Direct RESEARCH JOURNALS

Effects of land degradation on maize-based farm resource productivity in Oyo state, Nigeria

Direct Research Journal of Agriculture and Food Science (DRJAFS) Vol.2 (1), pp.8-12,January 2014
Available online at directresearchpublisher.org/drjafs
ISSN 2354-4147 ©2014 Direct Research Journals Publisher

Research Paper

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ABSTRACT

The physical impact of land degradation is reflected in irreversible loss of productive land through erosion; declining soil fertility resulting in reduced crop production; and deforestation resulting in decreased supply of wood. Indirect effects include an increased need for fertilizer and food imports, and weakening of food security since per capita food production has steadily declined over the past few decades.

Key words: Degradation, maize-based farms, Oyo state, productivity and resource.

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Accepted 7 December 2013

INTRODUCTION

Agriculture has long been the most dominant sector in the economics of Sub-Saharan African nations. This is partly because the food it provides is the basis for human existence. However, it is paradoxical to note that as population grows, the food need of nations increases, but the arable land needed to grow the food becomes scarcer, hence, the persistent stagnation in agricultural production, which has now become a matter of serious concern (Oyekale, 2004).

In Nigeria, the issues of sustainable agriculture include the problems of soil vis-à-vis human included soil degradation, bush burning and soil compaction (FAO, 2000). The problem of resources degradation has been identified as the most crucial environmental challenges that face the nation (World Bank, 1990). This conclusion was reached based on its economic significance, the wide area of land that is affected, and the large number of people whose economic activities are directly hampered. Specifically, the problem of land degradation affects about 50 million Nigerians and an estimated annual cost of US $ 3 billion is to be borne by the Federal Government. However, this conservative estimate only reflects the cost of food replacement through importation without considering the cost of health hazards that could likely result (World Bank, 1990).

Meanwhile, sustainable food production as a recent policy objective in Nigeria is far from being realized. Poor agricultural production has led to decline in the level of welfare among rural and urban households. As food prices increase, poverty and malnutrition problems widen in dimensions (Oyekale, 2004).

The objective of this study is to analyze the land resource degradation and its impact on maize-based farms productivity in Oyo State of Nigeria. This was carried out by estimating resource productivity and identifying socio-economic characteristics of the farmers in the study area.

METHODOLOGY

The study was carried out in Ogbomoso, Oyo State, Nigeria. Ogbomoso is located on latitude 8^0 7'N and longitude 4^0 15'E with a land area of 3457.84 square meters occupied by a population of 657,417 people (NPC, 2006). The vegetation is purely derived Savanna. The rainfall pattern is bimodal and annual rainfall amount is relatively moderate, which is between 1000mm and 1400mm. The dry season starts from November to February when the dry dust laden wind blows from the Sahara desert. The area has a temperature range of between 21.3^0C and 31.9^0C. The soil type is sandy loam, which supports the growth of food crops and tree crops some of which are cassava, maize, yam, cowpea, melon, sorghum, groundnut, vegetables, mango and cashew. Primary data were collected with the aid of a carefully designed and well-structured questionnaire. A multi-stage sampling technique was employed in the selection of the respondents. The first stage was the random selection of the zone from the Agricultural Development Project (ADP) zones.

The second stage involved random selection of three local government areas from the selected zone. The third stage was random selection of two villages from each local government area selected and the last stage was random selection of twenty-five households from each village making a total of 150. However, 125 (83.33%) were retrieved and used for the analysis.

Marginal Physical Productivity (MPP) and Average Physical Productivity (APP)

The MPP is calculated thus:

$$MPP = b_n \, x \frac{Q}{X_n}$$

Where: MPP = Marginal physical product
$b_n = b_1; b_2; b_3; b_4$
Q=Mean of the maize output in the study area
X_n=Mean of each of the farm inputs used i.e. $X_1; X_2; X_3; X_4$

Likewise, the APP is calculated thus:

$$APP_n = \frac{Q}{X_n}$$

Where Q = $(b_0 X_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4})$ = Total maize output
$Xn = X_1; X_2; X_3; X_4$

RESULTS AND DISCUSSION

Socio-Economic characteristics

Age of the Respondents

The age of an individual, to some extent, determines his or her output. About half (50.4 percent) of the farmers were between the age ranges of 21-50 years. This range represents active work force as revealed by the average technical efficiency given in Table 1. Interestingly 49.6 percent of the farmers were between age of 51 years and above.

This could be due to the rural-urban migration of the young and the middle-aged. Consequentially old farmers are facing energy constraints and they are less productive then younger which is in accordance with data presented by Olomola (1998). The average technical efficiency was inversely related to age, as age increases efficiency in relation to physical strength decreases.

Sex of the Respondents

The sex of an individual farmer is a very important factor in his/her productivity and since it is expected that an adult male should be stronger than his female counterpart, the male would be more effective in agricultural activities than the female. About 88 percent of the farmers interviewed were male, which is contrary to the finding (maybe is better a reformulation of the sentence) of Ajayi (1995) that most operation in agriculture is carried out by women. Also, it is revealed that the male farmers were more technically efficient (0.89) than their female counterparts (0.68) Table 1.

Marital Status of the Respondents

Marital status influences the productivity of a farmer, as a married man would be more committed to his work than the single considering the dependant(s) on him. However, the result shows that the single (3 percent of the respondents) were more technically efficient with an average of 90.5 per cent than the married (97 percent of the respondents) whose average technical efficiency was 74.9 percent. The reason adduced for this is that there were older farmers among the married than the singles hence the lesser efficiency.

Household Size of the Respondents

Household size largely determines the supply of family labour to the farms. It is shown that 85.6 percent of the farmers were having a household size of the range 5-9 people. However, the average technical efficiency of 84.9 percent recorded for the category of the least household size could be an indication of the quality rather than the quantity of the family labour provided.

Educational level of the Respondents

Education is expected to have significant influence on the rate of adoption of new technology, farm operations and efficiency of resource use. As revealed in Table 1, a larger percentage (64 percent) of the farmers interviewed had no formal education. The implication of this is that the rate of adoption of new technologies may be low, as confirmed by the low average technical efficiency of 67.7 percent recorded for farmers that had no formal

Table 1. Socio-Economic Characteristics of the Respondents.

Age group (years)	Frequency	Percentage
21-30	5	4.0
31-40	27	21.6
41-50	31	24.8
51-60	44	35.2
≥ 61	18	14.4
Sex		
Male	110	88
Female	15	12
Marital status		
Single	4	3.2
Married	121	96.8
Household size		
0-4	5	4
5-9	107	85.6
≥ 10	13	10.4
Educational level		
No Schooling	80	64.0
Primary	30	24.0
Secondary	13	10.4
Tertiary	2	1.6
Farming Experience		
1-19	7	5.6
11-20	34	27.2
21-30	39	31.2
31-40	32	25.6
41-50	13	10.4

Source: Data analysis, 2013.

education as against the 79.4 percent recorded for farmers with tertiary education. This is corroborated by the findings of Amaza (2000) that education enables farmers to acquire and use relevant information more effectively.

Farming Experience of Respondents

Continuous practice of an occupation for a long period presumably makes a person more experienced and more productive in the practice, particularly, in largely illiterate farming communities, farmers learn by doing. About 67.2 percent of the farmers had experience ranging from 21-50 years.

Actually, farming experience as a factor is supposed to have a positive relationship with the productivity of farmers, however, because those that have these many years of farming experience also tend to be the aged, productivity decreases with farming experience after some years (as shown by the lower average technical efficiency of 71.5 percent recorded for experience range 41-50 years as against the 85 percent recorded for experience range 1-10 years).

Level of severity of land degradation

Factors like management, level of land utilization and quality of land can actually cause signs of land degradation to be noticed. In this study, degrees of soil erosion were used to measure extent of land degradation. Therefore, the severity of land degradation in the studied area is presented in Table 2.

The table reveals that 68 percent of the farms had slight land degradation problem, with 5 percent having severe degradation problem while about 15 percent had no sign of degradation at all. As expected the farms with no degradation problem were the most productive with an average technical efficiency of about 94 percent while the farms with severe degradation were the least productive

Table 2. Distribution of farms according to level of land Degradation.

Level of degradation	Frequency	Percentage
No sign	19	15.2
Slight	85	68.0
Moderate	16	12.8
Severe	5	4.0
Total	125	100

Source: Data analysis, 2013.

Table 3. Resource Productivity Estimates

Resources	Elasticity	Average unit	MPP	APP
Farm size (ha)	0.0665	0.629	42.815	643.45
Labour (mandays)	0.0833	32.128	1.049	12.59
Fertilizer (kg)	0.0378	86.200	0.178	4.69
Planting inputs (kg)	0.0038	9.648	0.158	41.94

Source: Data analysis, 2013.

with an average technical efficiency of about 28 percent. This further proves to us the negative impact of degradation on farm productivity as it results in either complete crop lost or reduced crop output.

Resource Productivity

Having estimated the elasticity of output with respect to the physical inputs, it becomes necessary to evaluate the resource-use productivities. This is done by estimating the marginal and average physical productivities of the conventional inputs used by the farmers. On the average, Table 3 shows the level of resource-use produce productivity estimates. Table 3 shows that the MPP and APP of farm size is estimated to be 42.815 and 643.45 respectively. Therefore, the MPP estimated shows that if the farm size is increased by 1 hectare, crop output would increase by 42.815kg, but on the average, a hectare of farmland contributes 643.45kg of crop output. The comparison of MPP and APP of farm size shows that APP is higher than MPP, therefore, the production process is at stage II with respect to farm size, and thus land input (farm size) is experiencing diminishing returns to scale. Also, the MPP and APP of labour are 1.049 and 12.59 respectively. This implies that if the labour used is increased by 10 mandays the crop output would increase by 10.49kg, but on the average, a manday of labour contributes 12.59kg of crop output. The APP of labour being higher than its MPP indicates that the production process is at stage II with respect to labour. Furthermore, the Table 3 shows that the MPPs of fertilizer (0.178) and planting inputs (0.158) are low, which implies that any marginal increase in each of the two inputs would have a negligible effect on the output level. This further confirms the fact that in areas with land degradation problem more fertilizer is required to boost the farm productivity and the productivity of planting inputs reduces, under same condition. However, the APPs of the two show that on the average, a kilogram of fertilizer contributes 4.69kg of crop output, while a kilogram of the planting inputs contributes 41.94kg of crop output, and the production process is at stage II with respect to both fertilizer and planting inputs.

Conclusion and Recommendations

The need for materials like fertilizers, agro-chemicals and improved planting materials to be available and affordable to the farmers in the studied areas, is highly imperative. Government should sponsor the researches that will bring technology development for land management such that it will control land degradation, and for this reason extension agents should be motivated for the dissemination of information and the training of the farmers with regards to the development. Introduction of adult education to the farmers will enhance their understanding assimilation rate and rate of adoption of new technologies.

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