Asian Journal of Agriculture and Rural Development

journal homepage: http://aessweb.com/journal-detail.php?id=5005

Competency Capacity Building Needs of Crop Farmers in Soil Erosion Management in ENUGU State, Nigeria

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Abstract

This study sought to determine competency capacity building needs of crop farmers in soil erosion management in Enugu State, Nigeria. Four research questions guided the study. Descriptive survey research design was adopted for this study. The study was carried out in Enugu State. The population of the study was 3,562. The sample of the study was 279 drawn using quota sampling technique. The instrument used to collect data for the study was a structured questionnaire consisting of 84 items generated from review of literature. Three experts validated the instrument. Pearson product moment correlation method was adopted to determine the stability of the questionnaire items. A reliability coefficient of 0.84 was obtained. Two hundred and seventy-three copies of the questionnaire were retrieved and analyzed using weighted mean and Improvement Needed Index (INI) to answer the research questions. It was found out that crop farmers in Enugu State needed capacity building in 15 competency items in tillage, 11competency items in mulching, 10 competency items in cover cropping and 10 competency items in strip cropping for soil erosion management. It was therefore, recommended that the state government should direct the skill acquisition centres to integrate the identified competencies into their training programmes to retrain farmers in soil erosion prevention and control.

Keywords: Soil erosion, quota sampling, Enugu state

Introduction

Soil is the upper layer of the earth on which plants and animals grow and develop. Plaster (1992) defined soil as loose mineral and organic material on the surface that serves as a medium for the growth of plants. Emone (2003) explained soil as an outer weathered layer of earth's crust which has the potential to support plant and animal life. The submissions of the authors sited above suggest that soil provides a medium for the growth of plants. With reference to this study, soil is the uppermost layer of the earth's crust which has the potential to support plant growth, development and yield. Olaitan and Omomia (2009) explained that soil is a medium for plant growth and serves several functions such as a nutrient source, anchorage to plant and a medium for biological activity. The authors further stated that out of 16 elements needed by most plants; they obtain 13 from the

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soil. Soil is of great important to farmers as it supports the growth of their crops and yield. When the soil is not well managed, the particles and nutrients can be swept away by erosion through water, wind and human activities.

Soil erosion, in the view of Brandy and Weil (2009) is the wearing a way of land surface by running water, wind, ice or other geological agents including such as gravitational pull. Olaitan *et al.* (2011) noted that soil erosion is the detachment and transfer of soil particles from their original place to another by water, wind or human activities. The authors added that there are two major effects of soil erosion: positive and negative. The positive effects involve soil formation, deposition of alluvial soil on valley floor and at the mouth of river, creation of job opportunities for people and deposition of sand along water ways which can be used for building farmsteads. The negative effects, in the view Asogwa (2007) are not beneficial to man, animal and plant in that it leads to general decrease in soil fertility, displacement of population, loss of residential houses and farm crops, pollution of water resources, change in topography and disfiguration of roads. The effects of soil erosion through loss of soil particles, nutrients among others results in poor yield of crops. This implies that management of soil erosion is very necessary to enable soil retain its fertility for crop growth, development and yield.

Management, in the view of Anyakoha and Eluwa (2000) is planned activity directed towards the realization of value, the satisfaction of wants and accomplishment of desired goal. Kotler and Dan (2002) explained management as creative and systematic flow of knowledge that is applied to produce result by using human and other resources in an effective way. Morgan (1996) stated that the aim of soil erosion management is to maintain soil fertility and structure of the soil. Therefore, soil erosion management is the planned application of knowledge in the utilization of human and material resources for preventing or controlling soil erosion on the farm. It is a planned activity directed by farmers towards the maintenance of soil structure and fertility of the soil.

A farmer as defined by Olaitan (2005) is a person who grows plants or rears animals for the benefit of mankind. It is an individual who owns or manages a crop or an animal farm. In this study, a crop farmer is an individual who grows crops such as grain, cassava, vegetables, cocoyam, yam and others for the benefit of mankind. Okonkwo (2006) stated that farmers use various methods like crossbars, hedges, construction of local channels, digging of catchments pits and sand bags to prevent and control soil erosion. In Enugu State, the effective utilisation of each of the methods aforementioned, to a great extent, depends on competency of the farmer.

Competency as stated by Olaitan and Ali (1997) is the successful performance of a task through the use of knowledge, skills, attitude and judgement. Ogwo (2002) explained that competency is characterized by clearly stated, attainable and measurable objectives, followed by identified knowledge and skills that the learners have to master within a given time. Olaitan (2003) said that to be competent means that the individual has acquired knowledge, skills, attitude and judgement, which he requires in order to perform successful at a specific proficiency level in any given work. With reference to this study, competency is the acquisition of knowledge, skills and attitude needed by crop farmers for effective soil erosion management. The competency of a farmer is directly proportional to effective soil erosion management on his farm, all things being equal. That means that a competent farmer in soil erosion management is likely to prevent or control soil erosion on his farm and have a better crop yield than one who is not competent and has problem of soil erosion in his farm.

In Enugu State, the researchers observed that soil erosion is one of the most ecological problems faced by farmers. The effects of soil erosion through loss of soil particles, nutrients among others, have resulted into poor yield of crops and low supply of food crops to the market. Nevertheless, an opinion pull among some extension workers and crop farmers in the state, revealed that the majority of crops farmers have poor awareness of the causes, effects and measures for managing soil erosion. It shows

that crop farmers have low level knowledge and skills in the methods of soil erosion management while they have the potential and most tendencies to expand into large scale production of crops if their training needs in erosion control management are substantially satisfied and their interests well motivated in the occupation. This means that, to encourage crop farmers into large scale production, they need capacity building in soil erosion management.

Capacity building, in the view of Olaitan *et al.* (2009) is effort geared towards in proving an individual's level of knowledge, skills and attitudes essential in carrying out a given task. In reference to this study, capacity building is the process of improving the level of knowledge, skills and attitude possessed by crop farmers to enable them control and manage erosion for production of crops in large quantity to maximize profit and enhance their income. The purpose of this study therefore, is to determine the competency capacity building needs of crop farmers in soil erosion management in Enugu State, Nigeria. Specifically, the study sought to determine the competency capacity building needs of farmer in:

- Tillage operation,
- Mulching,
- Cover cropping and
- Strip cropping.

Methodology

Four research questions guided the study. Descriptive survey research design was adopted for this study. Olaitan *et al.* (2000) stated that descriptive survey research design is the plan, structure and strategy that the investigators wants to adopt in order to obtain solutions to research problems using questionnaire in collecting, analyzing and interpreting the data. Questionnaire was developed and used for collecting data from respondents.

The study was carried out in Enugu State, made up of three agricultural zones, Awgu, Enugu and Nsukka. (Enugu State Agricultural Development Project ENADEP, 2009). These zones are endowed with fertile lands which favour the growth of different types of crops but highly disturbed by soil erosion menace. This encourages equipping crop farmers with skills for effective soil erosion management and soil nutrient conservation. Therefore, the area was considered very suitable for conducting this study.

The population of the study was 3,562 made up of 484 teachers of Agricultural science in senior secondary schools, 38 agricultural Extension agents and 3,040 registered crop farmers from the three Agriculture Zones in the state (ENADEP, 2009). The sample of the study was 279 consisting of 59 teacher of Agricultural science, 38 Agricultural Extension agents and 182 crop farmers. The sample was drawn using quota sampling technique. Quota sampling in the view of Osuala (2005) is a non-probability method which aims to make the sample representative of the population by setting quota controls. Eboh (2009) stated that quota sampling ensures that a certain number of sample units from different categories with specific characteristic appear in the sample so that all characteristics are represented.

The instrument used to collect data for the study was a structured questionnaire consisting of 84 items generated from review of literature. The questionnaire was divided into two categories of competencies needed and competencies performed. The needed category had a 4 –point response scale of highly needed (4), averagely needed (3), slightly needed (2) and not needed (1) while the performance category had a 4-point response scale of high performance (HP), average performance (AP), low performance (LP) and no performance (NP), with a corresponding value of 4, 3, 2 and 1 respectively. Three experts validated the instrument, two from Department Vocational Teacher Education and one from Department of Soil Science, University of Nigeria, Nsukka. Their corrections and suggestions were used to produce the final copy of the questionnaire. Pearson product moment correlation method was adopted to determine the stability of the questionnaire items. A reliability coefficient of 0.84 was obtained. Three research assistants who were familiar with the area of the study were hired and given orientation on how to administer the questionnaire to the respondents.

Two hundred and seventy-nine copies of the questionnaire were administered to crop farmers. Two hundred and seventy-three copies of the questionnaire were retrieved and analyzed using weighted means and Improvement Needed Index (INI) to answer the research questions. To determine the capacity building needs of crop farmers, the following steps were taken.

The weighted mean of each item under the needed category was calculated.

The weighted mean of each item under performance category was calculated.

The difference between the two weighted means represented performance gap (PG) which indicated the level of capacity of the =PG was calculated.

Inference from the calculation was as follows
Where the performance gap (PG) equals zero (0) for each item, the farmers needed no capacity building because the level at which the competency item, was needed was equal to the level at which the farmers could perform the competency item.

Where the performance gaps (PG) was negative (-) for each item, the farmers needed no capacity building because the level at which the competency item was needed was lower than the level at which the farmers could perform the competency item.

Where the performance gap (PG) was positive (+) for each item, the farmer needed capacity building because the level at which the competency item was needed was higher than the level at which the farmers could perform the competency item.

Research questions
The following research questions guided the study:

What are the competencies in tillage for erosion management where crop farmer needed capacity building?
What are the competencies in mulching for erosion management where crop farmers needed capacity building?
What are the competencies in cover cropping for erosion management where crop farmers needed capacity building?
What are the competencies in strip cropping for erosion management where crop farmers needed capacity building?

Results

The results of this study were obtained from the research questions answered using data collected and analyzed.

The data for answering the research questions are presented in tables below.

Table 1: Performance gap analysis of mean ratings of the responses of crop farmers on competencies in tillage for erosion management where crop farmers needed capacity building (N=182)

S/N	Item statements in tillage	Xn	Xp	PG (Xn-Xp)	Remark
1	Mark out area to be tilled	3.84	2.12	1.72	CBN
2	Handle the implement	3.82	3.10	o.72	CBN
3	Cultivated to break up crusted soil	3.85	2.90	0.95	CBN
4	Determine the tillage depth depending on soil condition	3.39	2.73	1.08	CBN
5	Lift the soil collected with the implement	3.81	2.74	1.07	CBN
6	Twist the implement with the soil	3.39	2.63	0.76	CBN
7	Turn over the residues	3.58	2.80	0.78	CBN
8	Break up the soil clods	3.81	3.15	1.66	CBN
9	Stir or mix the soil with the implement	3.53	1.92	1.61	CBN
10	Bury the weeds properly with the implement	3.79	2.50	1.29	CBN
11	Prepare the land flat without ridges/beds	3.82	3.30	0.52	CBN

12	Make ridges/seedbeds and create furrow	3.63	3.01	0.62	CBN
13	Scrap the surface of the ridges to enhance in filtration	3.71	2.58	1.13	CBN
14	Smooth the surface of the seedbeds	3.77	2.50	1.27	CBN
15	Open furrow or hole for seed placement	2.60	1.66	0.58	CBN

Xn = Mean of needed, Xp = Mean of Performance, PG = Performance Gap, N = number of respondents, CBN = Capacity Building Needed

The data in table 1 revealed that the performance gap value of all the fifteen (15) items ranged from 0.52 to 1.29 and were positive. This indicated that farmers needed capacity building in all the fifteen competency items in tillage for erosion management.

Table 2: Performance gap analysis of mean ratings of the responses of crop farmers on competencies in mulching for erosion management where crop farmers needed capacity building (N=182)

S/N	Item statements in mulching	Xn	Xp	PG (xn-xp)	Remarks
1	Cut the materials to be used as mulch	3.84	3.49	0.35	CBN
2	Spread the materials to dry	3.61	1.25	2.36	CBN
3	Carry the mulch materials from home to farm	3.77	1.60	2.17	CBN
4	Spread by hand around germinated plants	3.81	2.85	0.86	CBN
5	For materials like straw or hay, use shredder to chop up the materials	3.67	1.99	1.68	CBN
6	Pile quite high 152mm or more of organic matter and settle over the season	3.68	2.76	0.92	CBN
7	Cover every part of the ridge or bed (complete mulching)	3.80	3.22	0.58	CBN
8	Cap or shed young tendrils or seedlings	3.69	3.13	0.56	CBN
9	Chop up mulch materials to make layers more permeable to water and speed up rotting	3.76	2.69	1.07	CBN
10	Avoid contact between leaves and mulches to prevent transmission of fungal diseases	3.59	2.61	0.98	CBN
11	Remove mulch after seed germination to prevent damage to the seedlings	3.81	2.88	0.93	CBN

Xn = Mean of needed, Xp = Mean of performance, PG = performance Gap, N = number of respondents, CBN = Capacity Building Needed.

The data in table 2 revealed that the performance gap value of all the eleven (11) items ranged from 0.35 to 2.36 and were positive. This indicated that crop farmers need capacity building in all the eleven competency items in mulching for erosion management.

Table 3: Performance gap analysis of mean ratings of the responses of crop farmers on competencies on cover cropping for erosion management where crop farmers needed capacity building (N = 180)

S/N	Item statement in cover cropping	Xn	Xp	PG (xn-xp)	Remarks
1	Select an appropriate site	3.69	2.24	1.45	CBN
2	Clear the site with suitable implement	3.57	2.83	0.74	CBN
3	Select suitable seed for planting	3.90	3.05	0.85	CBN
4	Carry out seed viability test	3.10	2.11	0.99	CBN
5	Loosen soil but do not over till	3.75	2.48	1.27	CBN
6	Break clumps and kill weed seedlings	3.75	2.22	1.56	CBN
7	Irrigate a few days before planting, the	3.29	1.77	1.52	CBN

	soil is dry				
8	Broadcast the seeds on the prepared land	3.79	2.80	0.99	CBN
9	Inspect the field and reseed any gap after one week of planting	2.84	1.75	1.09	CBN
10	Protect the farm from the outbreak of pests and diseases	2.86	2.06	0.80	CBN

Xn = Mean of needed, Xp = Mean of performance, PG = performance Gap, N = Number of respondents and CBN = Capacity Building Needed.

The data in table 3 revealed that the performance gap value of all the ten (10) items ranged from 0.74 to 1.56 and were positive. This indicated that crop farmers needed capacity building in all the ten competency items in cover cropping for erosion management.

Table 4: Performance gap analysis of mean ratings of responses of crop farmers on competencies in strip cropping for erosion management where crop farmers needed capacity building (N=182)

S/N	Item statement in strip cropping	Xn	Xp	PG (xn-xp)	Remarks
1	Draw the plan of the strip	3.39	1.79	1.60	CBN
2	Measure out position of the strip in the field using the plan.	3.59	1.88	1.71	CBN
3	Lay out the strip on long slops subject to inter rill and rill erosion.	3.81	2.85	0.96	CBN
4	Cultivate across the slope rather than within.	3.82	3.26	0.58	CBN
5	Determine the width of the strip.	3.45	2.77	0.68	CBN
6	Construct field strip not wider than 30m and narrower than 15cm.	3.55	1.89	1.66	CBN
7	Clear the soil of trashes in the areas to be tilled.	3.29	2.77	0.52	CBN
8	Till the soil.	3.80	3.24	0.52	CBN
9	Purchase the crops to be planted on the strips.	3.80	2.68	1.12	CBN
10	Plant at right angle to prevent wind.	3.61	2.85	0.76	CBM

Xn = Mean of needed, Xp = Mean of performance, PG = performance Gap, N = Number of respondents and CBN = Capacity Building Needed.

The data in table 4 revealed that the performance gap value of the ten (10) items ranged from 0.52 to 1.71 and were positive. This indicated that crop farmers needed capacity building in all the ten competency items in strip cropping for erosion management.

Discussion of the result

The result of the study revealed that crop farmers in the area of the study needed capacity building in fifteen (15)competency items in tillage, eleven (11) competency items in mulching, ten (10) competency items in cover cropping and ten (10) competency items in strip cropping for erosion management in Enugu State. The findings in tillage and its corresponding competency items were in agreement with the view of Brandy and Weil (1999) that outlined the following competencies in tillage practices; mark out area to be tilled, force the implement into the soil, determine the depth depending on soil condition among others.

The finding in mulching and its corresponding 11 competency items were in consonance with the view of Osinem (2005) who stated the following procedures for mulching: collect material such as saw dust wood, leaves, grasses, refuse, carry the mulch materials from home to the farm, and cover every part of the ridge or bed among others. The findings in cover cropping and its corresponding 10 competency items were in agreement with the view of Thomas, Robin, Russel, Hand Joesph (2008) who stated the procedures in cover cropping to include, select crop for planting, loosen soil but do not over till, break up clumps and others. The findings in strip cropping and its corresponding competency items were in consonance with Nwoke (2005) who outline the following

competency items in strip cropping: draw the plan of the strips, measure out the position of the strip in the field using the plan among others. The views and submissions of the authors cited above helped to add credence to the findings of this study.

Conclusion and recommendations

It was observed that crop farmers in Enugu State do not produce enough crops to meet up with the demand in the market due to the loss of land as a result of effect of soil erosion. This situation could be attributed to several factors such as the level of competencies possessed by crop farmers in erosion management. The study was carried out to determine competency capacity building needs of crop farmers in soil erosion management in Enugu State, Nigeria. This study found out that crop farmer in Enugu State needed competency capacity building in tillage, mulching cover cropping and strip cropping for erosion management. Based on the findings of this study, it was therefore, recommended that.

The state government should direct the skill acquisition centres to integrate the identified competencies into their training programmes to retrain farmers in soil erosion prevention and control.

Enugu State Government should utilize the identified competencies in soil erosion management in organizing improvement workshops for farmers on soil erosion management.

Agricultural extension agents should use the competencies identified to work more closely with farmers in retraining them in area of soil erosion management.

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