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SOCIO-ECONOMIC IMPACTS OF ARABLE FARMING- INDUCED VEGETATION LOSS IN OSUN STATE, NIGERIA.

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ABSTRACT

The study focused mainly on the socio-economic impacts of vegetation loss due to arable farming activities in the two agro-ecological zones: derived savanna (A) and rainforest (B) of Osun State. Through stratified random sampling, 105 open-ended and structured questionnaires were administered on arable farmers (35 in zone A and 70 in zone B). Socioeconomic impacts of vegetation loss were found to follow the same trend in the two zones. Results of students T-test analysis of $P<0.05$ showed that both timber and non-timber forest produce have dwindled significantly in the two zones in the last 15 years. In zone B, vegetation form (physiognomy) remains unchanged since 1989, ($P>0.05$, 0.066, 0.278) when compared to 1999 observations, while in zone A gradual changes were observed ($P<0.05$,0.007, 0.023). The observed causes of this trend include increasing farming population, loss of alternative jobs, national economic decline since 1984, faulty land use planning and practices which have contributed immensely to the progressive extermination of fire tender species especially in the derived savanna zone.

Multiple regression analysis of some socio-economic parameters; household size, educational level of farmers, family members available for farm work, willingness to plant fruit trees, land tenure systems, farmers' population trend, trend of yield of arable crops over time and farming experience of the farmers) on farm size as a function of vegetation loss, show that 25% and 26% of loss of vegetation in zones A and B respectively could be explained by the socio-economic parameters measured. (R^2 =25% and 26% respectively). A combination of all these has negative impacts on fallow period; farm yield; farmers' income; forest product availability and the environment. Adoption of agroforestry will redress several of these adversities.

INTRODUCTION

Throughout history, forests have been a basic support system for society. They have provided goods such as timber, game meat, fodder, medicinal and services such as soil formation and protection, watershed protection and climatic amelioration. McNeely (1994), observed that as humans have developed more sophisticated technology throughout history, the impact they have had on forests have tended to increase the level at which forests are degraded to the long term detriment of the over-exploiting society. Vegetation loss may be described as any act leading to removal or destruction of forest vegetation unaccompanied by deliberate effort at its replacement. The term thus includes not only felling of trees but also removal of shrubs, lianes, and other plants from the forest. At the early stages of civilization however, it was essential to destroy and remove some of the abundant forest in order to pave the way for activities such as arable farming and human settlements which accompanied man's development (Enabor, 1986). Goods and services of the forest play valuable roles in the rural and national economies and are necessary inputs for the survival of the society. Various forest species are the sources of raw materials for many cottage industries that had supplied the income for sustaining rural economies in many parts of the country (Popoola and Maishanu, 1995). Foods obtained from trees and forests make an important direct contribution to family diets, providing tasty and nutritious supplements to otherwise bland staple foods. Popoola and Galaudu (1998) have reported the role of spices in the diet of rural and urban people.

FAO (1989) noted that more important than food provision, forests provide a source of income and employment for many families. Millions of rural people depend on money earned from generating, processing and selling forest products to buy food and other basic necessities. However, adequate and continuous food production need be ensured to meet up with population growth estimated at 3-5% (FAO, 1989), in several developing countries. Agricultural production activities are largely land intensive and

require removal of the vegetation cover of the proposed site or location; particularly under shifting cultivation system. Shifting cultivation is often applied to any fallow-based agricultural practice involving the movement of cultivation site. (Raintree and Warner, 1986). Extensive shifting arable cultivation in essence leads to vegetation loss and land degradation which result in biodiversity loss, low yield, erosion menace, watershed management problems and increase in atmospheric temperature arising from increased green house gases. These can only be ameliorated by green vegetation. Continuous and unguarded devegetation as a result of arable farming activities through shifting cultivation results in Wildlife habitat destruction, which in effect disrupts the forest ecosystem. Boserup (1981) observed that as population increases in an area fields are simply cropped more frequently, leading to a shortening of the fallow period.

Akinola (1995) observed that occurrence of derived savanna vegetation in the southern part of Nigeria has been attributed to continuous cultivation and with annual bush burning where fire tender species have been progressively eliminated. These problems are associated with traditional shifting cultivation and land rotation systems. Forestry Management, Evaluation and Coordinating Unit (FORMECU) (1999) confirms that by 1998, the total land area of natural forest types and areas within forest reserves had shrunk to a mere 46,542.14 Km^2. Yet the demand for fertile land and forest products continue to rise. The main objective of is paper is to therefore, assess the social and economic impacts of vegetation loss arising from arable farming on the inhabitants of the study site and other adjoining areas. The results and recommendations are expected to be applicable in similar agro-ecological situations.

DATA COLLECTION AND ANALYSES

Study site

Osun State is located within longitude 07^0 and 8^0N and latitude 04^0 30' and 6^0 in the Southwestern part of Nigeria (Fig. 1). The State was carved out of the Old Oyo State in August 1991. It is largely covered by secondary forest. In the northern part, forest-savanna mosaic predominates, (Filani and Olabode 1993). According to the 1991 population census, the State has a population of 2.2 million inhabitants (2,203,016). The land area covers 9,396Km^2 with a population density of 234/Km^2. Major occupation of the population is farming, both of export and food crops. Off-farm activities include artisanship, trading and local politics. Arable farming in the state engages the natives and considerable migrant labour force.

Five main towns were selected randomly (Ejigbo in the derived savanna zone; Iwo in the transition zone; Ile-Ife, Ikire and Ilesa in the rainforest zone). The localities are described below:

a. Ejigbo (Derived savanna zone): The town lines approximately on 07^0 30'N and $O4^0$ 30'E in what used to be the rainforest zone of Western Nigeria. Today the vegetation is largely made up of stretches of woodlands and guinea savanna, the aftermath of annual bush burning. It has an undulating terrain, rising in the highest places to an altitude of about 1,200ft above the sea level and a rocky subterranean in some places.

b. Iwo (Transition zone): It lies within 7.38^0N and 4.11^0E. This is a rich agricultural area; about 41 percent of the people are farmers. It was formerly a typical rainforest location but currently sharing both the rainforest features in one area and the derived savanna in some parts. It is presently in the state transition zone of the state.

c. Ile-Ife: The vegetation is that of tropical rainforest and lies on longitude 40. 69^0E and latitude 07 50^0N. The climate is typically tropical.

d. Ikire: - Lies within the rain forest area of Osun State on longitude 40.20^0 E and latitude 07.30^0N within the basin of the river Osun.

e. Ilesa: Located approximately 07.38^0N and 4.38^0E. It lies within the rain forest zone.

Data were obtained from arable crop farmers with the aid of structured and open-ended questionnaires. A total of 105 respondents were sampled in the two agroecological zones as presented in Table 1. In each of the locations 10 percent of the total number of contact farmers of the State Agricultural Develompent Programme were interviewed. Data from the questionnaires were analysed using descriptive statistics, the student t-test (for comparison of forest products availability within and between the two agroecological zones). Chi-square (X^2) was used for the test of independence of willingness to plant agroforestry trees and land tenure system, while multiple regression analysis was used to observe the effect of some selected socio-economic variables on vegetation loss. The test hypotheses are:

- There have been no remarkable changes in vegetation form between 1984 and 1999 in the study area.
- Vegetation loss impact in the derived savanna zone (A) is not different from that of the rainforest zone (B) in the State.
- Farmers in Osun State are not keen on practising multiple land use.
- There is no vegetation loss in Osun State.

- Loss of vegetation is not induced by arable farming activities.

RESULTS

For over two decades now, farming population has been on the increase. Table 2 below shows that 74.29 percent of the respondents in zone A and 64.29 percent in zone B have observed increase in farming population. This they attributed to high unemployment rates in the society and the depressed economy in Nigeria over the mentioned period. This is obvious in Table 3 where unemployment accounts for 61.54 percent and 55.56 percent in zones A and B respectively.

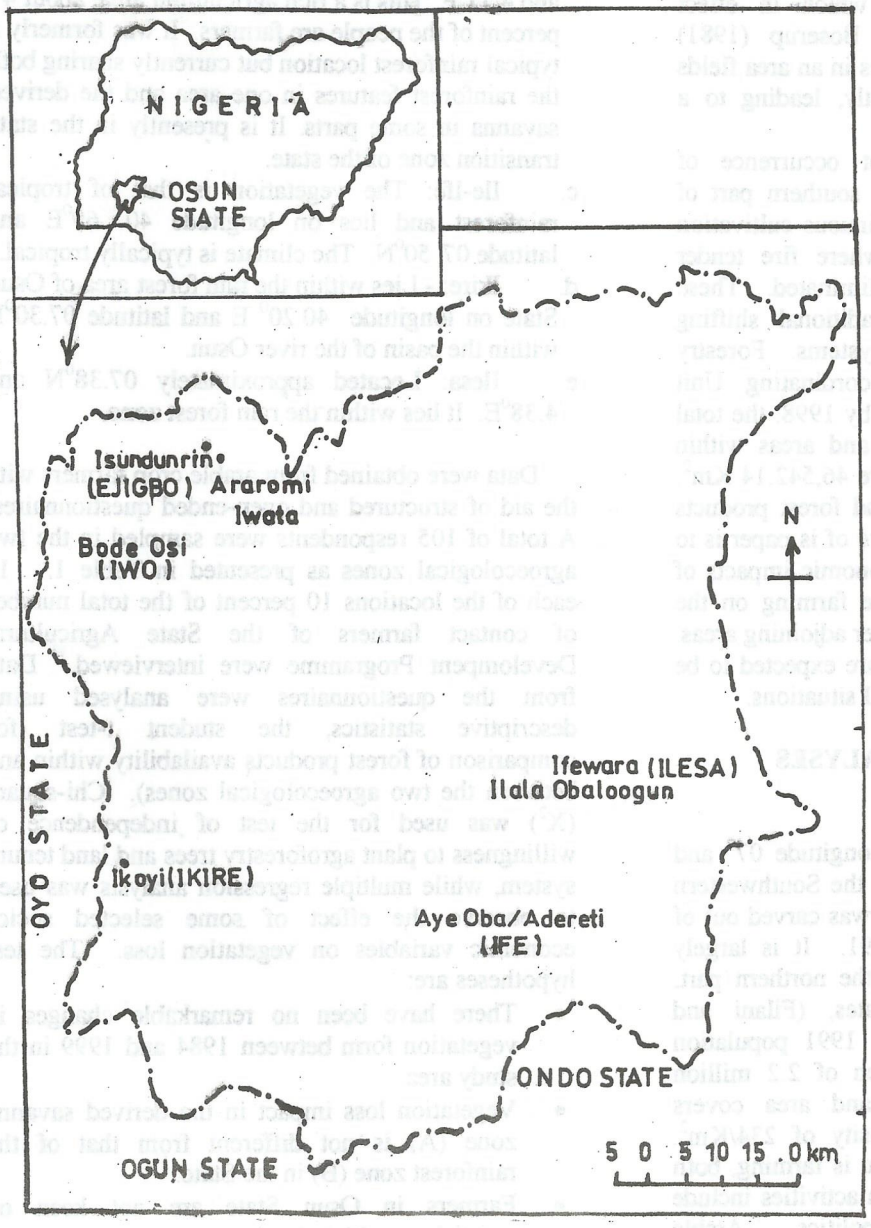

Figure 1: Map of Osun State showing the study locations.

Table 1: Questionnaire Distribution in the Study Area.

Zone A Selected Communities	Local Govt. Area	No. of Distributed Questionnaires	Zone B Selected Communities	Local Govt. Area	No. of Distributed Questionnaires
Bode Osi	Ola-Oluwa	15	Ikoyi-Ile, Ajeigbe, Asejire	Isokan	16
Araromi-Iwata	Ejigbo	15	Ifewara	Atakumosa	16
Isundunrin	Ejigbo	5	Aye-Oba Adereti	Ife South	23
			Obalaayan, Ilala-Oba-loogun	Ife-East	15
Total		35			70

Source: Field Survey, 1999.

Table 2: Farming Population Trends (1984-1999)

	Zone A		Zone B	
Response	Frequency	%	Frequency	%
Increasing	26	74.29	45	64.29
Decreasing	8	22.88	22	31.43
Can't Say	1	2.86	3	4.29
Total	35	100.00	70	100.00

Source: Field Survey; 1999.

Table 3: Reasons for Increase in farming population

Reasons	Zone A Freq.	%	Zone B Freq.	%
(1) Unemployment	16	61.54	25	55.56
(2) General Population increase	2	7.69	3	6.67
(3) Increase from farm proceeds	3	11.54	4	8.89
(4) Depressed economy	4	15.39	12	26.67
(5) Can't say	1	3.89	1	2.22
Total	26	100.00	45	100.00

Source: Field Survey, 1999.

Changes in Vegetation Forms Over Time

Based on the farmers' knowledge and observations on the trend of vegetation forms, i.e. forest vegetation availability in their immediate environments over time, changes in vegetation forms were analysed using the Student T-test. This showed that before 1984 there were remarkable differences in the vegetation forms compared to what obtained in 1999. This is shown in Table 4 below where $P=0.009<0.05$. This implies that the alternative hypothesis (H_a) is upheld. The farmers were however, willing to plant agroforestry trees on their farmlands. This was expressed by 74.29 percent of the farmers (Zones A and B) as shown Table 7. The farmers were willing to pay for tree Seeds/Seedlings. This is indicated by 65.17 percent and 71.43 percent of the responding farmers in zones A and B respectively.

Table 5 also shows that there were noticeable changes in vegetation forms in zone A, ($P<0.05$ in all the tests).

The slash and burn, and ridging method of land preparation always result in loss of vegetation. The

fire tender species were gradually and eventually exterminated over the years as farming intensity increased. The soil seed banks of the tree species were destroyed through annual burning thereby presenting a very difficult situation for the trees re-establishing themselves.

Forest Resources Availability

T-test results show that forest resources were declining over the years. These are expressed in Table 6. There are significant differences in the forest resources availability in the area ($P<0.05$). Timber, firewood, medicinal plants, ropes and leaves, forest fruits and wildlife all witnessed significant decline, howbeit in varying magnitudes.

Table 4: Comparison of Vegetation Forms within Zone B 1984-1999

Period	t-cal	t-tab	df	P	Decision
Before 1984-1999	-2.72	1.676	48	0.009	$P<0.05$, Reject H_0
Between 1989 and 1999	1.88	1.672	55	0.066	$P>0.05$, Accept H_0
Between 1994 and 1999	1.09	1.671	63	0.278	$P>0.05$, Accept H_0

Source: Field Survey, 1999.

Table 5: Comparison of Vegetation Forms within Zone A (1984-1999)

Period	t-cal	t-tab	df	p	Decision
Before 1984-1999	-3.87	1.753	15	0.002	$P<0.05$, Reject H_0
Between 1989 and 1999	3.11	1.746	16	0.007	$P<0.05$, Reject H_0
Between 1994 and 1999	-2.40	1.697	30	0.023	$P<0.05$, Reject H_0

Source: Field Survey, 1999

Table 6: Comparison of forest resources availability between 1984 and 1999.

	Zone A				Zone B			
Resources	t-cal	t-tab	P-value	df	t-cal	t-tab	P-value	df
(1) Timber	5.05	1.691	0.000	34	10.53	1.667	0.000	68
(2) Firewood	5.11	1.691	0.000	34	6.88	1.667	0.000	69
(3) Medicinal Plants	2.95	1.691	0.006	34	3.57	1.667	0.001	69
(4) Ropes & Leaves	8.10	1.691	0.000	34	12.29	1.667	0.000	67
(5) Forest Fruits	3.88	1.691	0.000	34	8.41	1.667	0.000	67
(6) Wildlife	10.75	1.692	0.000	33	11.82	1.667	0.000	69

Sources: Field Survey, 1999.

Table 7: Willingness to plant Agroforestry trees and to pay for Seeds/Seedlings by farmers

	Willingness to plant Agro forestry Trees				Willingness to Pay for seed/seedlings			
	Zone A		Zone B		Zone A		Zone B	
Response	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Willing	26	74.29	52	74.29	23	65.17	50	71.43
Not Willing	9	25.71	18	25.71	12	34.29	20	28.57
Total	35	100.00	70	100.00	35	100.00	70	100.00

Source: Field Survey, 1999.

The Chi-square (X^2) test of independence was used to analyse the dependence of willingness of the responding farmers to plant Agroforestry trees on land tenure system. The result showed that willingness to plant agroforestry trees does not significantly depend on land tenure system. In zone A; X^2 cal = 3.589, X^2 tab=8.41 while in zone B; X^2 cal = 0.164, X^2 tab = 3.841. From the above the calculated values were less than tabulated values; hence the result is not significant i.e. the willingness to pay/plant agroforestry trees is not in any way dependent on land tenure system.

Socio-economic factors of Vegetation loss:

The socio-economic parameters considered were as follows:

X_1 = Household Size
X_2 = Educational level of farmers
X_3 = Respondents' farming experience (years)
X_4 = Land tenure system
X_5 = Family members available for farm labour
X_6 = Willingness of farmers to plant Aforestry trees
X_7 = Yield of arable crops
X_8 = Trends of farming population

The above parameters were analysed using multiple regression analysis. Farm sizes of the farmers were used as a function of vegetation loss. Three regression functions were used (linear, semi-log and double log). In zone A the semi-log function had the best performance i.e. co-efficient of determination R^2 = 25.87%, while the linear function was chosen as the lead function for zone B with the Coefficient of determination R^2 = 26.27%. The results of analysis of variance (regression) of the socio-economic factors in zone A is Fcal = 0.3739 > 0.05 at P = 0.0.05 (Table 8). Fcal = 0.3739 < Ftab = 1.1347. However, in zone B the analysis of variance results in the socio-economic factors considered show that Fcal = 0.125 <0.05 at P=0.05 (Table 8). Fcal = 0.0125<Ftab = 2.7177.

Table 8: Analysis of variance of Socio-economic factors in Zones A and B

Zone A

	df	Sum of Squares (SS)	Mean Square (MS)
Regression	8	97.869	12.233
Residual	26	280.316	10.781
F = 1.1347		Sig. F = 0.3739	R^2 = 0.2587

Zone B

	df	Sum of Squares (SS)	Mean Square (MS)
Regression	8	339.55021	42.44378
Residual	61	952.87726	15.62094
F = 2.717711		Sig. F = 0.0125	R^2 = 0.26272

The regression models for zones A and B were as follows:

Zone A: $Y_{(VL)} = 5.89 + 1.2\log X_1 + 2.18\log X_2 - 1.88\log X_3 + 0.36\log X_4 + 1.05\log X_5 + 2.23\log X_6 + 0.68\log X_7 - 2.24\log X_8$

Zone B: $Y_{(VL)} = 2.94 + 0.06X_1 + 0.95X_2 - 0.07X_3 + 1.5X_4 + 0.46X_5 - 1.56X_6 + 1.43X_7 - 0.03X_8$

DISCUSSIONS

From the above results it would appear that socio-economic parameters do not significantly influence vegetation loss in zone A since Fcal > P0.05<Ftab. In zone B the variance analysis of the socio-economic parameters show that the parameters contributed significantly to vegetation loss Fcal <P=0.05<Ftab. Of all the parameters measured in zone B only two (X_3 = Farming experience and X_5 = family members available for farm labour) significant contributed to vegetation loss (P=0.05). (Sig. Test for X_3 = 0.321<0.05 and X_5=0.0271<0.05). It is obvious that the slash and burn agriculture is very rampant in the study area as a result of the resource poverty of the farmers. This leads to natural resources degradation. Blaikie and Brookfield (1987) observed that natural resources degradation is a pervasive phenomenon is many third world countries but especially critical in Sub-Saharan Africa (SSA). This is true of the study area and is further compounded by the phenomenal increases in population. The situation therefore, calls for ingenious intervention, the type that will over the long term enhance environmental quality and the resource base on which food production depends.

CONCLUSION

The results obtained from the analysis of data collected from the two agro-ecological zones studied reveal the same trend in the comparison of socio economic impacts of vegetation loss. However, it was established that the arable farmers willingness to plant agro forestry trees is not dependent on land tenure system. In the rainforest zone of Osun State, among the socio economic factors considered, farming experience and family members available for

farm labour are significant to the family farm size. These tend to influence vegetation loss. Annual bush burning should be discouraged while the integration of selected agroforestry trees on arable farmlands in the derived savanna areas of the State should be encouraged. This will help in the improvement and sustainable use of the already degraded savanna vegetation.

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