

Use of Vetiver Grass (*Vetiveria zizanioides*) in the Control of Erosion in Anambra State, Nigeria

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Abstract: This study investigated the adoption of vetiver grass (*Vetiveria zizanioides*) as soil conservation practice by farmers in Aguata agriculture zone of Anambra state, Nigeria. Data were collected through structured questionnaire administered to 120 farmers randomly selected from 12 circles. The data collected were analyzed using descriptive statistics and multiple regressions. Results showed that the adoption of the technology was below average with a mean adoption score of 2.94. The correlation and regression analyses showed that adoption of vetiver grass increased with educational level, household size, membership of cooperatives and decreased with farming experience. High cost of fertilizer, inadequate information, scarcity of vetiver, were some of the problems affecting the adoption of vetiver in the study area.

Key words: Vetiver grass, adoption, marginal lands, erosion control

INTRODUCTION

Land scarcity and increase in population have forced a lot of farmers to farm on lands which can be termed marginal lands (Munkner, 1996; Ekong, 2003). Most of such lands have shown to be susceptible to land/ soil degradation problems such as erosion, land slide etc (Djorovic, 1990; Barrow, 1991).

The problem of soil/environment degradation are so numerous in Nigeria. Such problems range from surface runoff, decreasing forests and development of gullies (Owino and Gretzmaacher, 2002). About 80% of lands in Nigeria are affected by one form of soil erosion or the other, about 70% of lands are devastated by gully erosion in the South East and South-South zones, while about 10% of land are equally lost to landslides annually particularly during rainy season (Egboka, 2000).

Anambra state is one of the states in the South Eastern part of Nigeria. According to the State's Agricultural Development Programme, the problem of soil erosion has become so endemic that most agriculturalists are becoming so confused. All over these erosion prone areas, people suffer loss of farm-lands, property and even lives. Aguata Agricultural zone has been selected for this study because of the preponderance of farming activities in the area and danger posed by erosion menace in the zone. Hence, Egboka (2000) described Aguata as the zone badly devastated by erosion in Anambra State. This

problem of land degradation can be solved through, the adoption of vetiver Grass which has been introduced to the farmers as a cheap method of erosion control.

Vetiver grass (*Vetiver zizanioides* 'Monto') is a dense clumping perennial grass which belongs to the family Gramineae. It grows up to 1.5 m in height. According to Michaels (2004), vetiver grass is native to India and Ceylon. It requires a hot and humid climate. It is adaptable to a wide range of soil and climate conditions, it can be established on very acid, alkaline or saline soils. Due to its extensive and deep root system, vetiver is very tolerant of drought. It has been found to be very suitable for the fight against desertification, soil moisture loss and enhancing the organic content of the soil (Okorie, 2001). The bacteria and fungi associated with the root system provide nitrogen and phosphorus fertilizes to the surrounding agronomic crops.

Babalola *et al.* (2003) see the use of vetiver as a soil conservation method that is cheap, replicable and sustainable. Here in Nigeria, Babalola *et al.* (2003) found a yield increase of 26% for cowpea and 50% for maize under vetiver management. They also found up to 70% reduction of soil loss and enhancement of Nitrogen use efficiency (NUE) up to 40%. In Kenya, Owino and Gretzmaacher (2002) found a run off reduction of 54% and soil loss reduction of 92% using vetiver grass.

Michaels (2004) stressed that the utilization of vetiver for soil and water conservation is not difficult for farmers

to apply on their own land. He stressed that it is particularly, easy if farmers develop a clear understanding of the benefits and seriously believe in the need to conserve soil resources for generating higher and more productive yields. He further explained that cultivation of vetiver is so simple that it can be implemented by people from diverse professions. Vetiver is also used non conventionally as compost, animal feed, for mushroom cultivation, botanical pesticide, ornamentals and even for pottery (Chomchalow and Chapman, 2003).

For about a decade now the use of vetiver grass as an erosion control method has been disseminated to farmers in Aguata Zone of Anambra State. The objective of this study therefore, was to determine the level of adoption of the technology and to analyze factors influencing its adoption

MATERIALS AND METHODS

Data collection: Data were collected from farmers in Aguata Agricultural Zone of Anambra State of Nigeria in 2006. Aguata Agricultural Zone is situated at the Southern part of Anambra State. It is made up of 6 extension blocks and 37 circles.

Two circle were randomly sampled from each block and 10 farmers randomly sampled from each circle making a total of 120 farmers.

Data analyses: Descriptive statistics such as percentages, means, frequencies, adoption model (A.I.E.T.A) and multiple regressions were used to achieve the objectives of the study.

Measurement of rate of adoption: The adoption levels (A.I.E.T.A) spelt out in the adoption model in the respective technologies under study was assigned values and calculated as follows:

Awareness	=	1
Interest	=	2
Evaluation	=	3
Trial	=	4
Adoption	=	5
(1 +2+3+4+5)	=	15/5 = 3

Decision rule: A mean adoption score of 3 was accepted as adopter in the respective technologies, while mean adoption score of 1-2.9 was considered as non-adopter. The Total Adoption Score (TAS) of the technology package was calculated as follows:

$$TAS = \frac{\text{Total no of adopters}}{\text{Total sample size}} \times \frac{\text{Total no of technologies}}{1}$$

$$\text{Mean Adoption Score (MAS)} = \frac{\text{Total no. of adoption score}}{\text{Expected adoption score}} \times \frac{\text{Total no. of technologies}}{1}$$

Regression analysis: The multiple regression used in the analysis is implicitly specified as follows:

$$Y = F (X_1, X_2, X_3, X_4, X_5, X_6, X_7) \quad (1)$$

where:

- Y = The adoption level measured by the intensity of adoption i.e., summation of adoption indices in the technology adopted.
- X₁ = Farmers age in years.
- X₂ = Level of education.
- X₃ = Household size.
- X₄ = Sex of farmers.
- X₅ = Membership of cooperatives.
- X₆ = Marital status.
- X₇ = Years of farming experience.

Age: A continuous variable. This is age of farmer which was recorded as supplied.

Level of education:

No formal education	=	0
Primary	=	1
Secondary	=	2
Tertiary	=	3

Household size: This was recorded as given.

Sex: A dummy variable (Male = 0, Female = 1).

Membership of cooperative: (Belonged = 1, Do not belong = 0).

Marital status: (Single = 1, Widow/Divorced = 3).

Farming experience: A continuous variable recorded as given.

Measurement of adoption: The farmers were expected to be involved in the under-listed, vetiver cultivation practice for erosion control.

Planting distance: Total 150 mm planting distance to encourage hedge formation.

Watering: This is done every 2nd day during scanty rains at initial plant establishment.

Number of suckers planted per stand/hole: Two to three suckers are planted per hole.

Fertilizer application: This was expected to be done immediately after planting and once every year with a complete N.P.K. Fertilizer.

Trimming: This was expected to be done every 3 months when the plants have fully established to reduce danger of fire in dry season and encourage hedge formation.

Non conventional uses: Example as forage, ornamentals and medicinal. Each of these practices (a-f) scores 1 point. Summation of the scores was used as level of adoption.

RESULTS AND DISCUSSION

Personal and socio-economic characteristics of the respondents: Results showed that most of the respondents were males (71.6%) and the majority of them were within the age bracket of 41 and 60 years. This indicated that most of the farmers were middle aged. Almost, all the respondents were married or widowed (80.8 and 5%, respectively). The majority of the respondents (70%) were literate. That is, they could read or write. About half of them (54%) belonged to cooperative societies and their major source of information on vetiver grass was from fellow farmers.

Adoption of vetiver grass by farmers: Results in Table 1 show that the adoption of vetiver in the study area was low with a mean score of 2.94. A closer look at the Table 1 shows that the use of vetiver for medicinal and ornamental purposes had the highest adoption score of 3.6, while planting of 2-3 suckers per stand during initial establishment had a low adoption score of 2.75. Maintenance of adequate planting distance of 150 mm which encouraged adequate hedge formation had an adoption score of 2.9. Watering frequency involved watering of the plants during scanty (Table 1) rains at initial plant establishment. This was usually done every 2nd day. This technology had an adoption score of 2.91. Trimming of vetiver which was supposed to encourage hedge formation and to reduce the danger of fire during dry season had adoption score of 2.5. The study also revealed that 23% of the respondents discontinued with fertilizer application after some time.

Despite the fact that Chomchalow and Chapman (2003), described the use of vetiver for medicinal and ornamental purposes as a non conventional use, it still had an overwhelming adoption level. This can be attributed to its relative advantage and compatibility with the farmers' previous experiences.

Factors influencing the adoption of vetiver grass: From Table 2, estimated regression equation showed that independent variables (x_1-x_7) explained 72.7% of the observed variation in the adoption (Y) under semi-log. The remaining 27.3% was due to error of estimation procedure and other factors outside the scope of this study. This being the case, semi-log was chosen as the lead equation because its coefficient of determination (R^2) was higher among other at 72.7%. Furthermore, the F-statistics was also significant at 1% level. This was an indication that all the variables included best explain the model (Table 2).

From the lead equation, 4 variables were found to be significant. These were level of education and farming experience, which were found to be significant at 5% level. On the other hand, household size and membership of cooperative were significant at 1% level.

The study showed that farmers with many years of farming experience were reluctant to adopt new technologies, due mainly to conservatism as shown by their negative significant relationship with vetiver. This finding conforms to the findings of Onyenweaku (1991) and Onyenweaku and Mbuba (1991).

Level of education had a positive significant influence on adoption. This showed that educated farmers were more willing to adopt new technologies than the non literate ones hence, the adoption of *Vetiveria zizanioides* were done more by literates. This finding was in line with the apriori expectation.

Household size also had a positive significant relationship with adoption. This shows that with an increase in population of the family (X_3) hence, higher family responsibility, there was a corresponding increase in adoption (Y) of vetiver. Increased family responsibility occasioned by large family size increases the farmers' explorative capacities. This will definitely encourage them to adopt new technologies.

Membership of cooperative (X_5) had a positive significant relationship with adoption. This implied that as the number of farmers in Agricultural cooperatives increased, the adoption of vetiver as erosion control increased. An agricultural cooperative gives their members easy access to credit and information. It also facilitates, the level of interpersonal relationship among the farmers.

Table 1: Distribution of respondents at different stages in the adoption process of Vetiver cultivation for erosion control

	Technology							Total	Adoption score
	Not aware	Aware	Interest	Evaluation	Trial	Adoption	Discontinued		
Planting distance	4	-	12	7	28	69	-	120	2.9
Watering frequency	4	12	06	13	15	70	-	120	2.91
2-3 suckers (culms) per stand	9	19	05	14	7	66	-	120	2.75
Trimming (Hedge formation)	8	22	06	5	7	72	-	120	3.0
Fertilizer application	-	13	17	2	-	60	28	120	2.5
Medicinal/ornamental use	-	8	12	10	3	87	-	120	3.6
Total adoption score									17.66
Mean adoption score									02.94

Source: Field Survey (2006)

Table 2: Regression result of variables affecting the adoption of vetiver as erosion control measure

Variables	Coefficients			
	Linear	Semi-log	Double-log	Exponential
Constant	1.657** (2.121)	3.826 (1.663)	1.032 (1.151)	0.621** (2.214)
Age (X ₁)	0.02436 (1.466)	-0.877 (-1.335)	-0.347 (-1.345)	0.01678 (-1.797)
Level of education (X ₂)	0.3272 (1.489)	0.924** (2.625)	0.402*** (3.045)	0.0159 (1.767)
Household size (X ₃)	0.486*** (4.718)	1.092*** (3.568)	0.446*** (3.878)	0.189*** (48.46)
Sex (x ₄)	-0.0292 (-0.136)	-0.234 (1.031)	-0.0639 (-0.752)	0.0345 (0.421)
Membership of cooperative (X ₅)	2.376*** (10.466)	2.453*** (10.434)	0.812*** (8.731)	0.846*** (9.296)
Marital status (X ₆)	0.0467 (0.347)	0.392 (0.665)	0.0293 (0.125)	0.4071 (0.341)
Farming experience (X ₇)	-0.0275** (-2.291)	-0.592** (-2.591)	-0.169** (-3.448)	0.08692** (2.897)
R ²	0.711	0.727	0.681	0.664
R	0.831	0.842	0.797	0.786
F-ratio	32.923***	28.657***	21.810***	26.389***

Source: Field Survey (2005); Note: Values in parenthesis are t-values; ***: Statistically significant at 1% level; **: Statistically significant at 5% level

Problems associated with the adoption of vetiver as erosion control measure: Identified problems militating against adoption of vetiver included high cost of farm inputs which ranked highest with a response of 44.17%. Others arranged in decreasing order include: Inadequate information concerning the grass (19.17%), scarcity of planting material (13.33%), lack of incentives (11.67%) and land tenure problem (6.67%). The problem of land tenure/fragmentation vis-à-vis adoption has also been highlighted by Ekong (2003), as discouraging the farmer from undertaking any land improvement investment.

CONCLUSION

The over-all result from this study revealed that the adoption level of the technology package was below average with a mean adoption score of 2.94. This could be attributed to the low level of extension visit in the study area as 63% of the respondents indicated to have had no

contact with the extension agents in one full farming season. Majority of the farmers (50%) received agricultural information from fellow farmers, while other sources of information like workshop/seminars, magazines and journals were not adequately available to farmers.

It is therefore, recommended that the Agricultural Development Project (ADP) which is responsible for the extension of this technology should re introduce the use of vetiver grass for erosion control and ensure that that farmers are sufficiently convinced of the benefits of the crop in order to increase the adoption rate. This can easily be achieved through a massive enlightenment campaign. The use of the mass media, cooperative organizations and extension visits are recommended for use.

REFERENCES

Babalola, O., S.C. Jimba and O. Maduakolam, 2003. Use of vetiver Grass for soil and water conservation in Nigeria. Proceedings of 3rd World International Vetiver Conference, in Guangzhou, China, October 6-9, pp: 282-288.

Barrow, C.J., 1991. Land Degradation Development and Breakdown of Terrestrial Environment. Cambridge University Press.

Chomchalow, H. and K. Chapman, 2003. Other uses and utilization of vetiver. In: Proc. International Vetiver Conference Op. Cit, pp: 474-485.

Djorovic, M., 1990. Experimental Study of Erosion and Crop Production on Bench Terraces on Sloping Land. In: Baordman, J. (Eds.). Soil Erosion on Agricultural Land. Singapore, John Willey Publisher, pp: 531.

Egboka, B., 2000. Erosion, causes and remedies. In: National Light Newspaper, pp: 12.

Ekong, E.E., 2003. Introduction to Rural Sociology. 2nd (Edn.). Uyo: Dove Publishers.

Michaels, F., 2004. What is Vetiver Grass in Green Harvest <http://www.greenharvest.com.au/plantsVetiver-info.html>.

- Munkner, H., 1996. Land rights in Africa collective use or private property? *Agriculture Rural Development*. CTA, 3 (2): 10.
- Onyenweaku, C.E., 1991. Factors associated with the adoption of the seed-yam-mini-set technique by farmers in Imo state Nigeria. *J. Agric. Sci. Technol.*, 1 (2): 155-157.
- Onyenweaku, C.E. and A.C. Mbuba, 1991. The adoption of the seed-yam mini-set multiplication technique by farmers in Anambra State Nigeria. *J. Agric. Ext.*, 6: 12.
- Okorie, P.E., 2001. Research Projects on Vetiver Grass, Jack Bean and Lyon's Bean. Occasional Publication. Michael Okpara University of Agriculture, Umudike.
- Owino, J. and R. Gretzmaacher, 2002. Performance of Narrow strips of Vetiver grass (*Vetiver zizanioides*) and Napier Grass (*Penisetum purpureum*) as Barriers against run off and soil loss on clay land. Soil in Kenya, Paper Presented on Conference on International Agricultural Research for development Witzenhansen, pp: 9-11.