
FARMERS' PERCEPTION OF THE ENVIRONMENT AND THEIR ENVIRONMENTAL PROTECTION PRACTICES: A CASE STUDY OF DUNDAYE DISTRICT IN SOKOTO STATE

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ABSTRACT

A survey was conducted to determine the level of environmental awareness of farmers and strategies they adopt to ensure sustainable natural resource utilization. To achieve the study objectives, 120 farmers were randomly selected from 12 villages within Dundaye District in Wammako Local Government Area of Sokoto State. Questionnaires were used to generate data on socio-economic characteristics of farmers, their extent of awareness of the environment and strategies they adopt to sustain the environment. Descriptive statistics were used to analyse the data. Results of the analysis revealed that farmers were conscious of the environment. A downward trend in erosion hazards and an increase in the amount and duration of rainfall were reported by the farmers. Nevertheless, majority agreed that it is necessary to adopt measures to sustain the environment. Tree planting, application of farmyard manure, mixed cropping, mulching, rainwater harvesting and crop rotation are some of the measures adopted to varying degrees by the farmers to sustain their farming environment. Shortage of tree seedlings, destruction of seedlings by livestock and water shortage, were reported as major constraints to tree planting. Considering the significance of trees in the area, the State Ministry of Forestry and Animal Health and others concerned with forest development in the State have the challenge of making tree seedlings available to farmers in adequate numbers. Additionally, farmers should be assisted to raise their own tree seedlings individually and in groups. Distribution of fencing wires at subsidised rates to farmers should also be considered. Furthermore, water harvesting techniques need to be popularised in the area as a strategy against water shortage and to promote crop production throughout the year.

Keywords: Environment; Degradation; Farmers' Awareness; Tree Planting

INTRODUCTION

It is generally recognised that environmental degradation is largely human in origin (Baba, 2002). One of the most important human activities with direct bearing on the environment is agricultural production. There is a two-way link between agriculture and the environment: the quality of environmental resources determines to a large extent, agricultural productivity, and the manner in which agricultural production is conducted determines the quality and sustainability of the environmental resource base.

Protecting the environment and resource base requires the adoption of environmentally sustainable practices by farmers. The first step towards realising this is farmers' awareness of the nature of their environment. It is only after this that they could adopt strategies that would sustain such environment. Using Dundaye District located in the fragile agro-ecology of Sokoto State as a case study, therefore, this study evaluates the extent of farmers' consciousness of their environment and the strategies they adopt to sustain it.

METHODOLOGY

The study was conducted in Dundaye District in Wammako Local Government Area of Sokoto State. Sokoto State is located within latitudes 12° - 13°58'N and longitudes 4°8' - 6°E. Located on the fringes of the Sahara desert, the environment of the State is fragile indeed. The State experiences a short rainy season (May - September) and a protracted dry season (October - April). Average annual rainfall is about 700mm and a major part of the dry season is characterised by gusty dust-laden winds, which cause severe wind erosion and the concomitant accumulation of sand dunes. The sand dune accumulation has been known to be so severe as to submerge roads and houses in

some parts of the State (Okoro and Ipinjolu, 1990; Akinbami *et al.*, 1996). The mean monthly temperature in the State varies from 13°C in December to 38°C in April and May. The vegetation of the area generally consists of a few scattered trees and grasses, which cover only about 30% of the ground surface (Obobo, 1986). Given these climatic and vegetation characteristics, it is no wonder that NEST (1991) classified the State as "heavily prone to environmental degradation".

The study population consisted of farmers who live in Dundaye District. Twelve villages, namely Takalmawa, Gidan Yaro, Shama, Gidan Ruwa, Zoromawa, Gidan Yunfa, Runjin Yamma, Gidan Aku, Gidan Hamidu, Makera Yamma, Gidan Asarki and Gidan Agoda, were randomly selected for the study. Ten farmers were then randomly selected from each village, giving a total sample size of 120 respondents. Two farmers were, however, dropped due to unreliable responses. Data were collected from the sampled farmers in 1998 using questionnaires in single-visit interviews. Data were collected on socio-economic characteristics of the farmers, their views on the environment and the environmental protection practices they adopt. The data were analysed using descriptive statistics.

RESULTS AND DISCUSSION

Farmers' Awareness of the Environment

To test farmers' consciousness of their environment, they were asked to comment on environmental variables such as trend in rainfall, frequency of drought as well as wind and water erosion. Their responses presented in Table 1 show that they seem to have good understanding of the environment. Majority (61.02% and 50.85%, respectively) observed that rainfall amount and rainfall duration have increased over the years. This view, particularly with respect to rainfall amount, is corroborated by available data from the Geography Department of Usmanu Danfodiyo University which confirms that rainfall amount in the district has indeed maintained an increasing trend in the recent past (Figure 1).

Table 1: Perception of farmers on some environmental variables (n=118)

Variable	Frequency	Percentage
Rainfall amount		
Increasing	72	61.02
Decreasing	25	21.19
Constant	21	17.80
Rainfall duration		
Increasing	60	50.85
Decreasing	24	20.34
Constant	34	28.81
Drought frequency		
Increasing	13	11.02
Decreasing	87	73.73
Constant	18	15.25
Severity of dry winds		
Increasing	29	24.58
Decreasing	60	50.85
Constant	26	22.03
No response	3	2.54
Wind erosion/Sand dunes accumulation		
Yes	78	66.10
No	36	30.51
No response	4	3.39
Water erosion problem		
Yes	67	56.78
No	49	41.53
No response	2	1.69

Source: Survey data, 1998

Majority (nearly 51%) of the farmers also felt that severity of dry winds was decreasing. Only about 25% disclosed that dry winds were becoming more severe. Available evidence (Figure 1) again shows that average wind speed in the area (particularly during the dry months of January – May and November – December) has decreased over the years, which confirms the view of majority of the farmers. Notwithstanding the fact that majority of the farmers observed decreasing dry winds, 66% of them experienced sand dunes accumulation in their farms. This is not surprising considering the sparse vegetation cover, which makes it easy for the gusty winds to remove the topsoil and deposit same elsewhere as sand dunes. Majority (about 57%) also identified water erosion as a problem. This may seem surprising given the low amount of rainfall recorded in the area. But the fact, as pointed out by Agyepong (1984), is that the rains are usually stormy and thus highly erosive. The situation is worsened by the fact that the soils, which are generally light and sandy, are largely unprotected.

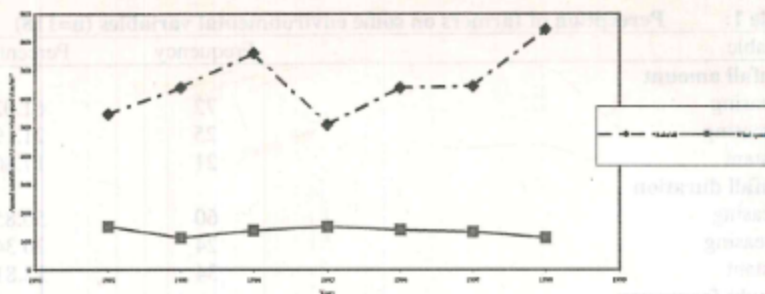


Fig. 1: Annual variation in rainfall and wind speed in Dundaye District of Sokoto State (1992-1998)

* Only the dry months of the year were included in the computation of average wind speed

Source: Data for the graphs are from Usmanu Danfodiyo University Geography Department

Table 1 also shows that a major proportion (74%) of the respondents indicated that drought frequency in the area has decreased. Nevertheless, nearly 97% of them agreed that they had experienced drought in the area in the recent past. An overwhelming majority (92%) identified low crop yield as the most important effect of drought (Table 2). The other effects identified include death of livestock, late maturity of crops and general water shortage.

ENVIRONMENTAL PROTECTION PRACTICES OF THE FARMERS

The distribution of farmers according to the various environmental protection practices adopted is presented in Table 3. The table shows that farmers adopted 10 different practices. The most popular practice among the farmers is manure application to enhance or sustain soil fertility. Since livestock rearing is common among the farmers, they have access to farmyard manure. However, because manure from a farmer's own farm is often inadequate, he has to purchase more. Even then, the farmers complained of inadequate supply of the input. Manure application usually takes place in the few months preceding the commencement of the rainy season.

Table 2: Distribution of farmers according to drought effect (n=118)

Effect	Frequency	Percentage
Low crop yield	109	92.37
Death of livestock	7	5.93
Late crop maturity	1	0.85
Shortage of water	1	0.85
Total	118	100

Source: Survey data, 1998

Table 3: Distribution of farmers according to environmental protection practices adopted (n=118)

Practice	Frequency	Percentage
Manure application	118	100
Mixed cropping	109	92.37
Tree Planting	84	71.19
Tree pruning	89	75.42
Leaving crop residue on farm	73	61.89
Mulching	51	43.22
Inorganic fertilizer application	41	34.75
Rainwater harvesting	24	20.34
Crop rotation	18	15.25
Land fallowing	6	5.08

Source: Survey data, 1998

Table 3 also shows that about 92% of the farmers practised mixed cropping. The crops in the mixtures consist of cereals (particularly millet and sorghum) and legumes (mainly cowpea and groundnut). The most predominant combination is millet/sorghum/cowpea mixture. The presence of legumes in the mixtures is to enhance soil fertility and provide ground cover against erosion.

Tree planting was also practised by majority (about 71%) of the farmers. There was an average of 11 trees per farm. In addition to protecting the soil (as reported by 58% of the respondents), other benefits respondents derived from trees include fuelwood (53%), fruits (30%), animal feeds (25%) and others (Table 4). To capture these benefits, farmers often plant many species on the same farm. Among the species planted, as can be seen in Table 5, are *Azadiracta indica*, *Acacia albida*, *Acacia nilotica*, *Mangifera indica*, *Balanites aegyptiaca*, *Adansonia digitata*, *Moringa oleifera* and *Kaya Senegalensis*. Other tree species planted to a lesser extent are *Tamarindus indica*, *Ziziphus spinacristi*, *Citrus lemon* and *Eucalyptus camadulensis*.

Table 4: Distribution of respondents according to benefits derived from trees (n=118)

Benefit	Frequency	Percentage
Soil protection	69	58.47
Fuelwood	62	52.54
Fruits	35	29.66
Animal feeds	30	25.42
Others	15	12.71

Source: Survey data, 1998

Table 5: Distribution of respondents according to types of trees on the farm (n=118)

Type of tree	Frequency	Percentage
<i>Azadiracta indica</i>	69	58.47
<i>Acacia albida</i>	69	58.47
<i>Acacia nilotica</i>	48	40.68
<i>Mangifera indica</i>	19	16.10
<i>Balanites aegyptiaca</i>	16	13.56
<i>Adansonia digitata</i>	10	8.47
<i>Moringa oleifera</i>	7	5.93
<i>Kaya senegalensis</i>	7	5.93
Others	14	11.86

Source: Survey data, 1998

In spite of the wide acceptance of tree planting in the area, farmers complained of some problems that hinder its practice (Table 6). The most important problem identified

by the farmers is inadequate supply of tree seedlings (30%). The Sokoto State Ministry of Forestry and Animal Health is the main agency responsible for production and distribution of tree seedlings at subsidised rates to farmers. The fact that farmers do not receive adequate seedlings indicates that the seedlings are not produced in sufficient numbers or that the distribution system is faulty or both.

Destruction of planted seedlings by livestock was identified as the next most serious constraint to tree planting. The livestock density in the area is quite high. When crops are harvested, most farmlands are grazed by livestock and the tree seedlings are not spared. Although farmers attempt to protect the seedlings by covering them with woven baskets, these are often not strong enough to withstand disturbance by livestock.

Table 6: Distribution of farmers according to problems encountered in raising tree (n=118)

Problem	Frequency	Percentage
Shortage of seedlings	35	29.66
Destruction by animals	24	20.34
Water shortage	21	17.80
Harsh weather	9	7.63

Source: Survey data, 1998

Some farmers (18%) also identified water shortage as a major problem constraining tree planting. Given the short duration of the rainy season, water usually becomes scarce during the long dry season and trees have to compete with man and livestock for available water. Only farmers who practise rainwater harvesting or whose seedlings are planted close to natural water sources are able to water their seedlings. For most of the other farmers, seedlings hardly survive the protracted dry season. There is little wonder, therefore, that some farmers also reported "harsh weather" as a factor limiting tree planting.

Another environmental protection practice of the farmers, as shown in Table 3, is tree pruning (reported by 75% of the respondents). Rather than cut down trees, farmers prune them, thereby encouraging more vigorous growth of the trees and at the same time obtaining fuelwood from the branches. About 62% of the farmers also indicated that they incorporate crop residue into the soil as an environmental friendly practice. It should be quickly noted, however, that most of the crop residue in the area is removed from the farm to feed livestock or construct fences in the case of millet stalks. Furthermore, even the little left, such as the fallen leaves of legumes, is usually grazed on the farms. Therefore, only minimal quantity of residue goes into the soil.

About 43% of the farmers also indicated that they practise mulching as a means of protecting the soil and crop seedlings while nearly 35% indicated that they applied inorganic fertilizer to sustain soil fertility. Rainwater harvesting was undertaken by only 20% of the farmers. But considering the nature of the environment, widespread adoption of water harvesting would have been a major environmental protection tool. As argued by Baba and Okosun (2001), it could facilitate the adoption of other environmental protection practices including tree planting. Furthermore, properly planned water harvesting could enable the production of some high-value crops all-year-round.

Similarly, only few farmers adopted crop rotation (15%) and land fallowing (5%). The latter alerts us to some danger because it shows that the fragile land resources of the area are now being cultivated more intensively. This could easily lead to land degradation if appropriate environmental protection measures are not taken.

CONCLUSION

The study has shown that farmers have a good understanding of the environment and have over the years evolved certain strategies to sustain the environment, particularly as it relates to sustaining soil fertility and protecting the soil against wind and water erosion. Manure application, mixed cropping and tree planting are the most popular strategies adopted by the farmers. With respect to tree planting, shortage of tree seedlings, destruction of seedlings by livestock and water shortage, were the key obstacles. The challenge for those concerned with environmental protection in the State is to produce sufficient seedlings and put in place an efficient distribution system to ensure that farmers obtain the seedlings easily. In addition, the extension staff of the Ministry of Forestry and Animal Health could assist farmers in raising their own seedlings on individual basis or in community nurseries. Furthermore, to protect seedlings from attack by livestock, there is the need to encourage the production and use of standing baskets that are stronger than what currently obtains in the market. Furthermore, the possibility of distributing fencing wires at subsidised rate along with the seedlings should be considered.

It is striking that water harvesting is not yet a popular environmental protection practice in the area, as revealed by the study. Water harvesting could minimise the problem of water shortage reported by the farmers. It could make more water available in the dry season for domestic use as well as for watering livestock and trees. It could also enable the production of some high value crops even in the dry season at least on a small scale. Efforts should therefore, be made to popularise water harvesting in the area, in view of the obvious advantages associated with the practice.

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