Ethiopian Journal of Environmental Studies and Management Vol. 6 No.5 2013

TRAINING NEEDS ASSESSMENT OF COCOA FARMERS ASSOCIATION MEMBERS ON SOIL MANAGEMENT TECHNIQUES IN CROSS RIVER STATE OF NIGERIA

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http://dx.doi.org/10.4314/ejesm.v6i5.13

Received 5th June 2013; accepted 26th August 2013

Abstract

The influence of soil fertility on the performance of any crop cannot be overemphasized. The study assessed cocoa farmers' training needs on soil management techniques in Cross River State of Nigeria. Study data were obtained from random sample of farmers belonging to Cocoa Farmers Association of Nigeria (CFAN) in Cross River State. Average age of respondents was 54.4 years while many (53%) were between ages 41–60 years. On soil management practices, 67.9% did not spend any money to maintain soil on their cocoa farms. Majority (83.4%) did not use any inorganic fertilizer to increase soil fertility. The findings also revealed that cocoa farmers need high level of training in the area of use of simple soil analysis tool to determine soil fertility (74.2%), handling of diseased and mummified pods removed from the farms (67.9%), record keeping on the soil management activities on the farm (87.5%) and appropriate methods of soil replenishment to encourage better yield (63.8%). Study's analysis showed that significant relationship exists between farmers' farming experience (r=0.56, p=0.03), farmers' income/ha from cocoa (r=0.45, p=0.00), farmers' educational status (r=0.35, p=0.04) and cocoa farmers' training needs on soil management practices in Cross River State, Nigeria. Study concluded that farmers need adequate information on how to manage soil for better yield and higher profit from cocoa farms.

Key words: *Cocoa, soil, training needs, Cross River, management techniques and Nigeria*

Introduction

Nigeria's cocoa production in 2011/12 is forecast to increase to 300,000 MT, up from 280,000 MT this year (GAIN, 2011). Cocoa is grown on a wide range of soil types and the standards for soil suitable for cocoa vary considerably. Cocoa trees are more sensitive to moisture stress than other tropical crops. In addition, cocoa trees are sensitive to water logging. While they can withstand flooding, they will not tolerate stagnant, water-logged conditions. Cocoa farmers of West Africa have always mentioned declining soil fertility as a major constraint to sustainable production. To date, the majority of farmers rely on soil nutrient replenishment through the recycling of leaf litter (STCP, 2006). According to Ogunlade *et. al.* (2009), Cocoa does not come up in coastal sandy soils where coconuts flourish. Most of the cocoa plantations in Nigeria are very old and there is dearth of forestlands for establishment of new cocoa plantation.

The soil nutrients in cocoa plantation are being mined annually via cocoa harvest (Ogunlade, *et al*., 2010). Ogunlade and Aikpokpodion (2006) in an assessment of soil nutrient status of cocoa plantation across cocoa ecologies of Nigeria reported that phosphorus is grossly inadequate for optimum cocoa yield. Application of fertilizer is inevitable for the replacement of soil nutrients that are being mined through cocoa pod harvest annually. Adequate use of fertilizer has been found to increase agricultural output. According to Olson (1970), fertilizer could increase food production by at least 50%. Opeyemi *et. al.* (2005) stated that an effective use of fertilizer on cocoa would help not only to improve yield but also has the advantages of profitability, product quality and environmental protection. Studies have shown that nutrient levels on cocoa farms are generally very low due to the relatively low use of inorganic fertilizers. The soil chemical fertility was significantly lower under cocoa compared to soils under forest, and this is often found under perennial crops (Hartemink, 2003).

Soil fertility decline is not just a problem of nutrient deficiency but also of: (i) inappropriate germplasm and cropping system design; (ii) interactions with pests and diseases; (iii) the linkage between poverty and land degradation; (iv) often perverse national and global policies with respect to incentives; and (v) institutional failures. Therefore, tackling soil fertility issues

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requires a long-term perspective and a holistic approach (Bationo *et. al.,* 2003). In Nigeria most cocoa plantation are very old and the production has been decreasing over the years.

This trend has been traced to soil depletion due the continuous usage without conscious efforts by cocoa farmers to replenish the soil. In recognition of importance of soil fertility in cocoa production, Dongo *et. al*. (2009) posited that the decline in cocoa production has been attributed to many factors including, the advent of the petroleum sector and its resultant effect in terms of massive movement of farm labour into the industrial, construction and service jobs created by the oil boom. Secondly, unattractive producer prices and deteriorating productivity due to aging trees, pests incidence, non-availability and high cost of cocoa production inputs, diminishing fertility of the soils and poor attention to cocoa plantations. Yondeowei and Kwarteng (2006) defined training need as the difference between the required level of individual competence and his present level of competence.

Allo (2001) pointed out that one of the main factors limiting the development of effective training programmes for agricultural professionals in developing countries is the inadequacy of information on their training needs. Training needs is meant to identify performance requirements, knowledge, skills, and abilities needed by an agency's workforce/individuals to achieve their required potentials. Identifying training needs in all aspects of agricultural production of farmers will help to enhance farmers' productivity for better yield and increased income. According to United State Office of Personnel Management an effective training needs assessment will help direct resources to areas of greatest demand. The assessment should address resources needed to fulfill organizational mission, improve productivity, and provide quality products and services.

A needs assessment is the process of identifying the "gap" between performance required and current performance. When a difference exists, it explores the causes and reasons for the gap and methods for closing or eliminating the gap. A complete needs assessment also considers the consequences for ignoring the gaps. Many authors (Appiah, *et al*., 1997, Aikpokpodion, 2010, and Gockowski, *et al*., 2012) have reported soil depletion and poor attention to soil management by cooca farmers as one of the factors responsible for low cocoa production in Nigeria. This shows that many cocoa farmers need training on soil management techniques to address the problem of soil depletion on cocoa farms, it is therefore necessary to identify the training needs of cocoa farmers on soilmmanagement techniques. This study assessed training needs of cocoa farmers association members on soil management techniques to cope with the low yield on cocoa farms in Cross River State, Nigeria.

Objective of the study:

The main objective of the study was to determine cocoa farmers' training needs on soil management techniques in Cross River State of Nigeria. Specific objectives of the study are to:

i describe the selected personal characteristics of the respondents;

ii find out the various soil management techniques of cocoa farmers in the study area; and

iii. identify the training needs of cocoa farmers in soil management techniques

Hypothesis tested

There is no significant relationship between respondent's selected personal characteristics and their training needs on soil management techniques.

Literature review on soil fertility/ farmers knowledge

The fertility of the soil greatly determines the performance of any crop at any point in time on the field. The problem of soil infertility has been traced to factors like farmers' inability to access fertilizers and other inputs required to replenish the lost nutrient from the soil, other factors such as land use pattern, farmers' inability to access credit facilities have been identified. The problem of soil infretility has been identified as one of factors responsible for the decline in cocoa production in Nigeria. Crop production involves a complex interaction between the environment, soil parameters, and nutrient dynamics. Because of this fact, the soil must be studied in terms of the productive potentials. Failure to understand these complexities has resulted in lack of good crop production and management techniques; hence agricultural production has tended to be low (Ololade *et al*., 2010).

Assessing soil fertility decline is difficult because most soil chemical properties either change very slowly or have large seasonal fluctuations. This decline includes; nutrient depletion, nutrient mining, acidification (decline

in pH and or an increase in exchangeable Al), loss of organic matter and increase in toxic elements (e.g., Al, Mn) (Hartemink, 2006). According to Ololade *et al*., (2010), it was reported that it is obvious that the dominant limiting factors of soil fertility include low organic matter content, low exchangeable minerals nutrients such as K and low soil CEC. Consequently, Ololade *et al*., (2010) advised cocoa farmers to increase organic matter for better soil cation exchange capacity and water holding capacity. This may include addition of farmyard manure, green manures, and/or crop residues and inorganic fertilizers.

Adewole *et al*. (2011) quoting Adegeye (1996) posited that over 50% of the total quantity of cocoa produced for export or utilized locally per annum comes from Ondo State. However, according to him, the production has declined in recent years; a fact attributed partly to poor soil quality. In Nigeria, and elsewhere in the tropics, extensive studies have been carried out on many tree crops including cocoa. Previous records on soil survey between 1951 and 1962, within the cocoa belts of Nigeria revealed that about 62% of Nigeria cocoa is grown on good or fairly good soils and the remaining thirty eight per cent on poor or very poor soil. Adewole *et al*. (2011) reported that Cocoa Research Institute of Nigeria (CRIN) has also shown experimentally that continuous cultivation of cocoa at same farmland leads to appreciable decline in physical and chemical properties of the soil. Soil fertility decline is considered as an important cause for low productivity of many soils (Sanchez, 2002). It has not received the same amount of research attention as soil erosion; probably because as soil fertility decline is less visible and less spectacular, and more difficult to assess (Ololade *et al*., 2010). In addition to Ololade *et al*. (2010), little resrach information is available on farmers' training needs in respect of soil management techniques.

In the tropics an increasing area is being depleted and converted to secondary forest, tree crops plantation and fallow (Ekanade and Orimoogunje, 2012). According to Ekanade and Orimoogunje (2012) in the case of farming whenever the forest is opened up for cultivation, the plant-soil equilibrium is disrupted. It has however, been observed that the cultivation of tree crops in the tropical rain forest region has brought a different dimension to agricultural practice and environmental conditions. The deterioration of organic matter content of the soil under tropical cultivation has been recognized as the chief cause of decline and falling productivity of the tropical soil.

Materials and Methods

Data for the study were obtained using simple random sampling technique to select farmers from Cocoa Farmers Association of Nigeria (CFAN) in Cross River State, one of the cocoa producing states in southern part of Nigeria. The state is the second highest cocoa producing state in Nigeria. The respondents were selected from three local government areas namely Etung, Boki and Ikom local government areas having 350, 248, and 218 cocoa farmers as members of CFAN respectively. To obtain the sample size for the study, 30% of respondents were selected from list of farmers in each local government areas using simple random sampling techniques, using the list of CFAN in the three LGAs. This resulted in total number of 244 respondents representing the sample for the study. After questionnaire administration, only 83.6% of the instrument was found useful for the study's analysis. The questionnaire was administered between May and November 2011.Pearson Product Moment Correlation (PPMC) was used in the analysis of the study.

Result and Discussions

Socio-demographic attributes of the of Respondents

Table 1 showed that 64.7% of the respondents were above 50 years while very few 18.6% were between ages 20 – 40 years. Average age of respondents was 54.4 years. This showed that aged people are still the ones engaged in Cocoa farming. This trend needs attention and youths have to be encouraged to take up cocoa farming as profession. The findings revealed that youth's involvement in cocoa production is low; it therefore shows that basic amenities that would encourage youths to show interest in rural areas' activities like cocoa farming have to be provided through joint efforts of all stakeholders involved in cocoa production. This is contrary to MMYE (2007) position where it was reported that 98.2 percent of the workers on cocoa plantation in Ghana fell within the age range 18 to 50 years. This shows that most workers on cocoa plantation were relatively young.

On respondents' educational status the study findings showed that few (31.4%) of the

respondents reported to have attained secondary school education, while 38.3% stated that they have at least primary school education. This shows that to some extent, the educational level of the respondents was averagely high. This finding is in support of (Adeogun, 2008) who found out from a study carried out among cocoa farmers in five cocoa producing states of Nigeria that, many of cocoa farmers (49.5%) have secondary school education while very few (11.4%) have attained tertiary educational level. The moderately high level of literacy of the respondents could be attributed to the interest being shown by youths in Cross River State in cocoa farming. Many youths in the state have gone into cocoa farming after their secondary school education due to government intervention in cocoa farming. This is quite different from what operates in southwestern Nigeria, where majority of the cocoa farmers are non-literate. The trend also supports the finding of (MASDAR International Consultants, 1998; Baah, 2006) that the cocoa farming population in Ghana is largely illiterate.

In respect of respondents' farming experience in more than half (55.4%) of the respondents had been in cocoa farming for over 20 years. This implies that over the years the respondents might have acquired enough experience in the management of depleted soil with locally available materials such as the cocoa pod husk (CPH) within their environment. The income per ha of the respondents showed that few (31.9%) realized less than 63.5USD/ha from their cocoa farm, while many (33.8%) realized between 324.1USD – 635.5USD /ha, while 25.5% made between 641.8USD –1280USD /ha on yearly basis. Few of the respondents (8.8%) realized over 1280USD USD /ha/annum from their farm. It can therefore be deduced that farmers' income from cocoa farming was low considering the high cost of production as claimed by the farmers during the study. The low income could be attributed to the high incidence of pests, diseases on cocoa farms and high soil depletion level of cocoa farm.

The farm sizes of the respondents in Figure 1 revealed that majority (61.3%) of the respondents are smallholder farmers having farm size ranging between 1 – 5 acres of cocoa farm. This is supported by Adeogun (2008) who reported that majority of farmers in a study carried out in 5 cocoa producing states in Nigeria have between 1- 5 acres of cocoa farm. This small size of farmland implies that farmers might be able to manage the small land size easily compared to when they have large hectare of farmland.

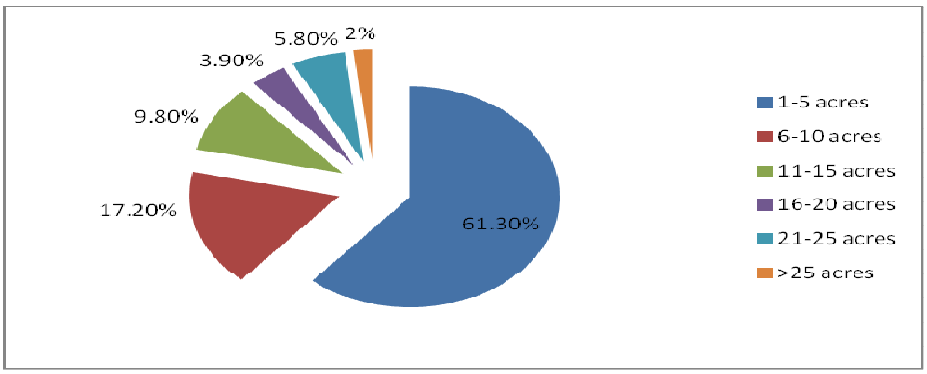

Figure 1 Pie chart showing respondents' cocoa farm size

Soil Management Techniques

Utilization of Cocoa Pod Husk (CPH) in Soil Management:

From Table 2, the respondents' responses showed that majority (62.3%) did not have knowledge of the usage of CPH in production of organic manure for soil management. Few (15.7%) of the respondents used CPH as organic manure on their cocoa farms to enhance its performance. The remaining 22% of the respondents claimed that they did not know CPH can be used as organic manure on cocoa farms. The low knowledge could be attributed to the low interaction between farmers and researchers on the issue of soil management. In addition, Figure 3 showed that very few (15.7%) of the

respondents used inorganic fertilizer such as NPK, Urea e.t.c. on their cocoa plantation to enhance soil performance, according to the respondents, their soil have been subjected to continuous usage for a long time. In addition to this as shown in Table 7, few (25%) of the respondents revealed that they spent money to maintain or manage soil on cocoa farms.

Interaction with cocoa farmers during the survey revealed that more farmers would have spent money to manage their soil, but they claimed proceed from cocoa farming was too small to sustain such interest. This is in line with Agbeniyi et al (2010) when it was reported some respondents (25.23%) claimed that they are not using fertilizer because the commodity is not always available. While 16.82% of the farmers said that fertilizer is too costly for them.

Cocoa Farmers Soil Management Activities

Table 3 revealed that cocoa farmers were involved in different activities to enhance soil nutrient and boost the yield from cocoa farms. These activities include; application of organic fertilizer, application of inorganic fertilizer, mulching application to reduce loss of soil moisture, planting of nitrogenous crops as intercrops and application of compost manure. Others include construction of drainage system to reduce flooding, planting of economic trees to reduce evaporation rate, recycling of leaf litters and removal of heaps of cocoa pod husk from the farm. The study showed that among these activities, many (60.8%) of the respondents, practiced recycling of leaf litters to enhance soil fertility. The least practiced among these activities are application of organic fertilizers (7.4%) and removal of heaps of cocoa pod husk from the farms (7.4%). Closely following these is mulching application (18.8%). The study showed that although farmers made use of many of these activities, level of usage was low.

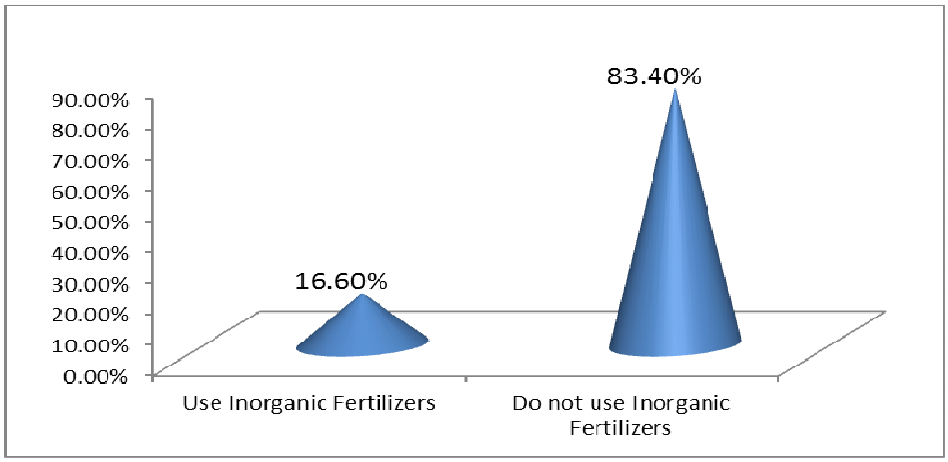

Figure 2 Conical chart showing cocoa farmers' utilization level of inorganic fertilizer

Cocoa farmer's training needs of soil management

In Table 4, the training needs of farmers were capture. The Table showed the various areas in cocoa soils management and extent to which respondents require training in these management techniques. The extent to which training was required was shown by indicating whether it was very low, low, high or very high. The findings from the Table 4 revealed that cocoa farmers need high level of training in the area of identifying indicators that help to detect declining fertility status of cocoa farm (74.2%), handling diseased and mummified pods removed from the farm (67.9%), record keeping of soil management activities on cocoa farm (87.5%) and appropriate methods of replenishing the soil to encourage better yield (63.8%). On the other hand, majority of the respondents (65.8%) and (65%) reported low training needs in knowledge of fertilizer recommendations in fertilizer application and knowledge of how to access credit facilities to manage soil management respectively. The study revealed that cocoa farmers in the stidy areas require training on soil management for effective management of their farms's soil.

Result and discussion of study's hypothesis

There is no significant relationship between selected respondents' personal characteristics of respondents and their training needs towards soil

management technoques in Cross Rivers State of Nigeria. The result of the inferential statistics in Table 5 showed significant relationship between respondents' personal characteristics and training need on soil management. The result showed that farming experience (r = 0.56, p = 0.03), income/ha/annum (r = 0.45, p = 0.00) and educational status (r = 0.12, p = 0.04) are significantly related with the training needs of respondents on soil management. This implies that those with long years of experience and higher income may have a better understanding of soil management techniques of cocoa farms; this may be due to experience and financial capability. Those with higher income will most likely be able to attend training to acquire knowledge on how best to manage farms' soil. In addition, the finding shows that educational levels will most likely influences farmers' training needs of soil management techniques. This simply implies that the more educated ones are able to manage their soil better. This could also be attributed to their exposures.

Conclusions and Recommendations

The study concluded that farmers require training on soil management techniques for better yield and higher profit from cocoa farms. The study however recommended the following; Stakeholders in cocoa industry such as government, Cocoa Farmer Association of Nigeria (CFAN), Licensed Buying Agents, Agro chemical providers, Cocoa Research Institute of Nigeria (CRIN) and others should organize training for farmers on appropriate ways of managing the soil for better yield.CRIN may also take up the challenges of training farmers on the use of cocoa pod husk in production of organic manure, to replenish their cocoa farm land, To encourage effectiveness of the ADPs staffs, the Cocoa Development Units (CDU) of Agricultural Development Projects (ADPs) should work closely with CRIN to aquire necessary knowledge from CRIN on soil management techniques. Such knowledge will help CDU staff to train cocoa farmers on soil management. The current Agricultural Transformation Agenda of the present goverment should give the training of cocoa farmers on soil management required attention since soil depletion significantly affects farmers' yield, finally Government should make fertilizer available at subsidize rate to assist farmer in soil management.

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Table 1 Frequency distribution showing Socio-demographic of the respondents n=204

Age categories	**Frequency**	**Percentages**
20 - 30 years	18	8.8
31- 40 years	20	9.8
41 – 50 years	34	16.7
51 – 60 years	74	36.3
>60 years	58	28.4
Total	**204**	**100.0**
Educational Status		
No formal education	93	45.5
Primary	14	6.9
Secondary	64	31.4
Tertiary	33	16.2
Total	**204**	**100.0**
Farming experience		
10yrs	23	11.3
10 – 15yrs	24	11.8
16 – 20yrs	44	21.5
21 – 25yrs	50	24.5
26 – 30yrs	30	14.7
30yrs	33	16.2
Total	**204**	**100.0**
Income/ha		
<63.5USD	35	17.2
69.9USD – 317.7USD	30	14.7
324.1USD – 635.5USD	69	33.8
641.8USD – 953.2USD	31	15.2
959.6USD –1280USD	21	10.3
> 1280USD	18	8.8
Total	**204**	**100.0**

(Exchange rate: 1USD =157.4 Naira)

Table 2 Frequency distribution showing farmers' usage of CPH Utilization of inorganic fertilizer production, n = 204

CPH	**Frequency**	**Percentage**
No Idea of Usage	127	62.3
Utilized CPH	32	15.7
Have idea of CPH usage but do not use	45	22.0
Total	**204**	**100.0**

Table 3 Frequency distribution showing frequency of using soil management techniques, n = 204

Soil management techniques	Usage of techniques		Frequency of usage		
	Yes	No	Regularly	Occasionally	Rarely
Application of organic fertilizer	15(7.4%)	189(92.6%)	2(13.3%)	10(66.7%)	3(20.0%)
Application of inorganic fertilizer	50(20.8%)	190(79.2%)	16(32.0%)	22(44.0%)	12(24.0%)
Mulching application to prevent loss of soil moisture	45(18.8%)	195(91.2%)	15(33.3%)	10(22.2%)	20(44.5%)
Planting of nitrogenous crops as intercrops	89(37.1%)	151(62.9%)	21(23.6%)	49(55.1)	19(21.3%)
Application of compost manure	76(31.7%)	164(68.3%)	45(59.2%)	14(18.4%)	17(22.4%)
Construction of drainage system to reduce flooding	50(20.8%)	190(79.2%)	25(50.0%)	20(40.0%)	5(10.0%)
Planting of economic trees to reduce evaporation rate	67(27.9%)	173(72.1%)	37(55.2%)	24(35.8%)	6(9.0%)
Planting of young cocoa seedlings in gaps on the farm for optimum soil utilization	146(60.8%)	94(59.2%)	99(67.8%)	40(27.4%)	7(7.1%)
Removal of heaps of cocoa pod husk from the farm	15(6.3%)	225(93.7%)	12(80.0%)	0(0.0%)	3(20%)

Table 4 Frequency distribution showing cocoa training needs of soil management techniques in Cross River State, n = 204

S/NO	Management Techniques	Very High	High	Low	Very Low
1.	Knowledge of indicators that help to detect declining fertility status of cocoa farm.	178(74.2%)	17(7.1%)	34(14.1%)	11(4.6%)
2.	Knowledge of the appropriate fertilizer on cocoa farm	120(50%)	45(18.7%)	40(16.7%)	20(8.3%)
3.	Conversion of cocoa pod husk into organic manure	110(45.8%)	39(16.3%)	74(30.8%)	17(7.1%)
4.	Handling of diseased and mummified pods removed from the farm	163(67.9%)	35(14.6%)	12(5.0%)	30(12.5%)
5.	Usage of leaf litters in organic manure production	43(24.2%)	130(62.5%)	23(9.61 %)	29(12.1)
6.	Record keeping on the soil management activities on the farm	210(87.5%)	4(1.7%)	12(5.0%)	14(5.8%)
7.	Knowledge of where to source information on soil management	4 2(17.5%)	10(4.2%)	23(9.6%)	165(68.8%)
8.	Appropriate methods of soil replenishment to encourage better yield	153(63.8%)	29(12.1)	43(17.9%)	15(6.3%)
9.	Knowledge of where to access unadulterated fertilizers to manage their farm soil	123(51.3%)	43(22.9%)	34(14.2%)	28(11.7%)
10.	How to attendance workshop/training regularly to acquire knowledge on soil management	101(49.6%)	64(31.6%)	43(17.9%)	20(8.3%)
11.	Knowledge of fertilizer recommendations in fertilizer application	23(9.6%)	40(16.7%)	158(65.8%)	19(7.9%)
12.	Knowledge of how to access credit facilities to manage soil management.	46(19.2%)	23(9.6%)	156(65.0%)	15(6.3%)

Table 5 Pearson Product Moment correlation showing the significant relationship between respondents' personal characteristics and cocoa farmers' training needs on soilanagement techniques

Independent Variables/	r–value	COD (r^2)	p – value	decision	%
Traning needs					
Farming Experience	0.56	0.31	0.03	Sig	31%
Income/ha/annum	0.45	0.20	0.00	Sig	20%
Educational Status	0.35	0.12	0.04	Sig	12%
Age	0.43	0.18	0.08	Not Sig	18%
Marital Status	0.68	0.46	0.09	Not Sig	40%

COD (r^2) = Coefficient of determination