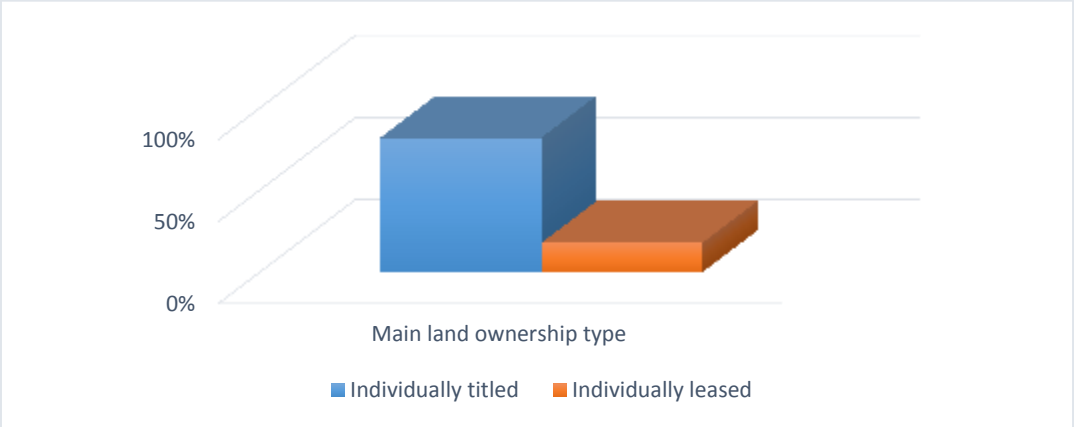

Figure 2: Main land ownership (Source: Field Survey, 2015)

3.2 Access to services and infrastructure: The provision of services and infrastructure was scored by the farming families as very low in health by 51.9%, technical assistance at 83.1 and off-farm employment at 85.7% as well as energy at 72.2% and financial services at 62.6%. Figure 3 provides the general outlook of access to services and infrastructure in the study area. The Figure indicates a serious vulnerability of the livelihoods of the farming families. Rural services, including economic and social services, are the very necessary foundation for the growth and development of any country. Rural services enhance living standards and, by extension, motivate the productive capacity of the people. [25] note that the availability and access to these services tend to contribute to the productivity of rural citizens. In addition, the result mirrored the findings in Papua New [26] who noted that the lack of access to services and infrastructure have an impact on social indicators and that there is little evidence to suggest that the traditionally poor and ecologically stressed areas will be able to meet the MDG. Similarly, [27] also cited challenges faced by farmers in Botswana to include access to services and infrastructure.

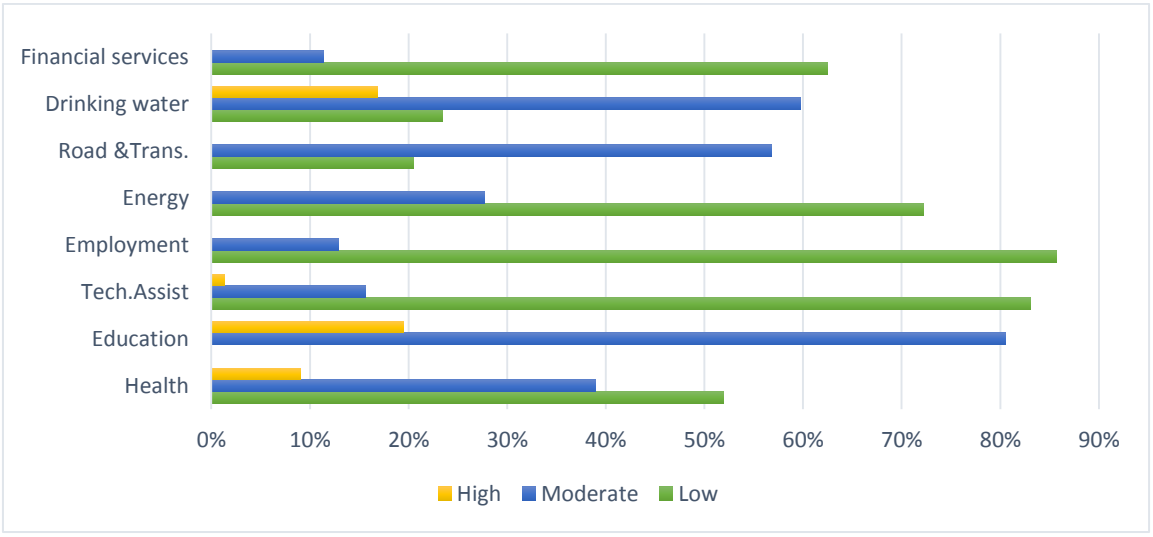

Figure 3: Access to services (Source: Field Survey, 2015)

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3.3 Purchase of foods from other localities: The responses by the farming families indicated that the purchase of food from other localities once every three months was scored at 69.4% while purchases twice in a year was at 30.6% as captured in Figure 4. The result mirrors the findings by [28] who noted that in the Savannah belt of Nigeria the cycle of seasonal food shortage by farming households keeps occurring yearly, becoming harsh by January/February and severe by March/Jun. The finding further espouses [24] overview, that the poor households that are affected by drought and desertification do not have adequate resources to deal with food shortages leading to food insecurity and hunger that affects millions of people. If land degradation continues at the current pace, it is projected that more than a half of cultivated agricultural area in Africa could be unusable by the year 2050, and the region may be able to feed just 25 percent of its population by 2025.The findings further concurred with the study of agricultural productivity in Botswana by [27] who revealed that agricultural productivity in Botswana has declined leading to a progressive increase in food imports. They argued that low productivity in agriculture has also prohibited farmers from earning significant returns from their enterprises and hence they have reduced farm incomes.

3.4 Food importation from neighbouring countries: The farming families were asked whether food was imported from neighbouring countries and the majority (71.4%) indicated that there was importation of food from neighbouring countries while 28.6% responded there was no importation as shown in Figure 4. The study mirrors the findings of [29] which indicated that traders in Jibia, Katsina State, confirmed there were exports of the Nigerien millet sold on the Jibia market. It could be deduced that the idea behind importation of foodstuff from neighbouring countries clearly manifests food insecurity in the study area.

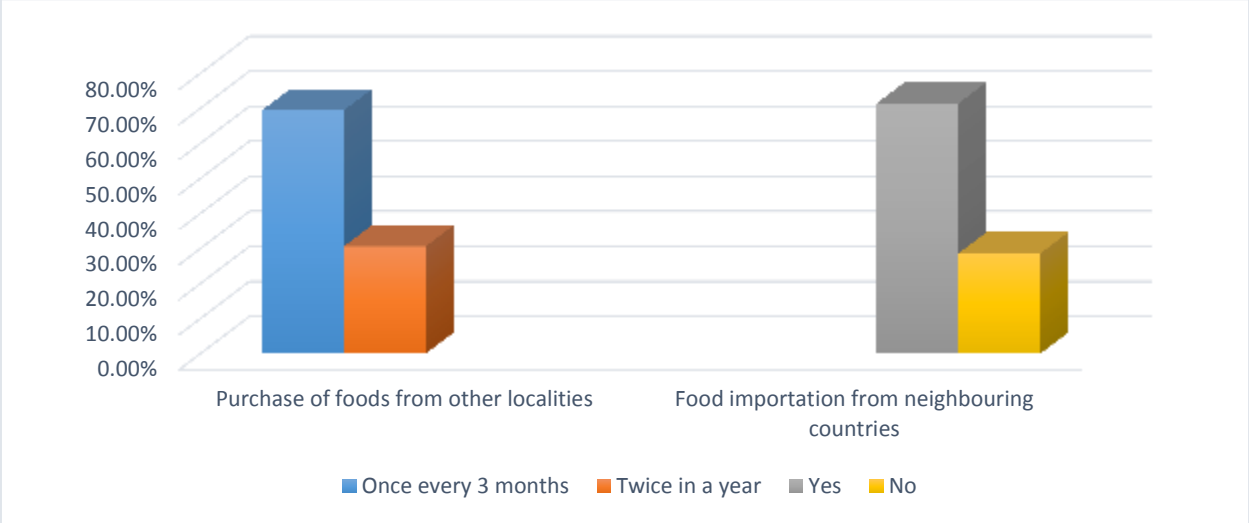

Figure 4: Food purchase from localities and neighbouring countries (Source: Field Survey, 2015)

The disaggregate responses of the farming families from the different agroecological zones in the study area showed that 96% of the farming families in the Sahel zone attest to the importation of food while in the Sudan Savannah 83% of the respondents emphasized its importation. The least response on the importation of food products came from 64% of the farming families in the Northern Guinea Savannah (Figure 5). Thus the revelations indicated serious vulnerability in food security in the Sahel and the Sudan savannah zones of the study area. The finding justifies the assertion made by [30] on why Africa has become a net food importer, which they argued was a result of low productivity level and growth and the decline of arable land per capita. They opined that it is no surprise that agricultural production grew slower than local demand which has contributed to the increase in import bills in many countries in Africa.

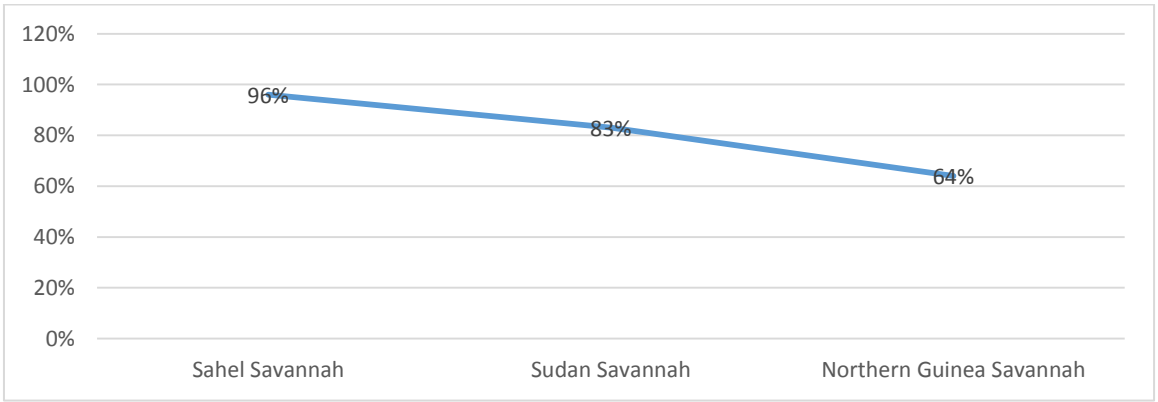

Figure 5: Food importation from other localities by agroecological zones (Source: Field Survey, 2015)

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3.5 KTARDA reforestation program: All respondents were of the view that that the KTARDA reforestation program was very effective. The reason for acclaiming the positive impact of the project stems from the efficient extension services provided and the regular visitations of the extension agents to farming families to educate and advise them on improved farm practices and facilitation of getting farm inputs at a subsidized cost. The KTARDA Project according to [31] undertook agroforestry project and included 6,668 farmers in the establishment of shelterbelts, windbreaks and woodlots from 1987 to 1990.

3.6 Community organizations involved in environmental protection: The farming families were asked if there are community organizations in their areas and majority of the respondents at a rate of 88.8% opined that there were communal level organizations involved in environmental protection while 11.2% noted the absence of such organizations in their areas as shown in Figure 6. [32] observes that community involvement in protecting the environment of their impacted community and related environmental issues is generally supported for its potential to provide low-cost sources of information to government agencies, increased acceptance of and confidence in government decisions, empowered community members on issues that affect them and advancement of democratic ideals. Moreover, the community involvement by residents can result in the collective transition from victims to agents of change.

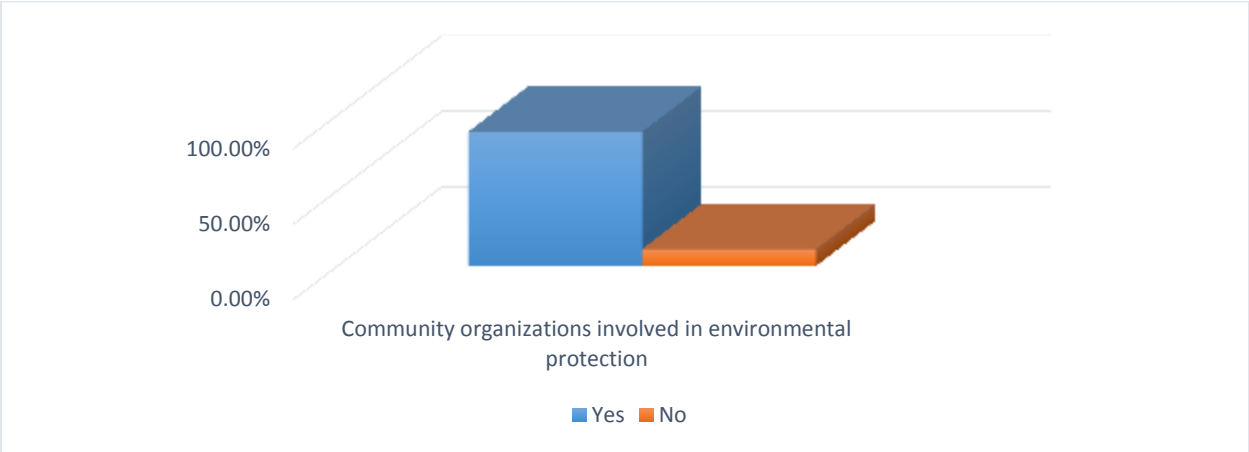

Figure 6: Community organizations involved in environmental protection Source: Field Survey, 2015)

3.7 Desertification campaigns by local councils: About 89% respondents (Figure 7) indicated that the local councils do not engage in any desertification enlightenment campaign while only 14.5% indicated their participation in the enlightenment campaigns. Lack of awareness makes people exploit the environmental resources faster, and they tend to overuse the natural resources due to lack of sufficient knowledge on environmental conservation [33]. In contrast to the finding of this study, successful anti-desertification programs which contributed to community interest in tree planting and related activities were achieved in Bongo area of Ghana through activities which include educational campaigns and training programs using audio-visual aids and drama [34].

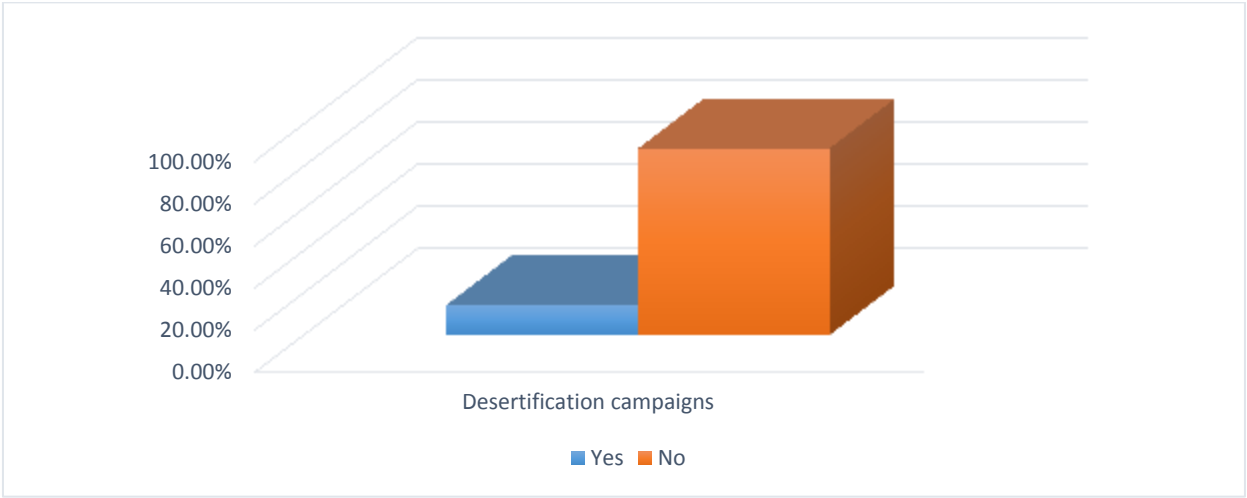

Figure 7: Desertification campaigns (Source: Field Survey, 2015)

3.8 Awareness of the GGWSS: When asked whether the farming families are aware of the GGWSS, over eighty percent responded that they were not aware of the GGWSS in the study area. Only about19% expressed their awareness of the project as

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depicted in Figure 8. This negative response mirrors the dearth of desertification campaign in the study area, which showed some decimal efforts in sensitizing the farming families on desertification issues.

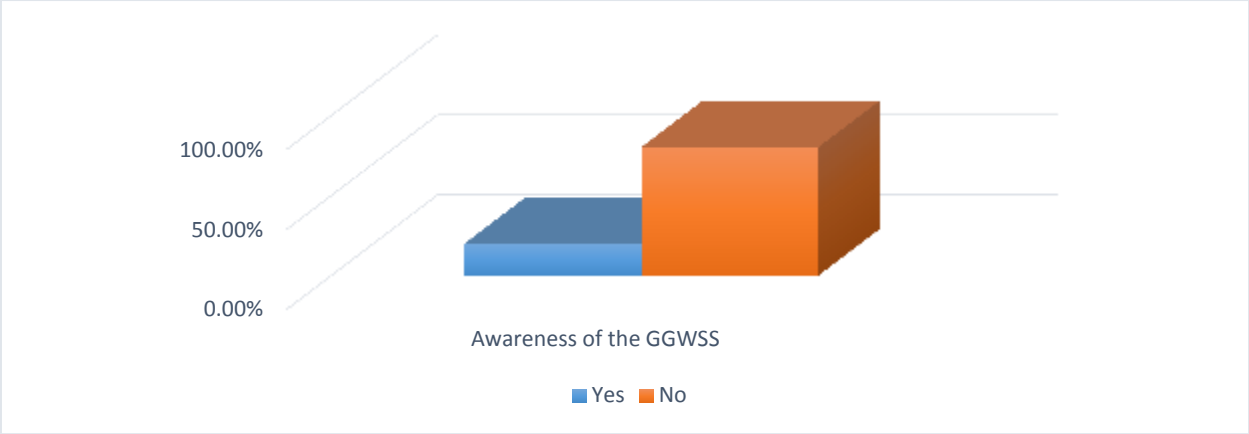

Figure 8: Awareness of the GGWSS (Source: Field Survey, 2015)

Thus, the limited participation of the farming families in the protection of the Green Wall in the study area cannot be overruled. The finding runs contrary to the reports of the GGWSSI first National Stakeholders Workshop where the panel stressed that participatory approach, awareness creation and educating local people must be pursued to ensure the success of the project [35].

3.9. Impact of annual tree planting campaigns: Over 80% of the farming families indicated that there has been no perceivable impact of the traditional annual campaign of reforestation by both the State and the Local Government Councils. Only about 19% perceived a positive impact of the exercise in the study area as shown in Figure 9. Effective maintenance of the trees must be ensured after planting. As this is the major reason that makes the program of tree planting exercise fail after the launching since local population seems not be consulted nor integrated into the maintenance framework. The results were a testimony to the ineffectiveness of the measures of combatting desertification by the State and the Local Government Councils. Similar results were obtained by [36] where they observed a paucity of trees in the Lagos Island Local Government despite the various tree planting efforts. A high mortality rate of trees was observed. Further findings in the area indicated that the public's desire to support, manage and maintain the planted trees was poor. The finding of this study contrasted with a successful tree planting activities undertaken by Save the Land Harambee in Naivasha and Kiambua districts that border Nairobi province [37].

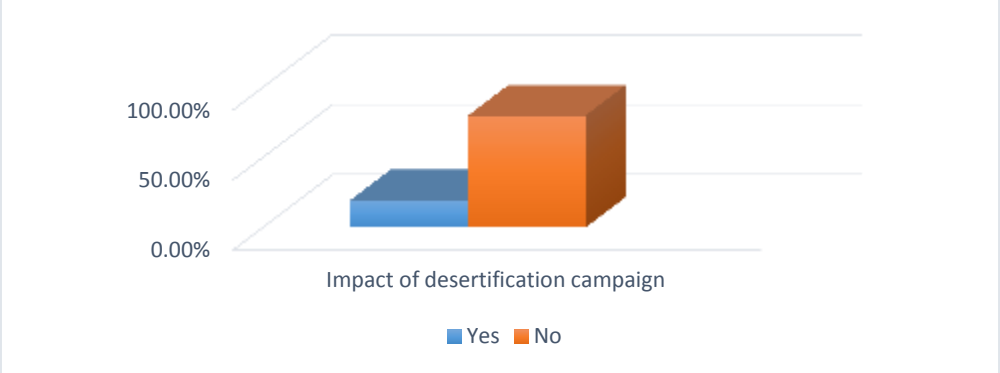

Figure 9: Impact of desertification campaign (Source: Field Survey, 2015)

3.10 Adequacy of Government Extension Services: [38, 39] argued that agricultural extension brings about changes, through education and communication in farmers' attitude, knowledge, and skills. The role of agricultural extension involves dissemination of information, building the capacity of farmers through the use of a variety of communication methods and help farmers make informed decisions. The farming families were asked whether the Government extension services were adequate to ensure land conservation activities in the study area and the majority of the responses (79.2%) indicated that such services were not adequate. However, 20.8% of the farming families opined that Government extension services were adequate to ensure adequate conservation activities. The finding mirrors the study of [40] in both South Africa and Botswana where extension services are highlighted at the policy level as important, but currently ineffective institutions within farming communities, yet there is no evidence that these services are being overhauled.

4.0 Inferential statistics: The logistical binomial regression was employed to ascertain the effects on the likelihood of government extension services to ensure land conservation measures by land ownership, purchase of food from other localities,

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food importation from other countries, Local Government engagement in desertification campaigns and the annual tree planting campaigns by the Government. The correlation matrix showed a linear relationship between the variables in the matrix (Table 1).

Table 1: Correlation Matrix

		Constant	Ownership(1)	Purchase(1)	Food(1)	Protection(1)	Council(1)	Annual(1)
Step 1	Constant	1.000	-.950	.000	.000	-.244	-.490	-.775
	Ownership(1)	-.950	1.000	.000	.000	.000	.515	.816
	Purchase(1)	.000	.000	1.000	-.945	.000	.000	.000
	Food(1)	.000	.000	-.945	1.000	-.204	.000	.000
	Protection(1)	-.244	.000	.000	-.204	1.000	.000	.000
	Council(1)	-.490	.515	.000	.000	.000	1.000	.000
	Annual(1)	-.775	.816	.000	.000	.000	.000	1.000

Source: Field Survey, 2015

The Omnibus Test of Model Coefficients showed a $\chi 2$ (df6) =354.639 at a significance of .000 as shown in Table 2.

Table 2 Test of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	354.639	6	.000
	Block	354.639	6	.000
	Model	354.639	6	.000

Source: Field Survey (2015)

Furthermore, the model summary (Table 3) indicated R2=.940, which explains 94% of the variance in the response of the farming families that the Government services were inadequate to ensure land conservation measures. The model correctly predicted 99% of the responses of the farming families.

Table 3: Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	38.843[a]	.602	.940

a. Estimation terminated at iteration number 20 because maximum iterations has been reached

Field Survey, 2015

The table text statistics below depict the chi- square contribution of each variable on land ownership by the respondents. 158.465 is the χ 2 on main land ownership, the degree of freedom is 1 and the Asymp. Sig. is .000 which indicates a significant relationship. The $\chi 2$ for access to services and infrastructure is = 111,558, the degree of freedom is 2 and the Asymp. Sig. is also .000. On whether food is imported by the respondents from neighbouring countries, the $\chi 2$ contribution is 70.714, the degree of freedom is 1 and the Asymp. Sig. is also .000. On how often the respondents purchase food from other localities, the $\chi 2$ is 57.665, the degree of freedom is equally 1 and the Asymp. Sig. is .000. The results from these Chi-square indicates that all the variables are statistically significant.

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Table 4: Test Statistics

	Identify the main land ownership type	Access to services and infrastructure	Is food imported from neighbouring countries	How often do you purchase food from other localities
Chi-Square	158.465[a]	111.558[b]	70.714[a]	57.665[a]
Df	1	2	1	1
Asymp. Sig.	.000	.000	.000	.000

Source: Field Survey, 2015

4. 2 Key Informant Interviews

It was a widely held view among all the participants that the farming families' ownership of land status was critical for an effective conservation measure. A key informant commented that;

> *"Farm lands in Katsina are mostly owned by the farming families as they hold their lands sacred ...only people from urban centres come in to lease some of the farmlands from those with multiple locations or in urgent financial strain."*

There was a refreshing thought on the traditional conservation techniques as key an informant stated that;

> *"Most of the farming families are now embarking seriously on a stone line, weeding and thinning…moreover, now they do not have a waste in their houses as they combine animal dung, crop residues, and household refuse and take it to the farm as a form of nutrient supplement….in addition I have noted in most areas the use of trash line of sacks filled with sand to check soil erosion."*

The responses from the key informant interviews were agreed on the very low infrastructure base across the localities which was a serious vulnerability to land degradation and an impediment to the practice of conservation measures. A key informant captured the situation pertinently;

> *"By and large, the infrastructure situation need to be looked into. When you cannot diversify your local economy, there is always a problem that will follow…People cannot get access to bank loans as they become frustrated with the process…I think that is why you see the local people have no option but to use local equipment like hoe and ox driven plough in their farmlands."*

In a summation by one of the key informant, he contended that;

> *"Currently the government is trying to improve infrastructure as already witnessed in the power sector and there are programs in place to open up windows for creating jobs and empowering the rural people...Yes our markets are mostly dependent on supplies from other areas not because we do not farm, but I think there is a production problem somewhere."*

Another key informant opens up on the GGWSS, and the response was instrumental in understanding the GGWSS progress in the State.

> *"Currently there is ongoing GGWSS activity in the northern local areas, but I think we have to embark on enlightenment campaign for farmers to help in the process… One engaging problem is the cited path in some areas fall within farmlands owned by individuals the government is going to look at how to overcome this challenge."* However, another informant lamented that:
>
> *"The GGW component is being contracted at the national level. The State government only facilitate the contractors to their locations for execution of the contract…unfortunately, most of these contractors were those with little or no knowledge of what the projection of GGW is on desertification…it is sad that the GGW physical component execution has been politicized*".

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4. CONCLUSION

The paper scrutinizes the socioeconomic desertification strategies in Katsina State, Nigeria with the determination of contributing to literature as well as providing the viewpoints of the farming families. The study revealed that there was an urgent need to step-up action towards bringing in more palliative measures to reduce the brunt of desertification in the study area. The desertification strategies in vogue proved to be inadequate, misapplied and in certain cases could not be synchronized with the essence of land restoration. There was a need for the authorities to involve the farming families in the execution of templates of desertification combat. It could be cost-effective to assimilate the local experiences and strategies of the farming families and modify such to improve their wellbeing, a panacea for desertification.

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