ASSESSMENT OF THE USE OF VETIVER GRASS (Vetiveria zizanioides) IN SHEET EROSION MANAGEMENT IN IMO STATE

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ABSTRACT

The study is aimed at assessing the use of vetiver grass *(Vetiveria zizanioides)* in sheet erosion management by farmers in Imo State, Nigeria. The study examined the conclusions reached by an earlier on – farm trial of the evaluation of the effectiveness and acceptability of using vetiver grass in sheet erosion management. The study arose out of the need to ascertain the current status of the use of the grass in sheet erosion management. Sixty farmers and six Agricultural Development Programme (ADP) officials were selected purposively from the areas where the trial was conducted in Imo State. Two sets of structured questionnaire one for the farmers and the other for the ADP officials and oral interviews were used in gathering data. Descriptive statistics and t-test were used in analyzing and presenting the data. The study revealed that some socioeconomic characteristics like farm size, sex, and income affected the farmers' use of vetiver grass in sheet erosion management in the study area The study showed that vetiver grass is not available for use by farmers in the study area to check sheet erosion. It also revealed that majority of the farmers (53%) do not know whether the grass is effective or not because they do not use the grass. Forty – five percent of the farmers said the grass is effective but their answer was based on the information given to them by the extension agents not that they have tried it out themselves. Two percent of the farmers reported that the grass was very effective. This category seems to be among the farmers that took part in the earlier trial but the study revealed that they too are not using the grass in sheet erosion control probably because it is not available or due to the cost involved in adopting it. This points to the low adoption rate of the use of the grass. The study revealed that the cost of adoption of vetiver is relatively high side since it costs a farmer about thirteen thousand naira to establish the grass on a one hectare plot of land using 10cm spacing. More so, the study showed that majority of the farmers did not accept the use of the grass due to its non-availability. It is concluded that vetiver grass is not available for use by the farmers to check sheet erosion in the study area. Recommendations are made for improving effectiveness.

INTRODUCTION

Vetiver (*Vetiveria zizanioides*) is a fast growing perennial grass that grows up to a meter or more. According to Van Den Berg *et al* (undated) Vetiver grass technology in its commonest form, is the establishment of a narrow (less than I meter wide) live stiff grass barrier, in the form of a hedge across the slope of a land. It grows in a wide range of areas from high lands to low lands in various soil conditions. It appears in a dense clump and grows fast through tillering. The clump diameter is about 30cm and the height is 50-150cm. The leaves are erect and rather stiff with 75cm of length and 8mm of width. It is a very useful grass.

The removal of this thin layer of quality top soil in a uniform way by rain drop splash, or water run off is called sheet erosion (www.neon.net.au/community/environment). Sheet erosion is soil movement from rain drop splash resulting in the break down of soil surface structure and surface run off. It occurs rather uniformly over the slope and may go un-noticed until most of the productive top soil has been lost (www.Omafra.gov.on.ca/english/engineer/facts). This brings about the loss of available nutrients and organic matter in the soil and thereby affects the productivity of the land.

The Nigerian Government estimated that more than 90 percent of the land area was suffering from sheet, rill and gully erosion (www.oxfam.org.uk). Areas seriously affected include Nanka, Agulu, Oko all in Anambra State, some parts of Abia, Imo and Enugu States. According to the Imo Agricultural Development programme (ADP) (2006), some of the areas mostly affected by sheet erosion in Imo

State include Umuhu Okabia in Orsu LGA, some parts of Owerri and Ezinnachi, Umu-Okpara, Amuro etc in Okigwe LGA.

According to Adegunde *et al* (2006), study has shown that soil erosion is one of the prominent natural disasters that has negatively affected people, their property and environment such as land, farms, crops, income etc. Majority of land in rural Nigeria is used for Agriculture and most people depend on the environment for their livelihoods. Soil erosion remains the world's biggest environmental problem. At present, it is the single most important environmental degradation problem in the developing world (Ananda and Herath, 2003). Soil erosion may pose a serious threat to food production and rural (as well as urban) livelihoods particularly in poor and densely populated areas of the developing world. Significant in this is that when soil gives away its fertility, human beings loose their fundamental living source they rely on. The ultimate effect is poor yields and thus food insecurity, low incomes and communities pushed to the brink of poverty and this kinds of poverty have been classified into physiological deprivation and income poverty. This is why soil erosion has been identified as the direct cause of environmental deterioration and poverty in many parts of the world (Adegunde *et al* 2006).

Problem Statement

In an on- farm evaluation of the effectiveness and acceptability of using vetiver grass to check sheet erosion management in Imo State, Ibe *et al* (2000) found that vetiver grass was very effective. The study reported that farmers accepted the use of the grass in erosion control

but its availability was not empirically addressed. It also reported that farmers complained that the grass may harbour pest like grass-cutters which attack cassava farms. Farmers may then incur more costs since timely weed control and maintenance are needed (www.vetiver.com/ag/ags).

Eight years on, the need arises to asses the findings of the trial by assessing the current status of this practice in the areas where the trial was conducted. This assessment involved looking at the farmers socio economic characteristics, farmers perception of the grass in terms of its, effectiveness, acceptability, availability and cost of use of vetiver grass in sheet erosion management.

Objectives of The Study

The broad objective is to assess the use of vetiver grass in sheet erosion management in Imo State. The specific objectives are to:

i.   describe socio-economic characteristics of farmers in the study area;

ii.   evaluate the acceptability effectiveness and availability of the use of vetiver grass in sheet erosion management as perceived by the farmers;

iii.   determine the cost of the use of vetiver grass in sheet erosion management;

iv.   make policy recommendation.

METHODOLOGY

Study Area

The study was conducted in Imo State, which is one of the states in eastern Nigeria. Imo State is made up of twenty-seven Local Government Areas. These Local Governments are divided into three major agricultural Zones namely:- Owerri, Okigwe and Orlu.

Imo State is located between latitude 5° and 6° N and longitude 7° and 8° E (Forest Resources Study Nigeria 1999). It is bordered by Anambra State in the North, River State in the South and Abia State in the East. According to the Ministry of Lands (1992), the total Land area of Imo State is 5067.20km^2. According to the Forest Resources Study Nigeria (1999), the climate of Imo State is tropical with well defined wet and dry seasons during which mean temperatures reach 22^oc and 33^oc respectively. The seasons are associated with the prevalence of the moist maritime South Westerly monsoon from the Atlantic Ocean in the wet season and the dry continental North Easterly hamattan from the Sahara Desert in the dry season. Mean annual rainfall is 2000mm. The beginning of the rainy season is often marked by afternoon's thunder storms, accompanied by heavy showers, tailing off in prolonged steady drizzle. Imo State is situated in humid zone with humidity ranging between 51% and 84%. The lowest daily values of relative humidity are recorded in the early afternoon, while the highest values are recorded in the early morning hours.

According to the Forest Resources Study Nigeria (1999), the relief is a flat, lying gently undulating except for a North – trending

ridge that extends from Owerri to Awka. Elevations range from approximately 50m in the Niger River flood plain in the Western part of the State, to almost 300m at the Northern Corner of Imo State. Elevations approach 300m. Three water sheds can be found within Imo State. The largest water shed is that of the Imo River, which drains most of the eastern and Southern Imo State. The North and Western parts of Imo State are drained by the Niger River. One main tributary, the Orashi River, can be found in Western Imo State where it flows South wards, parallel to the Niger River. The flood plain between the Orashi and Niger River (immediately to the West of Imo State) is poorly drained and covered with forested fresh water swamp (Forest Resources Study Nigeria 1999).

Sampling Technique

The selection of respondents was based on the purposive sampling technique so as to select the farmers and the ADP officials responsible for agro forestry in the areas where the trial was conducted. These included Umuhu Okabia in Orsu LGA of Orlu Agricultural Zone, Ishiuzo Egbu in Owerri North LGA of Owerri Agricultural Zone and Umuokpara Okigwe in Okigwe LGA of OKigwe Agricultural Zone.

The sample size was 66 which included 60 farmers and 6 ADP officials. 20 farmers and 2 ADP officials each were selected.

Method Of Data Collection

Data was collected through primary and secondary sources. The primary data was collected from the use of questionnaire while the secondary sources included information from agricultural journals,

text books, publications from Ministry of Agriculture, Agricultural Development programme (ADP) etc.

Data Analysis

Statistical tools were employed in this study, which included descriptive statistics such as frequency distributions, mean and percentages.Specifically, objectives I, ii, iii, iv and v were achieved using percentages and frequency distributions.

RESULTS/DISCUSSION

Socio-Economic Characteristics of the Farmers.

Socio-economic characteristics of the farmers discussed include sex, level of education, annual income, years of farming experience, farm size, annual income from farm and non-farm sources and types of crop grown.

Sex

The frequency distribution of the respondents according to sex is presented in Table 1. The table shows that a total of 63% of the farmers were females while 37% of the farmers were males. It can then be concluded that more women engage in farming than men in the study area. These women are also involved in labour demanding daily domestic and child care tasks. This affects the use of Vetiver Grass in Sheet erosion control because Vetiver Grass technology has been identified as a labour intensive technology linked to the cost of labour due to its weed control and maintenance practices (www.Vetivernetinternational.blog-system).

Table 1 Frequency distribution of the respondents according to sex.

Sex	Frequency of farmers	Percentage %
Male	22	37
Female	38	63
Total	**60**	**100**

Source: Field survey 2008.

Years of Farming Experience

Table 2 shows the frequency distribution of the respondents according to years of farming experience.

Table 1 shows that 2% of the farmers have up to 30 years of farming experience while majority of the respondents (40%) have up to 10 years farming experience. This tends to show that people are loosing interest in farming and this apathy shown by men and women towards agriculture is a clear indication that the present farmers may have no successors (Asawalam and Chukwu 2000) and this may constrain the adoption of a new technology like the use of Vetiver Grass in sheet erosion control.

Table 2   Frequency distribution of the respondents according to farming experience.

Range (years)	Frequency of farmers	Percentage %
1-5	11	18
6-10	24	40
11-15	16	27
16-20	6	10
21-25	2	3
26-30	1	2
Total	**60**	**100**

Source: Field Survey 2008.

Educational Level of Respondents

Frequency distribution of respondents according to educational level is presented in Table 3. This shows that 38% of the respondents had only primary school education, 30% of them had secondary education, those with tertiary education were just 15% whereas those with no formal education were 17%.

With 83% of the respondents having formal education, the use of such technology package as vetiver grass in sheet erosion management may not be constrained by lack of formal education.

Table 3   Frequency distribution of respondents according to educational level.

Level of education	Frequency of farmers	Percentage
No formal education	10	17
Primary	23	38
Secondary	18	30
Tertiary	9	15
Total	**60**	**100**

Source: Field Survey 2008.

Total Farm Size of Respondents.

Table 4 Shows the frequency distribution of the respondents according to farm size. It shows that only 25% of the farmers have farm size of 3ha and above while the majority of the farmers (38%) have farm size of 1-2 ha. This shows that majority of the farmers cultivate on small piece of land. This finding is consistent with Uma (1989), who stated that structure of land holding has become dualistic with a few large and many very small farms. The small land holdings has lead to faulty adoption or reluctance to adoption of some technologies that have long run benefits e.g. use of contour hedgerows (Alimba and Akubuilo 2000).

Table 4   Frequency distribution of respondents according to farm size.

Farm size (ha)	Frequency of farmers	Percentage %
<1	22	37
1-2	23	38
3 and above	15	25
Total	**60**	**100**

Source: Field survey 2008.

Annual Income From Farming and Non- Farming Activities.

The Frequency distribution of the farmers according to their annual income from farm and non-farm activities is presented in Table 5.

This shows that majority of the farmers (50% and 33%) earned below 100,000 naira per year (annually) from their farm and non-farm activities respectively. This also shows that farmers earn a little income from both their farm and non-farm activities in the study area, and only few farmers can save enough from their meager earnings to take full advantage of the ever increasing range of improved technologies(NAERLS,1992) of which the use of Vetiver Grass is one.

Table 5   Frequency distribution of respondents according to annual farm and non-Farm Income.

Income in thousand (N)	Farm Income frequency of farmers	Percentage %	Non farm income frequency of farmers	Percentage %
Below 100	30	50	20	33
100-290	15	25	19	32
300-490	10	17	15	25
500-690	3	5	4	7
700-890	2	3	1	2
900 and above	-	-	1	2
Total	**60**	**100**	**60**	**101**

Source: Field survey 2008.

Types of Crops Grown

Table 6 shows the frequency distribution of the respondents according to the type of crop grown.

Table 6 shows that 50% of the respondents cultivate cassava and maize on their farm lands and 20% grow melon on their farms. This shows that majority of the respondents in the study area grow mostly cassava and maize on their farms. vetiver grass is known to harbour some pest and rodents (www.vetiver.com/ag/ags) and according to Ibe *et al*,(2000), it was reported that farmers complained that vetiver grass may harbour pest like grass-cutter which affects cassava farms. With a majority of the respondents cultivating cassava, this might affect the use of the grass.

**Table 6: Frequency distribution of respondents according
to type of crop grown.**

Type of crop grown	Frequency	Percentage
Cassava and maize	30	50
Maize	10	16.7
Melon	12	20
Yam	5	8.3
Others	3	5
Total	**60**	**100**

Source: Field survey 2008

Acceptability of Vetiver Grass

Acceptability of vetiver grass for sheet erosion management is presented in Table 7. It shows that 48% of the farmers accepted its use for sheet erosion management. However, this category of farmers stated that the acceptance cannot be sustained as the use of the grass is constrained by non-availability. Majority of the respondents (52%) stated that because the grass is not available, it is therefore not accepted for use in sheet erosion management. This finding is inconsistent with the report of Ibe *et al* (2000), who reported that farmers accepted the use of vetiver grass for sheet erosion management in the study area.

Table 7:   Frequency distribution of respondents according to acceptability of the grass.

Acceptability	Frequency	Percentage
Yes	29	48
No	31	52
Total	**60**	**100**

Source: Field survey 2008.

Effectiveness of Vetiver Grass for Sheet Erosion Management

The effectiveness of vetiver grass for sheet erosion management is discussed in this section.

Table 8 shows that majority respondents (53%) stated that they had no idea about the effectiveness of the grass for sheet erosion management. This is a pointer to the adoption rate of the technology by the respondents; with 45% of the respondents stating that vetiver grass is effective for sheet erosion management, about 2% stated that the grass is very effective. This findings is consistent with the report from www.vetiver.com/ag/ags which stated that adoption rate of vetiver is low and rapidly disappearing as more farmers are opting for flat cultivation. But the 45% of the farmers who said it is effective explained that their response is based on what they heard about the grass from the extension agents not that they have used it themselves. The 2% of the farmers who stated that the grass is very effective for sheet erosion management tend to be those who directly participated in the trial carried out by the ADP Staff in 2000. This set

of farmers however did not continue with the use of the grass because of its non-availability.

Table 8:   Frequency distribution of respondents according to effectiveness of the grass.

Effectiveness	Frequency	Percentage
Very effective	1	2
Effective	27	45
Do not know	32	53
Total	**60**	**100**

Source: Field survey 2008

Availability of Vetiver Grass for Sheet Erosion Management in the Study Area

In this section, the availability of vetiver grass for sheet erosion management in the study area is discussed.

Table 9 shows that majority of the farmer-respondents represented by 85% stated that vetiver grass is not available for sheet erosion management in the study area. Further-more, the extension agents in the study area stated that vetiver grass is not available for use in sheet erosion control.

However, a t – test was conducted to determine the availability of vetiver grass for sheet erosion control in the study area. Since the t

calculated value (Appendix 1) is less than the critical value of $t \propto /2$ with $\propto = 0.05$, we accept H0 that vetiver grass is not available for use in sheet erosion management in the study area. This finding is an improvement on the trial conducted by Ibe *et al* (2000), which did not address the issue of availability. According to Meier (1984), appropriate technology (technology with positive effect) is one which the resource/use requirement is locally available and which meets the needs of people on a sustainable basis. Hence, the use of the grass for sheet erosion control is critically constrained by availability of the grass.

Table 9   Frequency distribution of respondents according to availability of the grass.

Availability	Frequency	Percentage %
Always readily available	5	8
Not available	51	85
Not always readily available	4	7
Total	**60**	**100**

t cal = 2.014, n-1t $\propto/2$ = ±2.021

Source: Field survey 2008

Cost of the use of Vetiver Grass.

This study revealed that majority of the farmers did not adopt the use of vetiver grass for sheet erosion management .This might be due to the cost of establishment of vetiver grass for sheet erosion management. The cost of establishing vetiver grass on I ha plot of land is put at N13, 000. This cost may be prohibitive for the average farmer. As a result, some of the farmers use palm fronds or construct small channels through which the water passes. Some use nothing at all to check sheet erosion.

SUMMARY CONCLUSION AND RECOMMENDATIONS

Summary

The study was aimed at the assessment of the use of vetiver grass (*Vetiveria zizanioides*) in sheet erosion management in Imo State. This study examined the conclusions reached on the on-farm trial of the evaluation of the effectiveness and acceptability of using vetiver grass in sheet erosion management.

The study used descriptive statistics to analyse the data. Data was obtained from both primary and secondary sources. Sixty farmers and six ADP officials purposively chosen from Imo State were interviewed for the study.

The study revealed that some socio economic characteristics like farm size, sex, farm income etc affected the farmers' use of vetiver grass in sheet erosion management in the study area. The study showed that vetiver grass is not available for use by farmers in the

study area to check sheet erosion. The findings also revealed that in terms of the effectiveness of the grass, majority of the farmers represented by 53% do not know whether it is effective or not because they do not use the grass due to its non-availability. The results showed that the cost of adoption was high for the farmers because it will take a farmer about thirteen thousand naira to establish the grass on one hectare plot of land. The findings showed that majority of the farmers (52%) did not accept the grass because it is not available.

Conclusion

Vetiver grass is not available for use by farmers in the study area to check sheet erosion and that tends to account for the farmers' use of palm fronds or construction of small channels through which water passes for the purpose of checking sheet erosion.

In terms of the effectiveness of vetiver grass in the study area, majority of the respondents (53%) stated that they had no idea about the effectiveness of the grass in sheet erosion management. This is a pointer to the low adoption rate of the technology by the respondents. This finding is inconsistent with the report of Ibe *et al* (2000), who reported that the farmers accepted the use of the grass in the study area.

Based on the findings also, farmers did not adopt the use of vetiver grass probably because of the cost involved. Some of the
 socio-economic characteristics like sex, farm size, income etc affected farmers' use of vetiver grass in sheet erosion management in the study area.

It is concluded that vetiver grass is not available for sheet erosion management in the study area and the cost of establishing the grass on a hectare of farmland is simply beyond the reach of the farmers.

Recommendations

The following recommendations are made based on the findings.

- Conscious efforts should be made by both the relevant government agencies and private entrepreneurs for multiplication of vetiver grass to ensure availability.

- Both the government and private entrepreneurs should extend financial support to farmers who want to use the grass for sheet erosion management.

- Adequate awareness should be made by the extension agents on the use of vetiver grass for sheet erosion control.

- Finally, it is recommended that the Imo Agricultural Development Programme updates the on-farm trial with a view to addressing the current realities.

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APPENDIX 1

t– test analysis to determine the availability of vetiver grass in the study area.

Availability	Frequency	Percentage %
Always readily available	5	8
Not available	51	85
Not always readily available	4	7
Total	**60**	**100**

$$t = \frac{\bar{x} - \mu}{\delta / \sqrt{n}}$$

Where $\bar{x}$ = sample mean
μ = population mean
δ = standard deviation
n = sample size

But $\bar{x} = \dfrac{\sum xi}{n}$
$= 5+51+4 = \dfrac{60}{3} = 20$

$\bar{x}$= 20

$$\delta^2 = \frac{\sum(x-\bar{x})^2}{n}$$

Solving for the variance δ^2 =

X	x −$\bar{x}$ = d	d^2=(x- $\bar{x}$)^2
5	-15	225
51	31	961
4	-16	256
		1442

$$\delta^2 \quad = \quad \frac{1442}{3} \quad = \quad 480.67$$

:. Standard deviation $\delta =$

$$\sqrt{480.67}$$

$$= \quad 21.9$$

$$\mu = \overline{x} - t\frac{\propto}{2} \quad \frac{\delta}{.\sqrt{n}}$$

$$= 20 - \frac{2.021 \times 21.9}{\sqrt{60}}$$

$$20 - \frac{2.021 \times 21.9}{7.746}$$

$$20 - 2.021 \times 2.83$$

$$20 - 5.72 = 14.28$$

$$\underline{\Omega} \quad = \quad 14.3$$

:. $\mu = 14.3$

Substituting into the t – formula

$$t = \frac{\overline{x} - \mu}{\delta / \sqrt{n}} \quad = \quad \frac{20\text{-}14.3}{21.9/\sqrt{60}}$$

$$\frac{20\text{-}14.3}{2.83}$$

$$= \frac{5.7}{2.83} = 2.014$$

Calculated t value = 2.014

Note $\propto$ = 0.05

Critical t value t $\propto$ /2 at n-1 df = ±2.021

Decision Rule

Since calculated t – value is less than the critical t value

i.e. 2.014 < 2.021

We therefore accept the null hypothesis that vetiver grass is not available for use in sheet erosion management in the study area.