Constraints to Agricultural Productivity in Kainji Lake National Park, Nigeria

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Original Research Article

ABSTRACT

The aim of this research article was to evaluate the constraints to agricultural productivity in Kainji Lake National Park (KLNP). This research was carried out between the months of January to December, 2011. There were five districts in Kainji Lake National Park in which three communities were selected from each district using simple randomised sampling technique. A total of 600 structured questionnaires were used for this study of which 40 copies were administered in each of the 15 villages sampled in the study area. The retrieved data were analysed using both descriptive and inferential statistics, stepwise multiple regression was also adopted to identify the contribution of agricultural constraints to the total food production in the study area. The results showed that the year class of 11-15 years had the highest duration of farmland cultivation of 35.8%, while the least farmland cultivation duration was class 20 years and above with 4.6% (Table 2). The size of randomly selected farmlands in the villages in all the districts revealed that the farm sizes less than

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1 acre had the highest usage of 30.5%, while the farm sizes with the least usage was above 5 acres with 16.44% (Table 3). Maize and Guinea corn were the most commonly cultivated crop, while Millet and Vegetables were the least cultivated crops in the study area (Table 4). The regression analysis of the constraints indicated that high cost of human labour had the highest regression coefficient (R^2) of 0.82, followed by the high cost of transportation with (R^2) 0.80, inadequate extension services had (R^2) of 0.78, lack of funds and credit facilities had 0.72 R^2 value, lack of modern farming equipment had R^2 value of 0.60. While poor marketing had the least R^2 value of 0.58. There were high levels of agricultural constraint in Kainji Lake National Park with commensurate negative effect on the survival of the surrounding communities. Hence, it was recommended that, modern farming equipment should be provided at subsidised rates by the government to encourage agricultural productivity among the farmers in the study area. Government should also construct better roads to ease transportation and movement of farm produces to the market centres. An urgent intervention is required to improve the livelihood of these communities to avoid over-exploitation and adverse impacts on conservation and sustainable management of Kainji Lake National Park.

Keywords: Agriculture productivity; agricultural constraint; conflict; degradation.

1. INTRODUCTION

Agriculture occupies more than one-third of the World's land area and it is the leading cause of habitat destruction on a global basis, be it on traditional/ small scale commercial systems. Malthus theory, in 1826 [1] says that the size and growth of the population depends on the food supply and agricultural methods. But Boserup's theory opposes this by saying that the agricultural methods depend on the size of the population. Malthus states that in times when food is not sufficient for everyone, the extra people will have to die. However, Boserup [2] states that in time of pressure, people will find ways to increase the production of food by increasing workforce, machinery and fertilisers among others.

Human demographic growth has caused an increased demand for natural resources [3]. In Africa, most people depend directly on these resources for their livelihood. In Nigeria like many other developing countries, the majority of population depends on agriculture for food, personal needs and income [4]. The relationship between agricultural practices and the environment has been relatively stable and favourable, but it has in recent times been disturbed by anthropogenic forces, leading to severe environmental degradation. This varies from country to country and Nigeria is not an exception. The quest to feed the ever increasing human population resulted in the expansion and advancement of agricultural systems to meet the demand of human race. Sekitoleko [5] reported that all agricultural activity upsets the natural ecosystem and the extent to which it is disturbed depends on the nature, intensity and duration of such activity. She further described the activities in categories, which are land/soil degradation, drainage, over harvesting and burning of wetlands, pollution of water bodies, land and air, overfishing and encroachment of protected area. However, agricultural practices and food production are unavoidably receded by some constraints which are impediment to agricultural development in the world especially in developing countries. Constraint refers to a reduction on the degree of freedom of the elements of a system exerted by some collection of elements. It can also be defined as a limitation on the variability of change in the kind of such elements [6].

Conflict between agriculture and environment quality is a challenge to mankind for survival. Conflicts may also arise when people who traditionally use natural resources around them are either controlled or forbidden on such resources [7]. Biodiversity conflict according to O' Leary and Bingham [8] occur when there are fundamental and ongoing differences amongst parties concerning value and behaviour as they relate to the environment. In addition, conflicts are situations where people deliberately, with or without knowledge of the consequences of their actions destroy biodiversity, particularly when they perceived a positive impact on their livelihood [9,10]. For instance, decision to establish a park where cultivation and grazing is prohibited requires removal of some people who used these lands.

Yoram and Heinrich, [11] reported that about one-third of vertebrates have suffered either

extinction or a drastic reduction in population because of human activities, whether hunting, agricultural practices, urban industrial development or poisoning. Although hunting was the main cause of several species extinction, habitat destruction has also been responsible for the disappearance of large numbers of species. The major natural resources, which include land, water, associated soil, plants and animals are of great importance to man. Most of the food comes from plants grown on the land or from animals, which themselves live by eating plants. Therefore, man's survival depends on agriculture, and food production is limited by some constraints as evident in Kainji Lake National Park communities. Natural areas which shelter ethnic groups dependent on hunting, fishing, and food gathering preserve the heritage of human wisdom derived from a long association with nature, such as the use of wild plants and animals for medicinal purposes.

There is a high level of agricultural constraints in the Kainji Lake National Park which has resulted in negative effect on the survival of the surrounding communities. Hence, this research was targeted at enumerating the types and levels of constraints to agricultural productivity in the Kainji Lake National Park.

2. MATERIALS AND METHODS

Data was obtained from both primary and secondary sources. The primary data was collected with the use of questionnaires and field observation method (Diaw et al., 2002). While, the secondary data collected was the villages' population data which was obtained from National Population Commission, Abuja, Nigeria. The study area (KLNP) has a total population of about 59,823 (Table 1) as compiled by the Global Environmental Facility (GEF) World Bank assisted projects in June 2009.

2.1 The Administration of Questionnaires

A total of six hundred structured questionnaires were administered in all the five districts. Forty questionnaires were administered at each of the three villages in each district, Five districts were examined totalling fifteen villages in all. (40 questionnaires × 3 villages × 5 districts = 600 questionnaires) to determine the demographic characteristics and duration of cultivation of farmlands in each districts. (Table 2) [12].

Table 1. Population of selected villages in the five districts of Kainji Lake National Park, Nigeria

District	Villages	Population
Wawa	Gada Olli	10,050
	Sabon Kadi	5,000
	Leshibe	2,500
Babanna	Kubli	6,000
	Kwasure	4,000
	Garuji	693
Zugurma	Patiko	4,000
	Muliya	3,500
	Faje	4,200
Kemeji	Tenebu	3,000
	Nanu shugaba	6,000
	Bezira	2,800
Dekala	Gulbi	2,000
	Benya	3,580
	Bezhi	2,500
Total		**59,823**

Source: Global Environmental Facility (GEF) World Bank Assisted Project. Zone Communities as at 26th June, 2009. [13]

2.2 Field Observation

The size of randomly selected farmlands in three villages from each of the five districts were measured (Below 1 acre, 1 – 2 acres, 2.5 - 5 acres and above 5 acres) Table 3. The types of crops cultivated were also observed (Plate 1 and 2).Simple Randomized Sampling technique was employed in selecting the villages from each district. Three communities were sampled from each district. Data obtained were analysed using both descriptive and inferential statistics.

Stepwise multiple regression analysis method was adopted to identify the contribution of agricultural constraints to total food production in the study area [14]. For this study, our dependent variable Y is the total acreage cultivated and total food production in tonnes, while the independent variables 1 - 6 are the constraints. Thus, it was expressed statistically as follows:

$$Y = a + b_1X_1 + b_2X_2 \ldots\ldots b_n X_n + e$$

Where

Y = acre
a = Intercept
b_1, b_n = parameter estimates
e = standard error
X_1 = Lack of modern farming equipments
X_2 = poor marketing

X_3 = High cost of human labour
X_4 = Inadequate extension services
X_5 = Lack of funds / credit facilities
X_6 = High cost of transportation

3. RESULTS

3.1 Duration of Cultivation of Farmland

The duration of cultivation of the farmlands was determined from the questionnaires administered. Table 2 showed that 20.1% of the respondents spend less than five years on their farmland, while 33.0% have been cultivating these farmlands between 5-10 years and 35.8% between 11-15 years respectively. Similarly, 6.4% of the respondents have been cultivating their farmlands between 16-20 years, while 4.6% of the respondents have been cultivating their farmlands for over 20 years.

3.2 Size of Farmlands in the Communities

Farmland size was used as a proxy to measure agricultural productivity as often considered in Africa following the methods used by Mamudu [15], Bhandari, [16] and Thapa [17]. The size of farmlands which was determined by measurement revealed that, in the five districts and across all the communities farmlands less than 1 acre in size had the highest of 30.5%, Farm sizes between 1 - 2 acre had 26.7%, 2.1 - 5 acres farmlands had 26.3%, while farmlands with 5 acres and above had the least of 16.44% (Table 3).

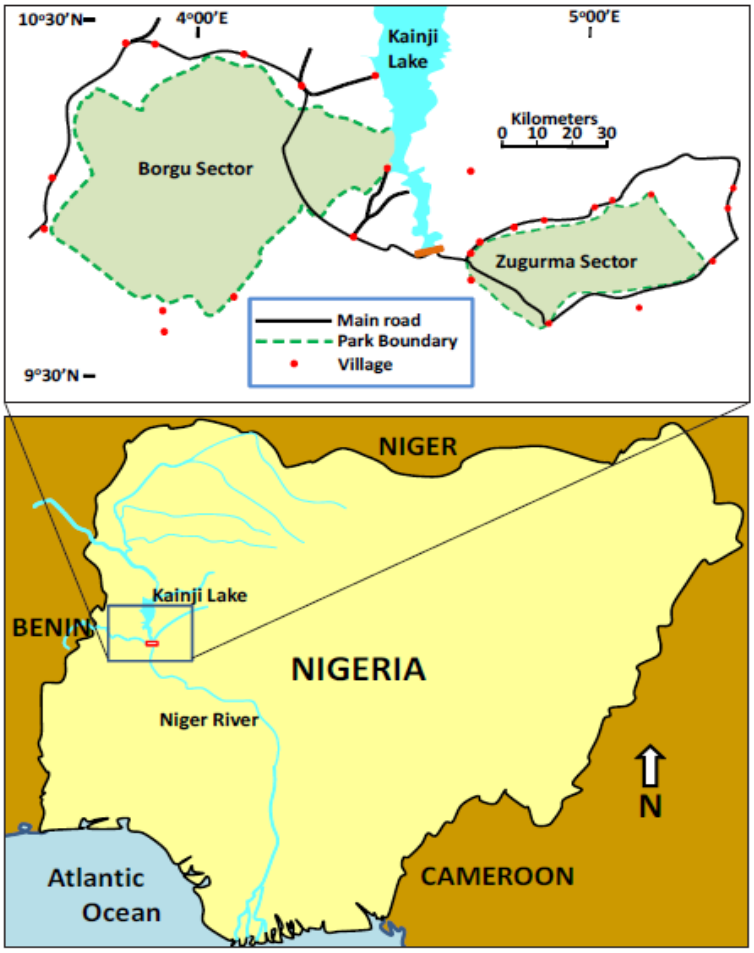

Plate 1. Map showing Kainji Lake National Park, Nigeria
Source: Amusa et al. [18]

Table 2. Duration of cultivation on farmland

Districts	Villages	Below 5 yrs	5 – 10 years	11 – 15 years	16 – 20	Above 20
Wawa	Gada Oli	8	6	12	3	1
	Sabon kadi	4	16	8	5	0
	Leshibe	2	14	6	2	3
Babanna	Kubli	6	12	8	2	1
	Kwasure	8	14	10	0	3
	Garuji	0	10	16	1	1
Zugurma	Patiko	2	16	12	0	1
	Muliya	4	8	16	3	2
	Faje	8	8	10	1	2
Kemije	Tenebu	10	6	12	3	0
	Nanu Shugaba	8	6	2	1	0
	Bezira	0	8	12	1	0
Deakala	Gulbi	6	12	8	4	2
	Benya	14	6	16	0	1
	Bezhi	8	2	10	2	3
Total		88 (20.1%)	144 (33.%)	156 (35.8%)	28 (6.4%)	20 (4.6%)

Source: Field Data, 2011.

Table 3. Size of farmland in the study area (Acre)

Districts	Villages	Size in Acres			
		Less than 1	1 - 2	2.1 – 5	Above 5
Wawa	Gada Oli	2	3	5	1
	Sabon kadi	3	4	3	2
	Leshibe	6	2	4	1
Babanna	Kubli	4	5	3	3
	Kwasure	3	2	4	2
	Garuji	7	6	4	3
Zugurma	Patiko	4	4	1	2
	Muliya	5	5	5	3
	Faje	3	3	4	4
Kemije	Tenebu	6	5	3	3
	Nanu Shugaba	5	4	4	2
	Bezira	4	3	6	3
Deakala	Gulbi	2	2	4	1
	Benya	5	6	3	3
	Bezhi	6	3	3	2
Total		**65**	**57**	**56**	**35**
Total (%)		**30.50**	**26.76**	**26.30**	**16.44**

Source: Field Data, 2011

3.3 Crops Cultivated in the Study Area

The crops cultivated at the study area as unveiled by the field observation revealed that Maize and Guinea corn were commonly cultivated in all the districts. While, Millet and Vegetable crops were less cultivated in the study area. Other crops which were cultivated at the study area include yam, cassava and groundnut (Table 4, Plates 1 and 2).

3.4 Stepwise Multiple Regression Results of the Agricultural Constraints in Kainji Lake National Park

The stepwise multiple regression analysis was used to measure the contribution of each constraint to the variation in the total agricultural productivity in the study area (Table 5). The multiple regression models showed a strong positive relationship among the variables tested.

It was observed from the regression table that, high cost of human labour (X_3) had the highest multiple regression coefficients (R^2) of 0.82 and the most severe constraint to increased food production. This was followed by high cost of transportation (X_6) with (R^2) of 0.8, inadequate extension services (X_4) with (R^2) 0.78, lack of funds/ credit facilities (X_5) with 0.72 (R^2), lack of modern equipments (X_1) with (R^2) of 0.64 and poor marketing (X_2) with the coefficient of determination (R^2) of 0.58 respectively. The positive parameter estimates observed were lack of funds, inadequate extension services and high cost of transportation which revealed that, they contributed to the dependent variable. While, the negative parameter estimates observed were poor marketing and high cost of human labour.

4. DISCUSSION

Agriculture provides basic economic activities in and around the study area. Agricultural constraints in Kainji Lake National Park have a profound impact on the survival of the communities located in the five districts of the park. Farmers in Africa enjoyed mixed cropping system of farming as a number of advantages are derived in the practice like increase farm yield, better labour utilisation and erosion control as evident in the study area Evidence suggested that, the duration of cultivation of farmland varied considerably in the sampled communities as it had a positive relationship with crop production which agreed with the findings of Olawepo [14] in a research that determined the rural farmers income in Nigeria. Newell, [19] also affirmed positive relationship between the duration of farmland cultivation, farm size and agricultural productivity in Gujarat as observed in Kainji Lake National Park communities. The farm size had also being used as proxy to measure agricultural productivity in Africa [15]. Since, research results revealed that farm size often determine the level of productivity. Bhandari [16] attested that, there was a positive relationship between farm size and productivity in his study of mass production of agricultural crops in Nepal. However, this was in contrary to the findings of Sen (1966), who obse1rved an inverse relationship between farm size and output per hectare in Indian agricuw`q `lture. Nevertheless, the largest population of farmers cultivated lands less than one acre, while the least percentage of the population cultivated on lands above five acres. This may be attributed to lack of modern farming equipment and high cost of human labour in the sampled communities; which also agreed with the findings of Olawepo [14].

The prevalent constraint to agricultural productivity in KLNP was high cost of human labour due to sole dependence on human labour to carry out all the farming operations. High cost of transportation to urban centres also had a profound impact on agricultural productivity due to lack of good access road to ease transportation and movement of farm produces and products to market centres.

Table 4. Types of crops grown in the study area

Districts	Villages	Crop specialization
Kwawa	Gada Oli Sabon kadi Leshibe	Guinea-corn, Groundnut, Rice, Maize and Cowpea
Babanna	Kubli Kwasure Garuji	Yam, Maize, Guinea-corn, Cassava, Groundnut and Vegetables
Zugurma	Patiko Muliya Faje	Yam. Guinea-corn, Cowpea, Maize, Groundnut and Cassava
Kemeji	Tenebu Nanu-Shugaba Bezira	Cotton, Rice, Maize, Guinea-corn, Groundnut and Cassava
Dakala	Gulbi Benya Bezhi	Guinea-corn, Millet, Maize, Yam, Cowpea and Cassava

Source: Field Data, 2011

Plate 2. Mixed cropping cultivation

Plate 3. Millet cultivation

Table 5. Stepwise Multiple Regression Analysis for the Agricultural Constraints in Kainji Lake National Park

Agricultural Constraints	Parameter estimates	Standard Error	R	R^2	% Change	% Cummulative
Modern farming equipment	0.03	0.01	0.87	0.64	-	64
Poor Marketing	-3.21	0.41	0.65	0.58	-6	58
High cost of human labour	-2.92	1.02	0.90	0.82	24	82
Inadequate extension services	1.54	2.21	0.86	0.78	-4	78
Lack of funds/ credit facilities	3.09	1.29	0.77	0.72	-6	72
High cost of transport to urban centres	2.11	1.63	0.89	0.80	8	80

Source: Field Data, 2011

5. CONCLUSION

The impacts of constraints to agricultural productivity has a profound effect on farmers within Kainji Lake National Park (KLNP), with a high cost of human labour having the most significant impact and poor marketing being the least constraint to agricultural productivity in the study area. These problems and lack of funds and access to credit facilities ranked high in receding increase food productivity in the communities. Hence, concerted effort should be expended and focus on strategies that shall include the followings:

Please mention ref [20] inside the text

- Modern farming equipment should be provided at subsidised rates by the government to encourage agricultural productivity among the farmers in the study area.
- Provision of short and long time loans for the farmers in the communities to combat the problem of insufficient funds.
- Farmers co-operative society should be established in order to encourage better marketing of the agricultural products
- Government should construct better roads to ease transportation and movement of farm produces to the market centres.
- Creation of awareness by extension officers on improved agricultural practices should be encouraged.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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