HUMAN COPING STRATEGIES TO DESERTIFICATION IN YOBE STATE, NIGERIA

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ABSTRACT

This paper examined the coping strategies adopted by the rural population in Yobe State of Nigeria to desertification. Data on methods used to cope with desertification were collected from eighteen development areas of the study area, as well as government agencies. The main objective was to examine how the process of desertification has forced the local population to use various coping strategies. Structured questionnaire was used to collect data. Data analysis employed the use of air photographs of the development areas obtained from the North East Arid Zone Development Programme (NEAZDP) for the 1990s and 2000s. These aerial photographs were used to validate the presence of sand dune accumulation, bare grounds, depletion of water bodies and vegetation cover. These results were validated at the Regional Centre for Remote Sensing in Jos. The study finings show that the expanding desert is a severe environmental problem. Environmental changes have been significant particularly in reduction of water body, depletion of vegetation cover, shifting sand dunes, increasing bare grounds and loss of biodiversity. A combination of coping strategies such as use of trees as wind breaks, woven stick construction around houses, agro-forestry practices and fadama farming have been used by the local population. The paper suggests the need for massive tree plantings in the study area and Nigeria in general. The Federal and State Departments of Forestry need to be empowered with adequate revenue for massive reforestation programme. Regulation to discourage dependence on wood for local energy should be put in place, while other sources of energy such as kerosene should be adequately provided.

Keywords: Human coping strategies, Desertification, Soil and Wind Erosion, Farming system, Grazing

INTRODUCTION

Desertification was earlier described as the replacement of forest by Savanna in Africa (Grainger, 1990). It became prominent in 1970's following widespread environmental degradation, drought and famine in the Sahel Zone of West Africa. The United Nations Conference on Desertification (UNEP, 2003) stated that "desertification is the diminution or destruction of the biological potential of the land, and can lead ultimately to desert-like conditions. It is an aspect of the widespread deterioration of ecosystems and has diminished the biological potential of the land, i.e. plant and animal production, for multiple use purposes at a time when increased productivity is needed to support growing populations in quest of development".

Desertification which is not only preventable but reversible (UNEP, 1992) is the most important environmental problem, affecting fifteen Northern States of Nigeria. The major cause of desertification according to Nyle

and Ray (2004) is over grazing by cattle, sheep and goats, a factor that likely accounted for about a third of all land degradation mainly in such dry regions as the Sahel in Northern Africa. Nigeria is presently losing about 351,000km^2 of its landmass to the desert which is advancing southward at the rate of 0.6km per year (FGN, 1997). Yobe State which is one of the worst affected states has about 48 percent of its land under siege from desert encroachment. Entire village and major access roads are being threatened and buried under sand dunes in the northern portions of Yunusari, Geidam, Yusufari and Machina. Desertification brings about severe disruption of the socio-economic development of the affected areas (UNEP, 1991). Desertification, among others, results in crop failure, death of livestock and eventually brings about famine. When fuel wood becomes scarce and costly, people turn to burning of animal dung, which further reduces the carrying capacity of the soil (Roland, 1993). Arifalo (2005) further observed that under arid conditions, there is very little organic matter that could provide binding force for soils, making it vulnerable to wind erosion. Tens of thousands of farmers and their families have already been forced to move away from land that has become barren. These people head south in search of jobs and land that does not exist. Farmers are not the only ones feeling the pinch, the nomadic Fulani people are also heading further south in the hopes of finding better grazing areas for their herds (William, 2007). This calls for a concerted effort by all stake holders since the concept of sustainability represents an intellectual attempt to balance human use of resources with the protection of the resources for future generations (Bridgewater, 2002).

MATERIALS AND METHODS

The data collected for this study includes respondents' settlement area, age, marital status, educational background, household size, source and types of energy use and their costs, strategies used to cope with desertification, role in tree planting, population change etc.

The study area is made up of eighteen units administratively defined as "Development Areas" The main source of data were structured questionnaires, field observations, interviews and focus group discussions directed to household heads, and some officials of North East Arid Zone Development Programme (NEAZDP). A total of 1,779 respondents representing 5 percent of the total populations in the eighteen development areas were sampled (Table 1). Informal interviews were held with ward heads, village heads and officials of Non-Governmental Organizations.

Observations were employed side by side with interviews and discussions which covered issues such as indigenous adaptations, agricultural and other land use practices, water use, soil erosion sites, settlement pattern and sand dune locations. Aerial photographs of the development areas obtained from NEAZDP for 1990s and 2000s were used to determine the differences in the proportion of the area accumulation of sand dunes, bare grounds; water bodies and vegetation cover (Figures 1 and 2). These results were computed and validated at the Regional Centre for Remote Sensing (RCRS) Jos.

RESULTS AND DISCUSSION

The Agricultural extension agent in the study area has encouraged the local farmers to adopt agro forestry farming system as a coping strategy. Agro-forestry is a collective term for land use practices that involve a deliberate growing of woody perennials in the same piece of land used for the production of agricultural crops and/or animals. The major type of agro-forestry practiced in the study area is agro-silvicultural practices which combines arable crop production with forestry, aimed to attain ecological stability while at the same time provide sustainable benefits such as windbreaks, tress and shrubs for sand dune stabilization and fuel wood, as well as improved income (Figure 3). The environment in the study area imposes very hash climatic challenges to sustainable dry land management for the farmers.

Table 1: Population in the sampled villages

Development Area	Population in clustered villages	Male	Female	Total household	Sampled household	Percentage
Balle	11,635	63	58	2327	116	4.98
Bulanguwa	11,034	54	56	2297	110	4.78
Dagona	10,277	56	51	2055	102	4.96
Dapchi	70,034	45	30	1406	80	5.68
Degeltura	7,882	44	39	1576	78	4.94
Dumburi	10,022	55	50	2004	100	4.99
Futchimiran	4,209	21	26	841	52	6.18
Gumsa	5,147	25	30	1029	61	5.92
Gwio kura	16,377	86	82	3275	163	4.97
Gorgoram	9,046	45	50	1809	100	5.52
Kanama	6,889	34	37	1377	69	5.01
Karasuwa	5,049	25	30	1009	60	5.94
Kaska	13,747	68	70	2749	137	4.98
Machina	13,081	65	70	2616	130	4.96
Muguram	10,905	58	54	2181	119	5.46
Yunusari	8,822	44	49	1764	95	5.39
Yusufari	11,089	56	61	2218	111	5.00
Wachakal	8,140	46	41	1628	96	5.90
Total	170,385	895	884	34077	1779	5.22

Source: *National Population Commission (2001)*

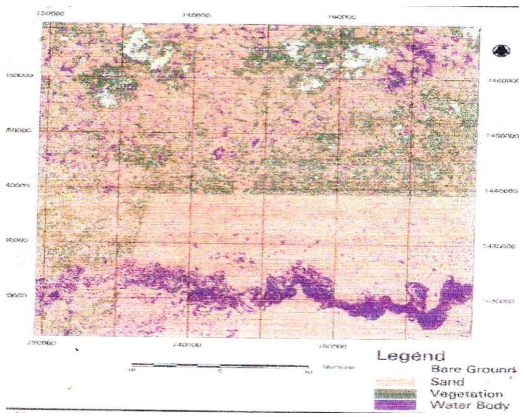

Figure 1: Classified LANDSAT MSS Gashua Area (1978)

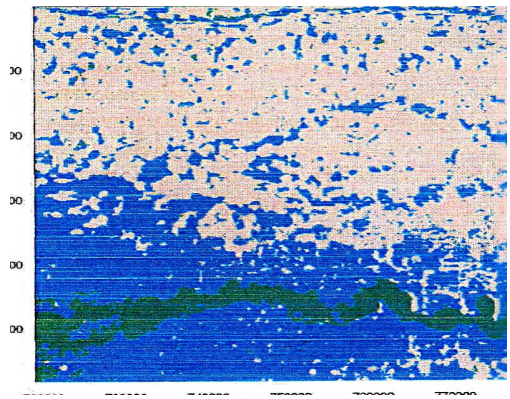

Figure 2: Classified MODIS IMAGE of Gashua Area (2002)

Figure 3: Agro-forestry practice in Yobe State, Nigeria

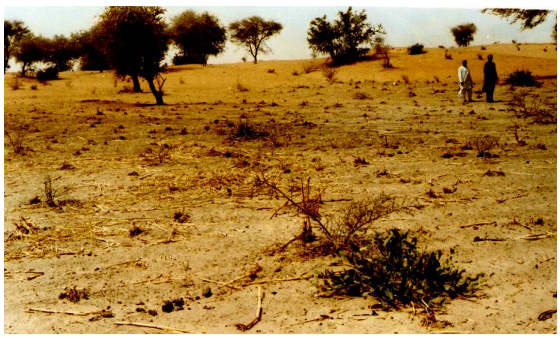

Figure 4: Scattered tree plantings in Yobe State, Nigeria

In order to overcome these constraints, the respondents select only tree species that can adapt to the environment, while at the same time produce goods, services and amenities needed by the local people. Some of these tree species include *Acacia senegal, Acasia seyal, Prosopis chilensis, Euphobium blasinifera* and *Azadiratcha indica* (Table 2).

Table 2: Anti-desertification plants use for desertification control in Yobe State, Nigeria

Scientific Name	Vernacular Name
***Amaranthus* spp.**	amaranth
Annona cherimola	cherimoya
Annona muricata	guanabana, soursop, graviola
Asimina triloba	*Asimina*
Cleome gynandra	African cabbage, cat's whiskers
Dacryodes edulis	safou or butter fruit
Ipomoea batatas	sweet potato
Irvingia gabonensis	Dika tree
Moringa oleifera	Moringa
Oxytenanthera abyssinica	drought-resistant bamboo
Prosopis cineraria	*Prosopis*
Simmondsia chinensis	jojoba
Solanum scabrum	African nightshade
Strychnos spinosa	monkey orange

It was observed that some villages in Balle, Kaska and Wachakal use various methods of agro forestry such as; Windbreak plantings (Figure 3) to protect agricultural crops and pastures against wind desiccation, and minimize soil erosion by wind; Inter-plantings with agricultural crops to protect the crops, enrich the soil, and provide wood and specialty (non-wood) products. Scattered plantings (Figure 4) to enrich soils, provide wood, shade, fodder and browse, and specialty products, and afford thermal protection for livestock.

The trees serve as sources of fuel wood, poles and post for building purposes; they are also important sources of fodder for livestock and act as soil stabilization. Tress and shrubs are used as buffer system to protect waterways, roads and settlements. The use of fadama areas for agricultural production is common.

Fadama in Hausa language means the land which is flooded during the rainy season. In environmental usage, however, the word fadama refers to all relatively flat areas either in streamlines depressions or adjacent to streams/rivers. The fadama is a "wetland" due to its characteristic moisture retention within or very close to the rhizosphere for greater part of the year is relatively high (Figure 5). The fadama in the study area is mainly used for farming, both rain-fed and irrigated, due to its sustainability and water availability.

Coping With Soil and Wind Erosion: The local populations have developed techniques of controlling soil erosion using their own local technology which is inexpensive and simple. One of these methods is contour farming which is planting or cultivation across the slope (Figure 6). This slows down runoff on the surface and hence forces water to infiltrate in to the soil. Farmers particularly those from Geidam and Bursari Development Areas have also successfully used the woven sticks (Figure 7) as barrier against wind erosion and to initiate terrace formation. In this practice, stakes preferably of sprouting species, are driven into the ground along the contour at intervals of about 0.5 – I m, green branches are then interwoven between the stakes. The use of compost, farm yard manure (FYM) and fertilizer also play an important role in wind erosion control. Compost and FYM have a dual advantage of reducing wind erosion when spread on loose sandy soils, their nature help to prevent the soil from being picked by wind and providing nutrients to crops thus enhancing crop growth.

Preventive methods include regulations to ensure rational use of the vegetation growing on sand. For example, in Kulala**,** Machina Development Area, the utilization of vegetation on loose sand is restricted by the village vigilante group. In Saaka, cattle grazing are prohibited as well as the removal of trees, shrubs and herbaceous vegetation growing on sand dunes.

It is now clear that desertification lead to various population responses which translate to coping strategies. Four main responses have been identified. These are responses comprises of special, economic system change, resource use and adjustments. The space change responses involve settlement abandonment owing to sand dune invasion and resettlements in new locations. The spatial response is through livelihood change. This involves change in people's occupation, for example, from fishing to rain fed and irrigated agriculture and trading. The prominent response is out–migration (Table 3), in addition to response that relates to adjustments towards optimization of resource use and land management. These indigenous desertification coping strategies have contributed significantly to anti desertification measures and natural resource conservation, pointing to the need for the empowerment of the rural population for environmental conservation.

Table 3: Migration per 1000 population in 2002

Development Area	In-Migration	Out-migration
Balle	12	150
Bulaanguwa	54	56
Dagona	13	59
Dapchi	30	40
Degeltura	10	6
Dumburi	40	60
Futchimiram	9	38
Gumsa	8	36
Gwio Kura	81	82
Gorgoram	6	37
Karasuma	25	44
Karasuwa	3	123
Kaska	76	61
Machina	11	140
Muguram	53	56
Yunusari	36	52
Yusufari	43	67
Wachakal	48	52
Total	558	1154

Conclusion: This study has examined how the process of desertification and environmental change resulted in diverse demographic responses. Desertification led to population and livestock demand pressure on the land and vegetation, resulting in an increase in sand dunes, decline in vegetation cover, and reduction in water body. Population responses have been found to be diverse.

Most of the responses are reflected in reduction in the scale of environmental based economic activities and productivity, flight from the study area, village relocation and increased rural urban migrations.

Figure 5: Fadama farming site in Yobe State, Nigeria

Figure 6: Ploughing across the slope in a farm in Yobe State, Nigeria

Figure 7: Woven sticks around home in Yobe State, Nigeria

The adjustive responses have been demonstrated in the development of indigenous adaptation and strategies to cope with environmental change. There has been some refashioning of new livelihoods in a changing environment. The lands that were used previously for cultivation are being depleted; rich soils are gradually being converted into less

fertile soils. Since moisture stress is an important variable in Yobe environmental system, many of the adaptation strategies are geared towards more efficient utilization of the available moisture. The result has highlighted the imperatives of indigenous environmental management knowledge in arid land management. The study has also provided a framework for developing a better understanding of the nexus between the environmental changes, population response and environmental policy and management.

Solutions to desertification must be aimed to increase the amount of food production in the area in concomitance with farm practices that must encourage environmental stabilization. Government must be all round committed to fight desertification and gain the participation of the local population. The key area to be given priority is massive tree planting exercise. This calls for more fund allocation to both State and Federal Forestry Departments in Nigeria. The aim should be a long term sustainable participatory environmental resources management programme. The goal should be partnership with the local stakeholders for massive reforestation programme, leading to improved environmental management capacity. There is the need for the tapping of underground water for domestic and irrigational purposes. Fadama areas should be protected with trees to avoid drying up of the catchment areas.

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