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Full Length Research Paper

Soil and water conservation capabilities among farmers and extension agents in eastern region of Nigeria

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Sustaining soil and water resources for improved agricultural production requires improved capacity of relevant stakeholders. The study aimed to ascertain this capacity in terms of perceived knowledge and importance of selected soil and water conservation (SWC) practices amongst farmers and extension agents (EAs) in the Eastern region of Nigeria. Data were collected from 101 farmers and 66 EAs using questionnaire instruments and analyzed using descriptive and inferential statistics. Results showed that both EAs and farmers were knowledgeable in most of the SWC studied as well as perceived the practices as very important. However, the EAs had more knowledge and perceived these practices as more important than farmers. Farmers did not adopt some SWC practices which were capital intensive or which they were not knowledgeable in. There were significant differences in the perceived knowledge and perceived importance of SWC practices between farmers and EAs in few SWC practices that were studied. Based on the key findings from the study, it was recommended that farmers need to be regularly trained by EAs using integrated methods in order to increase their capabilities in SWC practices. On the other hand, EAs also need to update their own skills through short courses and training in extension methods.

Key words: Soil and water conservation, practices, farmers, extension agents, Eastern Nigeria.

INTRODUCTION

A major challenge facing farming households, agricultural communities, governments and development agencies in the developing world is how to increase agricultural production while sustaining the productive capacity of the soil and water resources. Soil and water degradation results primarily from inappropriate land uses and poor land management practices. For example, shorter periods of fallow and soil exposure to erosion as a result of traditional and cultural techniques diminish natural soil fertility (Nyam, 2004). Invariably, the shorter fallow periods currently taking place in most farming communities in Nigeria due to population increase and socioeconomic developments prevent the soil from naturally regenerating itself and supporting crop production. This, most times calls for the application of inorganic fertilizers which in the long run may destroy the soil's supportive ability due to the chemical reserves left in the soil. Soil resources (nutrients and water) are renewable and they can be replaced through conservation methods which aim to reduce losses, sustain resources and enhance productivity. Soil and water conservation (SWC) practices consist of the control measures including managerial, vegetative, and structural practices aimed at reducing the loss of soil and water. Such methods seek to encourage water infiltration into the soil, reduce its velocity and check run off losses. The most common SWC methods are management and mechanical practices. Examples of management practices are; strip cropping, mulching, crop rotation,

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contour cultivation, planting of grasses for stabilizing bunds, planting of trees and afforestation, cashew nut plantation; while examples of mechanical practices are; bunding, terracing, gully control, and control of stream and river banks. More technical practices will include irrigation and other water harvesting technologies.

When SWC practices are properly applied, they result in yields of useful plants, animals and materials by establishing a balanced cycle of harvest and renewal which is a means of sustaining rural livelihood. According to the Overseas Development Institute (ODI, 2000), the major reasons for investing in SWC methods are to improve soil fertility, increase yields, reduce pest prevalence, reduce risk of crop failure and increase food available at home. Farmers and extension agents in Eastern Nigeria already know and practice some SWC practices, but their capabilities in effectively and efficiently using these practices seem insufficient, hence there are still reports of land degradation due to land mismanagement and poor agricultural practices resulting from low adoption of modern SWC practices (Igbokwe, 1996). Capability in this paper is referred to as the knowledge and ability to apply SWC practices. It also includes the relative importance attached to SWC in agricultural production by the stakeholders (farmers and extension agents). Studies have shown that usually there are strong links between measures for soil conservation and measures for water conservation (Hudson, 1987). Many measures are directed primarily to one or the other, but most contain an element of both. For example, a reduction of surface run-off by structures or by changes in land management will also help to reduce erosion. Similarly, reducing erosion will usually involve preventing splash erosion, or formation of crusts, or breakdown of structures, all of which will increase infiltration, and so help in water conservation.

Many studies have looked at the relationship between SWC and household capabilities. According to Anderson and Thampapillai (1990), the following factors are positively associated with the adoption of SWC practices. These include; level of income (on-farm and off-farm); access to low cost credit; labour availability; low discount rates (that is long policy-planning horizons); high levels of education among farmers; access to sound technical advice; and secure land tenure. Among these factors, poverty can be considered most generic and significant in preventing effective adoption of SWC practices by farmers. This is manifested among other things in the difficulties farmers face in securing the necessary inputs and infrastructure such as improved seeds and seedlings, fertilizers, pesticides, herbicides, processing and storage facilities which are required to achieve improved agricultural production and hence food security. Most importantly, such category of farmers does not have access to credits from banks required to expand production due to their inability to provide collaterals required by such finance institutions. Ajadike (2003) identified poverty as one of the factors accelerating environmental degradation because the poor by virtue of having less secure access to natural resources, are unable and often unwilling to invest in natural resource management such as soil and water conservation practices. ODI (2000) had earlier reported a positive correlation between poverty and non adoption of SWC practices in Tanzania and Uganda. Also, an improperly applied poverty alleviation programme can compound the problem of environmental degradation. In Nigeria, the side effects of many poverty alleviation programmes are not friendly to SWC (Phil-Eze, 2003). For instance, some adverse impacts of the Better Life for Rural Women Programme (BLRWP) on the environment in Anambra State include, land degradation through improper location of infrastructural facilities, irrational extraction of natural resources and over-exploitation of agricultural potentials of every available land.

Another factor that undermines the combating of land degradation problem and food security is the neglect of past governments to substantively invest in SWC practices and in agriculture in general. The Comprehensive African Agricultural Development Programme requires African governments to allocate 10% of their budgets to agriculture but so far, only very few countries such as Malawi, Comoros, Zimbabwe, Senegal, Madagascar, etc have achieved this recommendation by the African Union Maputo Declaration of 2003. Most farmers still have neither the capacity to invest in SWC technologies that require high capital nor the ability to undertake large-scale agricultural production activities/ventures due to lack of capital and other requisite resources. Although various agricultural innovation packages have integrated conservation practices, the general assumption is that extension personnel and farmers are knowledgeable on the practices. This can pose a handicap in the transfer of appropriate SWC practices to farmers as well as improving traditional systems as the assumption may not be correct.

In current technology transfer paradigm, extension agents bring to farmers specific technological packages which are assumed to have been tested and adapted to local conditions with clear understanding of farmers' knowledge and economic capabilities. In Nigeria, the testing of any technological package is jointly carried out by research institutions, extension agencies and farmers, and farmer organizations. This linkage provides great opportunity for any technology or innovation to be adapted to the farmer's conditions taking into consideration the environment, social, cultural, religious, economic and political situations prevalent in the area. One major mechanism for achieving this interaction is through the On-farm Adaptive Research (OFAR) that engages relevant research institutions, extension agencies and farmers in testing and adapting any particular technology or innovation in an area. The

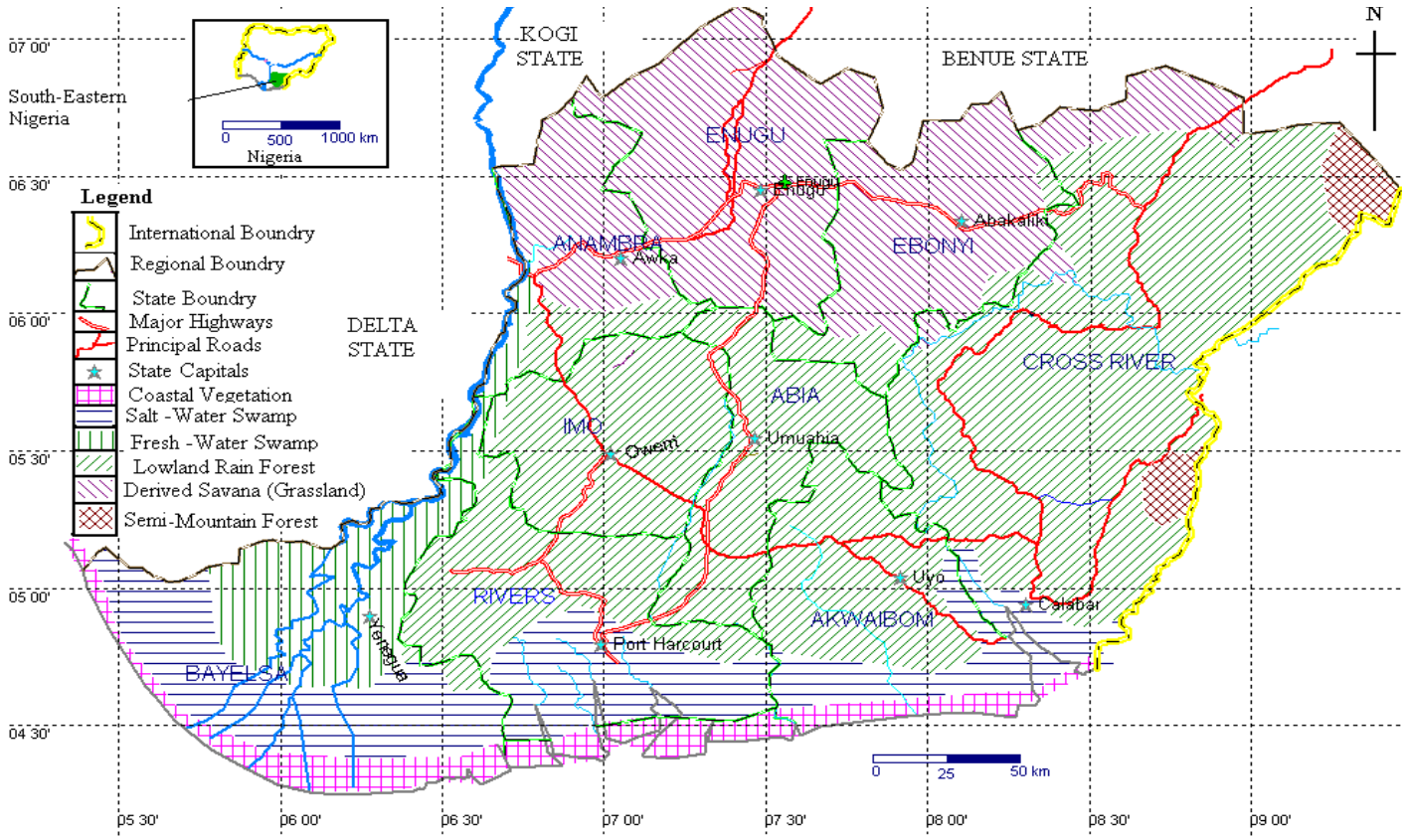

Figure 1. Map of the Eastern region of Nigeria.

question now is; what amount of knowledge do farmers and extension agents have in SWC practices? Do they perceive these practices as important? What differences exist in the knowledge and perceived importance of the SWC practices amongst farmers and extension agents? The paper therefore sought to ascertain the perceived knowledge and importance of SWC practices amongst farmers and extension agents. It also examined the differences in perceived knowledge and importance of SWC practices between farmers and extension agents.

METHODOLOGY

The study area

The area under study stretches from Latitude 4° 15'N to Latitude 07° 00'N and Longitude 05° 34'E to Longitude 09° 24'E (Unamma et al., 1985). It is bounded in the east by Cameroon, in the west by Delta and parts of Kogi States, in the south by the Gulf of Guinea/Atlantic ocean and parts of Cameroon; and in the north by parts of Kogi and Benue States (Aniedu, 2006) (Figure 1). It has a land area of 29,526 km^2 and a population of 10,712,675 people comprising a female population of 5,569,241 and a male population of 5,142,434 persons. Its vegetation is a tropical rainforest, although some of the northern zone seems to be 'derived' savannah, which is as a result of reduced fallow period in these areas (Lekwa et al., 2001). The area experiences two main seasons in the year, namely, the rainy season (April to November) and the dry season, which occupies the rest of the year. The average annual rainfall amounts to about 1730 mm in about 110 rain days. Its maximum monthly atmospheric temperature is about 32.5°C. It has loose sandy to sandy clay and loamy alluvial soils but in high lands, there are rocky mixtures. The major occupation of the inhabitants of this area is crop and animal production. The land surface of these states could be classified into three broad relief units; plains and lowlands (including the river valleys), cuesta landscapes, and highlands (Ofomata, 1985).

Due to the friable nature of soil in some parts, coupled with the vigorous and concentrated downpours of rains in the rainy season, there are some deepest erosion scars in the region. Crops produced include different kinds of palms e.g. oil palm (*Elaeis guineenis*), raffia palm (*Raphia vinifera*), fan palms, banana (*Musa* spp), yam (*Dioscorea* spp), plantain (*Musa paradisiaca*), pineapple (*Ananas comosus*), maize (*Zea mays*), melon, vegetables of all sorts, beans, cowpeas (*Vigna unguiculata*), cocoyam (*Colocasia esculenta*), cassava (*Manihot* spp), swamp rice (*Oryza sativa*), orange (*Citrus sinensis*), coconut (*Cocos nucifera*) and sugar cane (*Saccharum officinarum*) (Ugochukwu, 1999; Iwena, 2008). Economic trees include the mahogany, ebony, and iroko. Food-crop husbandry dominates the agricultural landscape of the Eastern States. Though an average family unit kept 10 to 15 local birds and 2 to 6 goats (mainly stall-fed), their contribution to the food economy and shares of agricultural land and labour inputs are comparatively small.

Population and sample

The study involved a survey of farmers' and extension agents'

capabilities on SWC practices in eastern region of Nigeria in 2006. The region is made up of nine states namely; Abia, Akwa Ibom, Anambra, Bayelsa, Cross River, Eboyi, Enugu, Imo and Rivers. Out of these, four states namely; Abia, Enugu, Imo and Rivers were randomly selected. From the list of registered farmers with Agricultural Development Programmes, 20, 20, 30 and 31 farmers were selected from Abia, Enugu, Imo and Rivers states out of a population of 1696, 2212, 246, and 542, respectively. Twenty extension agents (EAs) were randomly selected from each state out of 212 in Abia, 43 in Enugu, 91 in Imo and 92 in Rivers. This gave a total sample size of 101 farmers and 80 EAs and a grand total of 181 respondents. However, only 66 out of 80 copies of the EAs' questionnaire were retrieved and found analyzable.

Data collection procedure

Data were collected using semi structured questionnaire instruments and interview schedules. Focus group discussions (FGDs) were also conducted to obtain in-depth information on the subject matter from the respondents. A pilot test was conducted as part of the instrument validation and to test for reliability. These instruments were validated by experts in agricultural extension and soil and water conservation practice. The twenty SWC practices examined in the study were obtained from literature and the list of SWC technologies being disseminated by the agricultural extension agents to farmers in the region. Using a 5-point Likert-type scale, respondents were requested to indicate the level of knowledge and perception of importance of each SWC practice by separately ticking one of the response frames of 1= not knowledgeable and not important; 2 = slightly knowledgeable and slightly important; 3 = moderately knowledgeable and moderately important; 4 = knowledgeable and important; 5 = very knowledgeable and very important.

A mean of 3.0 was computed by adding the response frames of 1 to 5 for both the knowledge and importance levels of SWC practices. The practices with mean scores of ≥ 3.0 were considered significant, that is, respondents were knowledgeable of the practice and considered it important. On the other hand, the practices with mean scores below 3.0 were not considered significant, that is, respondents were neither knowledgeable of the practice nor considered it as important.

Data analyses

Both descriptive and inferential statistics were employed in analyzing data from the study. Percentage scores were used to ascertain the distribution of extension agents based on their areas of academic specializations and educational qualifications**,** while mean scores were used to ascertain the perceived knowledge and importance of SWC practices among farmers and extension agents. Furthermore, a t-test statistic was employed to test the differences in knowledge and perceptions of importance of SWC practices between the two categories of respondents.

RESULTS AND DISCUSSION

Area of specialization and educational qualifications of extension agents

The distribution of extension agents according to their areas of specialization and educational qualification show that 30% of the EAs majored in agricultural extension, 21% specialized in general agriculture, 20% studied animal science and 16% specialized in crop science/ agronomy (Table 1). Out of the 66 EAs that participated in the study, 70% had no academic training in extension and only 16% of the EAs who specialized in crop science/agronomy disciplines received some training in soil conservation techniques. Table 1 also shows that 36% of EAs obtained Higher National Diplomas (HND), while 32% had first degrees. About 23% of the EAs had Ordinary National Diplomas (OND). The results show that most of the agricultural extension personnel did not receive formal training on how to transfer SWC techniques to farmers – a skill acquired in formal training by graduates of agricultural extension discipline. There is therefore absolute need for extension officers to be capable of assisting farmers in acquiring the knowledge and skills required to effectively adopt the SWC techniques.

However, most of the EAs in the study area depended only on the trainings organized for them by the extension agency at intervals. This undoubtedly affects the uptake of recommended SWC practices that are targeted to farmers. Nevertheless, extension agents who lack the requisite formal trainings do usually make up these deficiencies through regular fortnightly trainings (FNTs) and block meetings (BMs) organized for all the extension personnel in the region by the agricultural extension agencies such as the Agricultural Development Programme (ADP) and the Fadama Programme.

Perceived knowledge and importance of SWC practices by extension agents and farmers

Out of twenty SWC practices studied, EAs were knowledgeable ($\Re \geq 3.0$) in 19 practices. At the same time, they also perceived the 19 practices as significantly important for dissemination to farmers. The most prominent practices were; ridging across the slope ($\Re$= 4.5), crop rotation ($\Re$= 4.3), application of organic manure to the soil ($\Re$= 4.2); and avoidance of overgrazing ($\Re$= 4.2). The other practices which the EAs were knowledgeable in are shown in Table 2. On the other hand, farmers were knowledgeable in 17 out of the 20 SWC practices. They also perceived the 17 practices as significantly important in their farming practices. The most prominent practices, where farmers' perceived knowledge were high, include; ridging across the slope ($\Re$= 4.9), application of organic manure ($\Re$= 4.4), and crop rotation ($\Re$= 4.3). Other SWC practices where farmers were knowledgeable in and perceived as important are shown in Table 2.

The grand mean scores for EAs and farmers were 3.8 and 3.6 respectively. These scores were above the cut off mark of 3.0. This shows that both categories of respondents had significant knowledge of the SWC practices examined in the study. At the same time, they also perceived the same practices as important in

Table 1. Percentage distribution of extension agents based on their areas of academic specializations and educational qualifications.

Area of specialization	Extension agents (n = 66) percentage
Agric. extension	30
Animal science	20
Crop science/agronomy	16
General agric	21
Soil science	3
Agric. engineering	2
Home economics	3
Agric. economics	3
Veterinary science	2
Educational qualification	
M.Sc. /M.A.	2
B.Sc./B.Agric./BA/B.Ed	32
HND	36
NCE	4
OND	23
TC11	0
WASC/SSCE	3

Source: Field data (2006).

enhancing soil and water conservation for agricultural production. Comparing the mean scores of EAs and farmers, it was observed that EAs were expectedly more knowledgeable in SWC practices than farmers, probably because of their exposure to SWC issues during their formal training and during their regular fortnightly trainings offered by the ADPs of Fadama programmes in the State. It was important to observe that farmers were knowledgeable in most of the SWC practices that were indigenous to them. This may be because farmers found such practices to be ideal, cheap, and sustainable. The practice of ridging across the slopes which received the highest score in respondent's knowledge is as old and indigenous as agriculture itself. Farmers who lived in undulating areas or dry lands learnt by intuition to make ridges across the slopes in order to check erosion and run offs. Research has shown that ridging across the slopes not only prevent erosion but also retains water in the furrows when cross ridges are made at about 2 to 3 m intervals (Farm Radio International, 1997). Sometimes when it rains, so much water falls in such a short time that it cannot all sink into the ground right away, even if the soil below the surface is dry. Instead, water flows away over the soil surface, always towards the lowest land. Instead of soaking into the ground where crops can use it, a lot of rainwater is lost. Farmers mostly in dry lands use a special method to help hold that precious rainwater on their land. First of all, they grow row crops such as maize, sorghum, or sweet potatoes, on ridges. When it rains, water collects in the furrows between the ridges. To make sure the water stays where it falls in the furrows and does not flow away, the farmers make little barriers called cross-ridges across each furrow at regular intervals. The cross-ridges block the furrows off into basins that hold the water in one place (Farm Radio International, 1997). Igbokwe (1996) further noted that farmers from Maku in Awgu Local Government Area of Eastern Nigeria which happens to be a hilly area had long been practicing terrace farming but it does not seem to be widely known by farmers who do not live in hilly areas.

However, both the EAs and farmers had inadequate knowledge in the use of some modern SWC techniques. These techniques include; water-harvesting, grass strips alternating with crop strips on the same plot to check erosion e.g. using vetiver grass; and digging of pits to protect and retain soil and water out-flows. Farmers noted during the FGDs that most of the modern techniques are costly and require some level of technical expertise hence they tend to lose interest in them, especially if the message was not properly delivered. According to Troeh et al. (1999), the low adoption rate of SWC practices by farmers can also be caused by lack of funds as some of these practices are capital intensive. It is important to note that the EAs themselves may have contributed to the non adoption of the modern SWC techniques, as a result of poor delivery of services to the farmers due to lack of adequate extension skills. Other contributing factors to the poor delivery of services to farmers by EAs may be due to poor motivation of staff. According to Chukwuone et al. (2006) poor funding and funding instability, activities of corrupt officials, delays in

Table 2. Mean scores of perceived knowledge and importance of SWC practices by extension agents (n= 66) and farmers (n= 101)

S/N	SWC practices	Extension agents		Farmers	
		Mean	SD	Mean	SD
1	Placing plant rows and tillage lines at right angle to the normal flow of surface run-off	3.8(.17)	1.43	3.5(.15)	1.55
2	Pit dug to protect and retain soil and water out flows	3.2(.16)	1.33	2.7(.13)	1.49
3	Alternate planting of different crop in strips	4.0(.15)	1.25	3.8(.13)	1.38
4	Application of organic manure to the soil	4.2(.15	1.23	4.4(.11)	1.18
5	Planting trees and shrubs around the farmland to control wind erosion	4.1(.14)	1.14	3.7(.13)	1.39
6	Grass strips alternating with crop strips on the same plot to check erosion e.g. using vetiver grass	3.8(.13)	1.13	2.5(.13)	1.37
7	Using the straw to cover the plot after land preparation	3.8(.13)	1.14	3.5(.12)	1.23
8	Building dams	3.2(.21)	1.17	3.1(.15)	1.56
9	Ridging across the slopes	4.5(.13)	1.10	4.9(.51)	5.14
10	Using tied ridges	4.0(.13)	1.11	3.0(.16)	1.68
11	Irrigation – surface or sprinkler	3.7(.14)	1.17	3.2(.15)	1.56
12	Using combination of different crops	4.0(.16)	1.32	4.2(.11)	1.14
13	Alternating period of cropping and period of fallowing	4.0(.15)	1.22	4.2(.11)	1.18
14	Application of agro-chemicals e.g. lime and fertilizer	3.6(.19)	1.58	4.1(.12)	1.30
15	Terrace farming	3.6(.16)	1.34	3.1(.14)	1.50
16	Crop rotation	4.3(.12)	.99	4.3(.10)	1.16
17	Avoidance of overgrazing	4.2(.12)	1.01	4.2(.11)	1.20
18	Establishment of permanent water ways	3.4(.17)	1.41	3.6(.14)	1.44
19	Use of water-harvesting techniques such as digging pits	2.4(.16)	1.33	2.11(.13)	1.35
20	Keeping the soil covered with growing plants	3.8(.15)	1.29	4.0(.12)	1.29
	Total	76.4		72.7	
	Grand Mean Score	3.8		3.6	

Values in parenthesis are standard errors; SD= Standard deviation; Cut off mark= 3.0. Source: Field data (2006).

payment of EAs salaries,inadequate materials for fieldwork, and poor transport facilities, all contributed to the poor performances of EAs in their delivery of extension messages to farmers in Nigeria. These and other factors have affected the dissemination of proven agricultural technologies including SWC techniques to farmers. There is therefore need for proper monitoring and evaluation in the extension system to ensure that extension agents discharge their duties profess-sionally and are provided with the necessary materials to accomplish their tasks. Such materials meant for extension work must also reach the target clientele to ensure that the system function effectively.

Differences in perceived knowledge of SWC practices between extension agents and farmers

The t-values for the differences in knowledge of SWC practices between EAs and farmers showed a significant difference in six SWC practices as shown in Table 3. In all the six SWC practices where the differences occurred, EAs had more knowledge on the practices than the farmers. Most of the six SWC practices were modern techniques being disseminated by the EAs themselves under the ADP arrangement and hence one expects them to be more knowledgeable than the farmers in the application of the techniques. Again, EA's knowledge may be

Table 3. t-values of differences in perceived knowledge of SWC practices between extension agents and farmers.

S/N	SWC practices	EAs mean scores	Farmers mean scores	T-value
1	Placing plant rows and tillage lines at right angle to the normal flow of surface run-off	3.75	3.04	3.08*
2	Pit dug to protect and retain soil and water out flows	3.13	2.14	3.47*
3	Alternate planting of different crops in strips	4.12	3.47	3.32*
4	Application of organic manure to the soil	4.57	4.28	1.89
5	Planting trees and shrubs around the farmland to control wind erosion	4.24	3.36	4.68*
6	Grass strips alternating with crop strips on the same plot to check erosion e.g. using vetiver grass	3.90	2.22	8.96*
7	Using the straw to cover the plot after land preparation	3.46	3.20	1.32
8	Building dams	3.13	2.69	1.76
9	Ridging across the slopes	4.62	4.26	2.22
10	Using tied ridges	3.92	3.53	0.69
11	Irrigation – surface or sprinkler	3.24	3.03	0.92
12	Using combination of different crops	4.25	4.09	0.88
13	Alternating period of cropping and period of fallowing	4.21	4.08	0.66
14	Application of agro-chemicals e.g. lime and fertilizer	4.12	4.14	-0.21
15	Terrace farming	3.86	2.82	4.85*
16	Crop rotation	4.54	4.34	1.23
17	Avoidance of overgrazing	4.48	4.09	2.30
18	Establishment of permanent water ways	3.62	3.39	0.93
19	Use of water-harvesting techniques such as digging pits.	2.36	1.96	1.96
20	Keeping the soil covered with growing plants	3.80	3.90	-0.50
	Total	77.29	68.30	
	Overall Mean	3.86	3.42	

Source: Field data (2006) *P ≤ 0.05.

attributed to the formal training they may have previously received in universities and colleges of agriculture. However, it is possible that the EAs did not effectively disseminate these techniques to farmers or that the materials necessary for the adoption of these techniques were not available locally to encourage their adoption. It is therefore necessary to involve farmers in agricultural programme development, so as to ascertain the comparative advantages prevalent in farmer's areas and also consider their priority needs. Engaging farmers in agricultural development programmes from the outset (identifying farm problems, project planning and implementation) leads to increased adoption of technologies being disseminated to them (Ozor and Madukwe, 2005).

Differences in perceived importance of SWC practices between extension agents and farmers

It became necessary to ascertain the perceived differences in importance placed by the two categories of respondents on the SWC practices examined in this study in order to identify areas where extra efforts are needed to be strengthened, so as to achieve high adoption rate of the SWC practices. This is because the importance placed on any particular practice determines the level of investment stakeholders can make on it. Consequently, the t-value analysis for differences in perceived importance of SWC practices between EAs and farmers showed

Table 4. t-values of differences in perceived importance on SWC practices between extension agents and farmers

S/N	SWC practices	EAs mean scores	Farmers mean scores	t-value
1	Placing plant rows and tillage lines at right angle to the normal flow of surface run-off.	3.84	3.51	1.42
2	Pit dug to protect and retain soil and water out flows	3.27	2.72	2.48
3	Alternate planting of different crops in strips	4.03	3.80	1.10
4	Application of organic manure to the soil	4.24	4.41	-0.90
5	Planting trees and shrubs around the farmland to control wind erosion	4.12	3.74	1.91
6	Grass strips alternating with crop strips on the same plot to check erosion e.g. use of vetiver grass.	3.84	3.54	6.51*
7	Using the straw to cover the plot after land preparation	3.86	3.51	1.55
8	Building dams	3.21	3.16	0.16
9	Ridging across the slopes	4.53	4.93	-0.75
10	Using tied ridges	4.01	3.00	4.83*
11	Irrigation – surface or sprinkler	3.71	3.26	2.09
12	Using combination of different crops	4.01	4.28	-0.14
13	Alternating period of cropping and period of fallowing	4.00	4.29	-1.71
14	Application of agro-chemicals e.g. lime and fertilizer	3.68	4.10	-1.82
15	Terrace farming	4.39	3.12	2.47
16	Crop rotation	4.28	4.30	-1.82
17	Avoidance of overgrazing	3.46	4.22	2.48
18	Establishment of permanent water ways	3.46	3.67	0.34
19	Use of water-harvesting techniques such as digging pits.	2.40	3.67	0.54
20	Keeping the soil covered with growing plants	3.80	2.11	0.34
	Total	76.42	72.77	
	Overall Mean	3.82	3.63	

Source: Field data (2006) *P ≤ 0.05.

significant difference in only two SWC practices as shown in Table 4. These were grass strips alternating with crop strips on the same plot to check erosion using, for example, vetiver grass (t= 6.51) and use of tied ridges (t= 4.83).

The EAs perceived the two SWC practices more significantly important than farmers for the same reason as already stated. According to the farmers, these techniques (grass strips alternating with crop strips on the same plot to check erosion and use of tied ridges) require special skills which must be acquired through training and demonstrations. Farmers therefore, needed to understand why grass strips should alternate with the crops in their farms as well as the advantages of using tied ridges. In areas where the availability of farmland is scarce, allowing grass strips may be difficult for crop farmers as they may tend to engage in continuous cropping.

On the other hand, farmers who engaged in mixed farming benefitted from such farming system as the grass strips serve as fodder for grazing livestock, while the manure from animals helps to enrich the soil for subsequent use by crops. However, it is interesting to observe that farmers perceived almost all other SWC practices as significantly important just like the extension agents. This shows that farmers acknowledged the importance of the SWC techniques disseminated by the extension agents and those they

learnt through experiences in their farms.

CONCLUSION AND RECOMMENDATIONS

The study examined the soil and water conservation (SWC) capabilities among farmers and extension agents in the Eastern region of Nigeria. Respondents were randomly selected from four states out of the nine states that make up the region. The states were; Abia, Enugu, Imo and Rivers States. Results from the major findings of the study showed that most extension agents operating in the region did not receive formal training and skills in agricultural extension discipline which should enable them effectively disseminate proven agricultural technologies to farmers. Results further showed that the extension agents and farmers were both knowledgeable in most of the SWC practices studied. Both categories of respondents also considered most of the SWC practices as significantly important in improving agricultural production in the region. However, there were statistical differences in the perceived knowledge and perceived importance of SWC practices by both the extension agents and farmers. The result showed that the extension agents had more knowledge of the SWC practices than the farmers and also perceived them as more important than the farmers. This was attributed to the formal trainings they received in higher institutions of learning and the regular fortnightly trainings they received from their offices.

Based on the foregoing, it was recommended that more efforts should be made to raise the capacity of farmers and extension agents in acquiring the relevant knowledge and adopting the SWC technologies needed to improve agricultural productivity in the region. One of such ways is for the responsible extension agencies to design specialized training on SWC techniques and technologies for the extension agents to enable them disseminate the same to farmers. Most importantly, the training should include skills in extension methods to enable them reach farmers most effectively and efficiently. On a longer term basis, institutions of higher learning offering agriculture should update their curriculum on emerging technologies for SWC practices with a view to training a crop of experts who will disseminate the same to farmers. Again, it should be made mandatory for agricultural extension officers to possess at least a diploma in agricultural extension. This will enable a cream of professionals who possess the requisite skills and knowledge of agricultural extension service to be entrusted with the extension system. In this way, the problem of ineffective dissemination of technologies to farmers due to lack of basic skills would have been addressed.

Furthermore, extension agents should use more integrated approaches in teaching farmers the best practices in SWC; including farm and home visits, use of demonstrations, audio visual facilities, print materials, and computer and telecommunication technologies. The mixture of extension methods enhances learning and practice. Extension agents should also visit their clientele farmers regularly to ascertain their farm needs and use it to design programmes for their clientele farmers.

On the other hand, farmers need to organize themselves in groups or cooperatives to be able to learn, adopt and boost their scale of operation in SWC practices. Most importantly, farmers should pool resources together to invest in SWC technologies that could enhance their farming operations and productivity. Finally, governments at all levels need to support farmers in adopting the modern techniques in SWC by providing some basic facilities to farmers. Facilities usually in demand by farmers in the region are; improved seeds and seedlings, inorganic fertilizers, credit facilities, processing and storage facilities, irrigation facilities, and technical advice through extension.

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