PRINT: ISSN 0970-9274 ONLINE: 2456-6608
J. Hum. Ecol., 17(2): 109-115 (2005)
DOI: 10.31901/24566608.2005/17.02.04

Between Man and His Environment: Indigenous Knowledge Approaches to Soil Fertility Conservation Amongst Farmers in Ekiti State, Nigeria

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KEYWORDS Sustainable Development. Environment. Ecology. Indigenous Knowledge. Soil Fertility

ABSTRACT The article identified socio-economic and ecological factors influencing the practices of indigenous knowledge systems (IKS) in soil fertility conservation amidst farmers in Ekiti State, Nigeria. It specifically identified the various IKS practices used in conserving soil fertility; identified the reasons why the practices were used; determined the benefits of IKS utilisation in soil fertility conservation; and analysed the socio-economic and ecological factors influencing the use of IKS. The study was conducted using a multi-stage sampling technique to select 250 farmers in 20 communities drawn from the five administrative divisions of the State, namely: Ekiti North; Ekiti West; Ekiti East; Ekiti South; and Ekiti Central. Pre-tested structured and unstructured interview schedules were used to collect information from the respondents. Frequency distribution, percentages, mean and standard deviation were used to describe the data. Correlation and regression analyses were the inferential statistics used. The result of the inferential statistics showed that at $P < 0.01$ and 0.05 levels of significance, there was a positive and significant correlation between IKS utilisation and socio-economic factors such as age (r=0.260), family size (r=0.289), religion (r=0.132), farm size (r=0.180); and income level (r=0.252). Also, there existed a positive and strong association between IKS utilisation and association membership (t=1.769) and farming scope (t=3.741). Conversely, negative but significant relationship existed between IKS utilisation and soil (r= - 0.125), vegetation (r= - 0.409) and education level (r= - 0.177).

INTRODUCTION

The hallmarks of sustainable development are resource management, environmental protection and economic growth. To achieve these objectives, various stakeholders need to understand their environment and take advan-tage of the same for the benefit of mankind. The environment constitutes the totality of man's surrounding. The elements that affect the individual's habitat are enveloped in his immediate environment. "Population pressures and a lack of adequate agricultural technologies, among other factors, are major forces driving the poor to make desperate choices" (Wilson, 2001).

Farmers have, in the course of experimentation, devised various techniques of conserving soil fertility through sustainable approaches. Apart from the fact that the indiscriminate use of inorganic fertilizers could result in environ-mental degradation through soil acidity (Akinyo-soye, 1976; Muller-Samann and Kotschi, 1997), the exorbitant price of the products to the resource-poor farmer (Nwosu, 1994) and the problems associated with procurement tend to discourage their use. To meet up with the demand of the moment, therefore, and in conjunction with the prevailing ecological conditions, most farmers are left with no other alternatives but to seek for ways of overcoming apparent obstacles in conserving soil fertility through local know-ledge approach. "Thus, the underlying principle of land utilisation is to mimic the community ecosystem and therefore capitalize on nature's own superior design for light and nutrient capture, pest control and soil and water conser-vation" (Osunade, 1996). The interest in indi-genous knowledge research is in the seeking of universal characteristics of knowledge systems of providing a mechanism that will respect the contributions of every community to global knowledge and will change attitudes in such a way that nation state will begin to recognize the most important resource they have – the know-ledge generated but ignored by their own citizens (Warren, 1996).

In as much as folks are involved in the development of Indigenous Knowledge Systems (IKS), they need to be studied. Physical and socio-cultural environment which impinge on development are taken into account by IKS. It, therefore, portends that IKS must shift focus from the elements that are used to the people that use them.

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"Thus that complex man who is the main actor manipulating all other variables become the object of study. Give two people the same environment, the chances that they will act differently is very high. Studies in indigenous knowledge, therefore, synthesize the behaviour pattern of man and especially their interactions with their environment through their decision-making process" (Osunade, 1996). "Regardless of the degree to which they have embraced modernity, local people continue to prefer concrete knowledge, which belongs to them in time and space, and which they deem suitable for particular purposes." (Kolawole, 2001).The climatic conditions (such as rainfall, temperature, humidity etc.), soil type, and vegetation constitute the environment of the farmer, and these determine the ecological conditions of where he is located. What then are the socio-economic and ecological factors that influence the use of local knowledge in the conservation of soil fertility in Ekiti State, Nigeria?

Objective of the Paper

The general objective of the article was to identify the socio-economic factors influencing the use of local knowledge in conserving soil fertility in Ekiti State.

The specific objectives were to:

(i) identify the various IKS used in conserving soil fertility in Ekiti State;
(ii) identify reasons for utilising such knowledge systems in Ekiti State;
(iii) determine the benefits of IKS utilisation in soil fertility conservation in Ekiti State; and
(iv) analyse the socio-economic and ecological factors influencing the use of IKS in Ekiti State.

METHODOLOGY

Area of Study: The area covered by the study was Ekiti State in Western Nigeria. The State comprises five major administrative divisions (Ekiti North; Ekiti West; Ekiti East; Ekiti South; and Ekiti Central of Ekiti State) with 16 Local Government Areas (LGAs). These are *Ikole, Oye, Ilejemeje, Moba, Ekiti* East, *Ijero, Ido/Osi, Irepodun/Ifelodun, Ado, Gbonyin, Emure; Ise/Orun, Ikere, Ekiti* South West, *Efon Alaaye* and *Ekiti* West LGAs.

The area lies between latitudes 6°20' and 8°10' North of the equator and between longitudes 4°20' and 5°40' East of the Greenwich Meridian (London). Ekiti State is landlocked and is, therefore, bounded in the North by Kwara and Kogi States; in the West by Osun State; also in the East by Kogi State; and in the South by Ondo State. It has a land area of approximately 10,898.68 square kilometers. Agriculture is the predominant means of livelihood of the people.

Sampling and Sample Size: Ekiti State was purposively selected for the research. A multistage sampling technique was used to sample male and female farmers' opinions in the State. Stratified sampling technique was used to select ten (10) Local Government Areas (LGAs) from the five (5) major divisions. Two (2) communities were randomly chosen from each of the selected LGAs. Also, respondents were randomly sampled from each of the selected communities in proportion to the latters' populations. In all, two hundred and fifty (250) respondents were selected for the research. A set of validated and pre-tested, structured and unstructured interview schedules were developed and used for data collection.

Measurement of Variables: The dependent variable is measured by scoring farmers based on the number of IKS practices used by them in conserving soil fertility.

A field pre-survey exercise conducted before the commencement of the actual field survey found six commonest practices (mulching, organic manure application, shifting cultivation, crop rotation, trash burning and bush fallow) amongst farmers in Ekiti State. Each practice was score one (1) point. In all, the maximum score possible was six (6) while the minimum was zero (0).The independent variables analysed were the socio-economic and ecological factors. The religion of the respondent was measured by assigning one (1) point apiece to both Islam and Christianity. However, traditional religion was assigned two (2) points since tradition might favour the use of local knowledge than other religions. To measure fatalism and risk-aversion, farmers were asked to rate their level of agreement with ten (10) attitudinal statements on a Likert scale from one (strongly agree) to five (strongly disagree). For example, respondents were asked to rate their level of agreement with the statements: "There is no amount of effort that could bring about any change in man's destiny" and "I may not get myself involved in any business activity if I'm not too sure of its success". Farm size was measured by assigning points

according to the number of hectares put under cultivation. Age was also assigned points according to the number of years of the respondents, etc.

The ecological factors were measured by topography, rainfall pattern, soil and vegetation. For example, farmers were asked to indicate whether their farmland terrains were either "plain" (assigned 1 point), "undulated" (scored 2 points) and "mountainous" (ascribed 3 points). The maximum score for each respondent was 6 points while the minimum was one. Vegetation was measured by asking farmers whether their farmlands were "appreciably shielded" (assigned 1 point), "mildly shielded" (scored 2 points) and "exposed" (assigned 3 points). A maximum score of 6 points was assigned to a respondent whose farmland fell into the 3 categories while 1 point was scored a farmer whose farmland was "appreciably shielded". Also, farmers were asked to indicate whether the soil in the area/farm was "loam" (*iledu*), "clay" (*odo*), "sand" (*yanri*) or "gravel" (*olokuta/wobowobo*). Loam was assigned 1 point, clay, 2 points, sand, 3 points, and gravel, 4 points. The maximum possible score was 10 points and a minimum of 1 point. To measure rainfall pattern, the maximum score for a farmer who experienced "heavy" rainfall, which was also "well distributed" was 6 points while the minimum score was 1 point for those who experienced "light" rainfall which was "not well distributed".

Data Analysis Procedure: Descriptive statistics such as measures of central dispersion (mean and standard deviation), frequency counts, and percentages were used.

Pearson's correlation (r) analysis was employed to determine the relationship between the dependent variable, Y (IKS utilisation) and independent variables, $X_{1...i}$.

$$r = \frac{\sum_{i=1}^{n} (X_i - \bar{X})(Yi - \bar{Y})}{\left[\sum_{i=1}^{n} (X_i - \bar{X})^2 \sum_{i=1}^{n} (Yi - \bar{Y})^2\right]^{1/2}}$$

Where: r = Correlation co-efficient
X = Independent variables
Y = Dependent variable

The square of correlation co-efficient (r^2) is the coefficient of determination. This gives the percentage variation in the dependent variable (Y) as explained by an independent variable (X) (Koutsoyiannis, 1997; Karmel and Polasek, 1980).

Multiple regression analysis was also used to determine the magnitude of change in the farmer's score of IKS utilization as explained by his socio-economic characteristics and the ecological factors analysed in the study area.

$$Y = B_o + B_1X_1 + B_2X_2 + \ldots\ldots B_KX_K + E$$

Where:
Y = IKS score
B = Constant
X = Independent Variable

RESULT AND DISCUSSION

The major findings are presented under the personal and socio-economic characteristics of farmers (as in Tables 1 and 2) and the ecological factors thus:

Personal and Socio-economic Characteristics of Farmers: The average age of farmers was 51.82 with a standard deviation of 11.92. Analyses in Table 1 revealed that majority (57.6%) of the farmers were in the active ages of 40 and 59 years bracket. Most (95.2%) of the farmers were male while only 4.8% were female. The study also revealed that majority (65.6%) of the respondents was mainly farmers while 34.4% combined farming with artisan (such as carpentry, masonry) and other jobs.

The average size of the family was 7.87 with a standard deviation of 2.73. About 76.8% of the farmers had between 6 and 10 family mem-bers while only 10.8% had above 10 members. Also, the average size of farm labour was 5.50 with a standard deviation of 3.61. About 55.3% of the respondents had between 5 and 9 farm labourers. Only 2.4% had more than 9 labourers. Majority (93.6%) of the respondents were Christians while just 4.4% were Muslims. About 0.4% was assigned to both the traditionalist and the adherents of all of Christianity, Islam and Traditional religion, respectively. The implication was that most farmers might have de-emphasised the use of IKS particularly those that were perceived as magical and not open. Data in Table 2 show that 52.8% had formal education while 15.6% had informal education. Also, 31.6% of the population had no education at all. The average farm size was 2.69 hectares with a standard deviation of 1.87. About 59.2% of the farmers had between 1 and 3.99 hectares of farmland. While about 21.6% had between 4 and 6.99 hectares, about 2.4% had between 7 and 9.99 hectares of farmland. The

Table 1: Percentage distribution of respondents by age, sex, occupation, family size, and farm labour

Variable	*N*	*%*	*N = 250*
Age (years)			
i. up to 39	36	14.8	
ii. 40-49	72	28.8	
iii. 50-59	72	28.8	
iv. 60-69	46	18.4	
v. 70 and above	24	9.6	Mean-51.82
Total	250	100.0	Std. dev. 11.92
Sex			
i. Female	12	4.8	
ii. Male	238	95.2	
Total	250	100.0	
Occupation(s)			
i. Farming	164	65.6	
ii. Farming and others	86	34.4	
Total	250	100.0	
Family Size (Members)			
i. up to 5	31	12.4	
ii. 6-10	92	76.8	
iii. 11 and above	27	10.8	Mean = 7.87
Total	250	100.0	Std.dev.=2.73
Farm Labour			
i. 0-4	104	42.3	Mean = 5.54
ii. 5-9	136	55.3	Std.dev.=3.61
iii. 10 and above	10	2.4	
Total	250	100.0	
Religion			
i. Christianity	234	93.6	
ii. Islam	11	4.4	
iii. Traditional	1	4	
iv. All the 3 above	1	4	
v. None	1	1.2	
Total	250	100.0	

Source: Field Survey, 2000

average score of farmers' risk-aversion tendency was 3.57 with a standard deviation of 0.92.The study revealed that about 96.0% of the farmers were risk-averse. Also, the average score in terms of farmers' fatalism was 2.91 with a standard deviation of 1.20. Most (85.0%) farmers were fatalistic and were, therefore, most likely "to rationlise a lack of effort in the face of threatened catastrophe". The average income of farmers was ₦48, 244.00 per annum with a standard deviation of ₦5, 255.50. Analysis revealed that about 71.6% of the farmers had ₦50, 000.00 and below as income per annum. Only 22.4% had between ₦51, 000.00 and ₦100, 000 per annum.The resource-poor farmers may have preferred IKS to WKS, which in most cases are costlier than the former.

The study also show that about 75.2% belonged to religious groups; 51.6% to age groups; 45.2% to "*esusu*"; 16.8%; and 12.4% belonged to village council; and farmers cooperatives, respectively. Analysis revealed that about 43.2% of the farmers planted both arable and permanent crops. About 25.2% was ascribed apiece for farmers who practised mixed farming and those who engaged in arable crops cultivation only. About 5.6% and 0.8% of the population were those who planted arable crops in addition to animal rearing and those who reared animals alone, respectively. The risk-averse and fatalistic tendencies of the farmers, coupled with their low income level may have engendered the use of IKS.

Ecological Factors: The analysis in Table 3 revealed that most (82.4%) farmers believed their farmlands were plain. Only about 16.4% and 1.2% said their farmlands were mountainous and undulated, respectively. Most (90.4%) farmers perceived rainfall to be heavy in their areas while 6.4% and 3.2% believed rainfall was light and mild, respectively. Also, majority (81.6%) of the farmers had loamy soil type on their farmlands. Only about 9.2%; 7.6%; and 1.6% had part or all of their farmlands being sand; clay; and gravel, respectively. Most (78.8%) farmers had farmlands that were covered by vegetation. In essence, most farmlands might not likely be exposed to agents of soil degradation such as run-off water; wind and intense heat.

Utilisation of Indigenous Knowledge System (IKS): The study indicated that about 64.0% of the farmers utilised between 1 and 2 IKS just as 36.0% utilized between 3 and 4 of the practices identified. The study revealed that about 72.0% utilised trash burning; 58.0%, shifting cultivation; 45.2%, mulching; and 28.0%, crop rotation. Only about 20.4% and 8.0% utilized bush fallow and organic manure application, respectively. Majority (80.0%) of the farmers utilised IKS in conserving the fertility of the soil because they were easy to practise. Also, about 72.0% of the population used IKS because inorganic fertilizers were not easily come by. About 60.0% of the farmers also reported that they utilized IKS because facilities for such practices were always available to them. Most (80.0%) farmers were, however, of the opinion that IKS practices were cheaper than modern methods. It was also believed that IKS practices were economically advantageous (80.0%) and ecologically sound (30.0%).

However, land tenure (48.4%); the destructive nature of trash burning (49.2%); and (the) drudgery associated with mulching (5.6%) were

Table 2:Percentage distribution of respondents by education, farm size, association membership, farming scope, risk aversion, fatalism and income level.

Variable	*N*	*%*	*N = 250*
Education level			
i. Had primary education only	78	31.2	
ii. Had secondary education	39	15.6	
iii. Had post-secondary education	15	6.0	
iv. Had informal education	39	15.6	
v. Had no education at all	79	31.6	
Total	250	100.0	
Farm Size (hectare)			
i. less than 1	42	16.8	
ii. 1-3.99	148	59.2	
iii. 4-6.99	54	21.6	
iv. 7-9.99	6	2.4	M = 2.69
Total	250	100.0	SD = 1.87
Risk Aversion			
i. up to 2.49 (low)	10	4.0	
ii. 2.50 – 4.49 (Average)	130	52.0	M = 3.57
iii. 4.50 and above (high)	110	44.0	SD = 0.92
Total	250	100.0	
Fatalism			
i. up to 2.09 (low)	37	14.8	
ii. 2.10-4.11 (Average)	197	78.8	M = 2.91
iii. 4.12 and above (high)	16	6.4	SD = 1.20
Total	250	100	
Income Level (₦' 000/annum)			
i. up to 50	179	71.6	
ii. 51-100	56	22.4	
iii. Above 100	15	6.0	M = 48,244
Total	250	100.0	SD = 5,255.50
*Association Membership**			
i. Religious organisation	188	75.2	
ii. Group farmers' coop.	31	12.4	
iii. Village council	42	16.8	
iv. Age group	129	51.6	
v. Esusu	113	45.2	
Farming Scope			
i. I engage in arable and perm. crops cultivation and animal rearing	63	25.2	
ii. I engage in arable and perm. crops cultivation	108	43.2	
iii. I engage in arable crops cultivation only	63	25.2	
iv. I engage in perm. crops cultivation only	-	-	
v. I engage in perm. crops cultivation and animal rearing only	2	0.8	
vi. I engage in arable crops cultivation and animal rearing only	14	5.6	
Total	250	100	

*Multiple responses
Source: Field Survey, 2000

the major problems recorded against the identified IKS practices in Ekiti State.

Relationship Between Selected Farmer's Socio-economic Characteristics and the Utilisation of IKS: Data in Table 4 showed that at both $p < 0.01$ and 0.05 levels of significance, age of respondents ($r = 0.260$); family size ($r = 0.289$); religion ($r = 0.132$); farm size ($r = 0.180$); association membership ($r = 0.136$); farming scope ($r = 0.327$); and income level ($r = 0.252$) had positive and significant relationship with the utilisation of IKS. Conversely, education level ($r=-0.177$) had negative but significant relationship with the utilisation of IKS.

The co-efficient of determination (r^2) in Table 4 explained the degree of variation in IKS utilisation, which was attributable to each of the socio-economic characteristics of the respondents. Therefore, age (6.8%), family size (8.4%), religion (1.7%), education (3.1%), farm size (3.2%), association membership (1.8%), farming scope (10.7%) and income level (6.4%) were attributed to the variations in the attitudes of respondents towards IKS utilisation. Multiple correlation coefficient (R) revealed 46.0% relationship between IKS utilization score and all independent (x) variables.

R^2 revealed that education ($t = - 2.224$), association membership ($t = 1.769$) and farming scope ($t = 3.741$) explained 21.2% of the changes or variations in the farmer's IKS utilization.

Relationship Between Ecological Factors and the Utilisation of IKS: Data in Table 5 revealed that soil ($r = - 0.125$) and vegetation ($r = - 0.409$) had negative but significant relationship with the utilisation of IKS at both $p < 0.01$ and 0.05 levels of significance. This is explained on the ground that the higher the fertility of the soil and the better the vegetation cover, the lesser would be the farmer's effort in devising means of improving the soil (e.g. IKS utilisation).The co-efficient of determination (r^2) revealed that 0.8%, 0.5%, 1.6% and 16.7% variations in the farmer's attitude towards IKS utilisation were attributable to topography, rainfall pattern, soil and vegetation, respectively.

Multiple correlation co-efficient (R) showed 42.4% relationship between IKS score and all ecological factors investigated in the study.R^2 revealed that 18.0% of the variations in the farmer's attitude towards IKS utilisation was explained by rainfall pattern ($t =1.977$) and vegetation ($t = - 6.620$).

Table 3: Percentage distributions of respondents by ecological factors such as topography, rainfall pattern, soil and vegetation (N = 250)

Variable	*N*	*%*
Topography (Land Terrain)		
i. Plain	206	82.4
ii. Undulated	3	1.2
iii. Mountainous	41	16.4
Total	250	100.0
Rainfall Pattern (Annual)		
i. Light	16	6.4
ii. Mild	8	3.2
iii. Heavy	226	90.4
Total	250	100.0
Soil (Type)		
i. Loam	204	81.6
ii. Clay	19	7.6
iii. Sand	23	9.2
iv. Gravel	4	1.6
Total	250	100.0
Vegetation		
i. Farmland is appreciably covered	116	46.4
ii. Farmland is mildly covered	81	32.4
iii. Farmland is entirely exposed	53	21.2
Total	250	100.0

Source: Field Survey, 2000

CONCLUSION

The types of IKS utilised in the conservation of soil fertility in the study area were: Mulching, organic manure application, crop rotation, shifting cultivation, trash burning and bush fallow. Most farmers, however, utilised trash burning in soil fertility conservation in Ekiti State, as it was believed to yield the quickest result. Majority of the farmers found most IKS easier to practise just as facilities enabling the use of such IKS were available and that inorganic fertilizers were not easy to come-by. It was generally believed that most IKS practices were cheaper and ecologically sound.

The farmers possessed some characteristics that influenced their inclination towards the utilisation of IKS in the study area. Although the relatively younger ones were not found to be active farmers, most of the population fell within the active age that enabled them carry out farm practices. In addition to this, majority of the farmers were males who by virtue of their biological make-up were emotionally stable and able to withstand the drudgery associated with traditional farming practices. Hence, most farmers in Ekiti State had farming as their sole business while a relatively fewer number combined other

Table 4: Correlation and multiple regression analyses showing linear relationship between IKS utilization score and the socio-economic/demographic characteristics of respondents

Characteristics (X- variables)	*Correlation coefficient(s) (r)*	*Coefficient of determination (r^2)*	*Regression coefficient (b)*	*t-value for Ho*
i. Age	0.260**	0.068	0.077	1.007
ii. Other Occupation(s)	-0.078	0.006	0.072	-1.109
iii. Family size	0.289**	0.084	0.122	1.479
iv. Farm labour	0.115	0.013	0.099	1.389
v. Religion	0.132*	0.017	0.085	1.400
vi. Education	-0.177**	0.031	-0.144	2.224*
vii. Farm size (ha)	0.180*	0.032	-0.006	-0.086
viii. Asso. membership	0.136*	0.018	0.113	1.769*
ix. Farm scope	0.327**	0.107	0.252	3.741**
x. Risk aversion	0.025	0.001	0.081	1.291
xi. Fatalism	0.032	0.001	0.004	-0.060
xii. Income level	0.252**	0.064	0.070	0.910

Source: Field Survey, 2000
t value at $p \leq 0.01 = 2.326$
t value at $p \leq 0.05 = 1.645$
r significant at $p \leq 0.01$ level
r significant at $p \leq 0.05$ level.
R square (R^2) = 0.212, R = 0.460
Number of independent variables = 13
Number of respondents = 250
Critical value of r at $P \leq 0.01 = 0.171$
Critical value of r at $p \leq 0.05 = 0.124$

Table 5: Correlation and multiple regression analyses showing linear relationship between IKS utilization score and ecological factors.

Ecological Factor (X-variables)	*Correlation coefficient (r)*	*Coefficient of determination (r^2)*	*Regression coefficient (b)*	*t-value for Ho*
i. Topography	-0.092	- 0.008	-0.024	-0.389
ii. Rainfall pattern	0.073	0.005	0.117	1.977*
iii Soil	-0.125*	-0.016	0.020	-0.318
iv. Vegetation	-0.409**	-0.167	-0.420	-6.620**

* r is significant at $p \leq 0.05$ level.
** t and *t are significant at $p \leq 0.01$ and 0.05 levels respectively.
R = 0.424
R - square (R^2) = 0.180
Critical value of r at $p \leq 0.05 = 0.124$
t- value at $p \leq 0.01 = 2.326$
t- value at $p \leq 0.05 = 1.645$
** r is significant at $p \leq 0.01$ level
Source: Field Survey, 2000
Number of independent variables = 4
Number of respondents = 250
Critical value of r at $p \leq 0.01 = 0.171$

businesses with farm work. The average family size of these farmers was about 8 members in each household. Some of these members contributed immensely to farm labour.

The respondents also possessed some economic factors, which influenced the utili-sation of IKS. Most farmers had between 5 and 9 labourers with an average farm size of about 2.69 hectares that were mainly put under arable and permanent cropping systems. A substantial percentage of the farmers, however, practised mixed cropping. All this enabled farmers, to a certain extent, practise a range of IKS meant to improve the fertility of the soil.

The farmers also possessed social factors associated with the utilization of IKS. Most of them were Christians. The population of those who had formal education was a little bit above average. Hence, majority was able to read and write both *Yoruba* and English language. Most of them were, however, fatalistic and risk-averse; perhaps due to their low level of education and income level, which average was just ₦48, 244.00 per annum. Almost all the farmers, if not all, belonged to one association or the other which invariably created a suitable environment for social interaction and information exchanges.

Ecological factors found associated with IKS utilisation were topography; rainfall pattern; soil type and vegetation. Most farmlands were found to be plain in the study area; rainfall was heavy, most farmlands were predominantly loamy and substantially covered by vegetation, which prevented the cases of surface run-off, erosion, leaching and evaporation due to excessive heat.

RECOMMENDATIONS

- In order to enable farmers have access to ample land where they could use appropriate measures to enhancing soil fertility conservation, the traditional land tenure system needs be de-emphasised (as in the case of Nigeria's Land Use Act of 1976 which must, however, be redefined and strengthened by the government).
- There is the need for the extension agencies and education department to organise relevant educational programmes for the grassroots farmers. This is to enable them develop better knowledge, skills, and atti-tudes towards improving their local techno-logy for sustainable development.
- Government must ensure the improvement of indigenous soil conservation techniques, and that such approaches are not carelessly suppressed by the Western knowledge systems. Better put, farmers need be encouraged to employ best practices and approaches to conserving the environment and at the same time improve on productivity.
- Government should regulate the activities of grassroots farmers particularly when using practices that are seemingly detrimental to either the environment or the farmer's health (e.g. indiscriminate bush burning should be outlawed).

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