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Adoption of Integrated Pest Management among Cocoa Farmers in Cross River and Osun States of Nigeria

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Abstract

The determinants of adoption of IPM among cocoa farmers were investigated in Cross Rivers State, 271 trained cocoa farmers were systematically selected out of 2704 while in Osun State 107 were selected out of 1070. Structured questionnaire was used to obtain data on respondents' socio-economic characteristics, enterprise characteristics and benefits from IPM. Data were analysed using descriptive statistics and Chi-square. The mean age of the respondents across the states was 48.52±11.37 years. The total mean yield value was 1006.22kg. More yield (0.98±0.135) was ranked by the respondents as the most important benefit to them, followed by higher product quality (0.97±0.159) and higher income (0.96±0.206). In overall result there was significant relationship of sex (X^2 =130.38) and benefit of IPM. Adoption of IPM increased income and yield among trained respondents. Training of farmers on IPM in all cocoa producing states should be intensified.

Keywords: Integrated pest management, Cocoa farmers, Farmers Field School

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Introduction

Cocoa serves as an important crop around the world: cash crop for growing countries and a key import for processing and consuming countries. Cocoa has a high food value because it contains as much as 20 percent protein, 40 percent carbohydrate, and 40 percent fat. It is also mildly stimulating because of the presence of theobromine, an alkaloid that is closely related to caffeine (International Cocoa Organisation, 2012).

Total World production has increased in absolute terms from 3.98 million metric tonnes in 2011-2012 to 4.158 million metric tonnes in 2015 (Table 1) Change in production has not been linear. It has however, fluctuated in various patterns among the different regions. Africa has been and is projected to remain the principal cocoa producer. The four major West African cocoa producers, the Ivory Coast, Ghana, Nigeria and Cameroon, together account for about two-thirds of world cocoa production. Outside of West Africa, the major producers of cocoa are Indonesia, Brazil, Malaysia, Ecuador, and the Dominican Republic (International Cocoa Organisation, 2015).

Table 1: Production of cocoa beans (thousand tons)

	2012/2013	2013/2014	2014/2015
Africa	2836	3198	2978
Cameroon	225	211	230
Côte d'Ivoire	1449	1746	1750
Ghana	835	897	696
Nigeria	238	248	210
Others	89	96	93
America	622	722	744
Brazil	185	228	230
Ecuador	192	234	250
Others	246	260	264
Asia & Oceania	487	450	435
Indonesia	410	375	350
Papua New Guinea	41	36	42
Others	36	39	43
World total	3945	4370	4158

Source: ICCO Quarterly Bulletin of Cocoa Statistics

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Nigeria was the second leading cocoa producer in the world in the 1970s but due to a combination of factors, such as incidence of pest and diseases cocoa production declined. The main insect pests of cocoa are brown mirids; *Sahlbergella singularis and* black mirids; *Distantiella theobroma* which had caused damage of an estimated loss of 100,000 tonnes while the main disease of cocoa is the 'Black pod' disease caused by *Phytophthora palmivora* and *Phytophthora megakarya* which had caused a total loss of 100% in some cocoa producing countries of the world and 75% loss in Nigeria (Asogwa, Anikwe and Ndubuaku, 2004).

Mitigating the adverse effects of pesticides has become a focus for many research programmes. For example, a diverse range of non-chemical pest control options have been introduced by International Institute of Tropical Agriculture/Sustainable Tree Crop Programme (IITA/STCP) in farmer field school (FFS) training which include biological, cultural control (including the manipulation of planting dates and cropping patterns such as crop diversity and crop rotation), plant-host resistance, genetic transformation and hand removal of infected plants.

However, there is a lack of understanding of the benefits derived from the adoption of IPM technologies on farming systems in Nigeria. The overall objective of the IITA/STCP IPM FFS training in Nigeria is to improve the well-being of farmers. IPM can help farmers realize economic and health benefits. A knowledge gap exists on the adoption of IPM practices which this study sought to fill. There are factors which may either be barriers to or enhancers of benefits of adoption. The factors could be a complex set of interactions or conditions involving the technology, the institutions, the potential/targeted adopter or the general setting in which the technologies are introduced. Hence, this study will address various IPM practices that are being utilized and identify benefits derived from its adoption.

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Objectives

The main objective of this study was to ascertain the benefit of integrated pest management among farmers in selected states of Nigeria. The specific objectives of this study were to:

- identify the socio-economic characteristics of respondents;
- ascertain the enterprise characteristics of respondents; and
- identify the benefits derived from IPM adoption by trained cocoa farmers.

Hypotheses of the study

Ho1. There is no significant relationship between selected socio-economic characteristics and benefits of IPM adoption.

Methodology

Study area

The study was carried out in two states (Cross River and Osun states), which falls into two agro-ecological zones (Mangrove/Swamp forest and Tropical Rainforest zones) in Nigeria where cocoa is cultivated.

Sampling procedure and sample size

Multi stage sampling technique will be used to select two Agro-ecological zones from seven zones while two states; Cross River and Osun will be purposively selected from the Mangrove/Swamp forest and Tropical Rainforest zones based on the training centres of the IITA/ STCP. A total of 2714 farmers were trained on IPM in Cross River and 1073 in Osun states by IITA/STCP. A total of 378 IPM trained respondents (271from Cross River and 107 from Osun state) were randomly selected from the IITA/STCP farmers' field school (FFS) participants' list using a systematic random sampling technique. A structured questionnaire was used to elicit information on Interview schedule was used to elicit information on socio-economic

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characteristics, enterprise characteristics and benefits derived from IPM adoption Descriptive and inferential statistics were used for data analysis. Chi-square was used to test hypothesis at $\alpha_{0.05}$.

Results and Discussion

Socio-economic characteristics

Male respondents in Cross Rivers and Osun states were 83.4% and 69.2% while females were 16.6% and 30.8% respectively. The result reveals that 79.4% of the total respondents were males as shown in Table 2. This is an indication that more males are involved in cocoa farming IPM adoption than the females. In Nigeria, most traditional culture limit women in acquiring land for tree crops cultivation which however affects gender issues in agricultural production and technology adoption. This justifies mixed evidence regarding the different roles men and women play in technology adoption. This finding is in line with Adeogun, Olawoye and Akinbile (2010) who opined that rural women farmers are constrained by social and institutional factors including access to inputs, modern technologies, education and land ownership. These factors limit rural women ability to improve agricultural production and the well-being of their families.

Table 2 reveals that few (29.5%) of the respondents' age were between age 21-40 years while 8.5% fall between age 61-80 and majority (62.0%) were between the age range of 41 and 60 years in Cross Rivers State. In Osun State few (24.3%) of the respondents' age were between age 21-40 years while 23.4% fall between age 61-80 and the remaining (52.3%) were between the age range of 41 and 60 years. The result across the states reveals that most (59.3%) of the respondents were between 41-60 with a mean age of 48.52 which indicates that most of them are still in their prime age and would be ready to learn and apply the skill of IPM techniques in their farms. This finding is supported by Ejechi (2015) that farmers of age 41-60 were still at their productive age. According to Few youths are involved in cocoa farming which could affect IPM techniques adoption negatively as some of the techniques are

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labour intensive. Age is a factor thought to affect adoption and it is said to be a primary latent characteristic in adoption decisions. This study supports the findings of

Uwagboe *et al* (2012) who stated in their study that most of the farmers trained on IPM were still in their prime age and would be ready to adopt IPM.

Farming experience of the respondents as shown in Table 2 reveals that many (46.9%) of the respondents in Cross Rivers State had between 11-20 years of experience in cocoa farming while in Osun State 52.3% of the respondents had between 11-20 cocoa farming experience. In the overall result, 48.4% of the respondents had 11-20 years in cocoa farming experience with a mean of 18.85±9.21; therefore, they might be expected to have higher proclivity to adopting IPM technology. Farmers' experience in farming count more than educational attainment in order to increase their productivity (Nwaru, 2004) while Ogungbile *et al*. (2002) opined that the length of time of farming business can be linked to the age of farmers, access to capital and experience in farming which may explain the tendency to adopt innovations and new technology such as IPM.

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Table 2: Distribution of respondents on socio-economics characteristics

Socio economic variables	Cross River state Percentage (n=271)	Osun state Percentage (n=107)	Total Percentage(n=378)	Mean	SD
Sex					
Male	83.4	69.2	79.4		
Female	16.6	30.8	20.6		
Age				48.52	11.37
21-40	29.5	24.3	28.0		
41-60	62.0	52.3	59.3		
61-80	8.5	23.4	12.7		
Farming experience				18.85	9.21
1-10	24.3	15.9	22.0		
11-20	46.9	52.3	48.4		
21-30	22.9	13.1	20.1		
31-40	4.8	13.1	7.1		
41-50	1.1	5.6	2.4		

Source: Field survey, 2015

Result in Fig. 1 shows that in Cross Rivers State majority (92.3%) of the respondents were educated with primary (29.2%), adult education (3.7%), secondary (33.2%) and Tertiary (26.2%) while 7.7% had no formal education. In Osun State most (71.0%) of the respondents had formal education while 29.0% had none. Across the states, most (96.9%) of the respondents had one form of formal education or the other while very few (13.8%) had no formal education. Education is very vital in technology adoption as it helps in quick assimilation of the innovation. This finding revealed that most of the respondents were literate. It is evidence that formal education has a positive influence on adoption of IPM innovation and supports the findings of Oluyole (2005), who posited that high literacy level will predispose farmers to adopt and use improved farm practices. Mohanty (2013) opines that individual is likely to be more receptive to the modern technologies, because education empowers individuals in

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terms of decision making, problem solving and change proneness, hence that leads to the understanding that since most of the respondents in the array of the study are

having secondary level of education they may be considered as potential adopter of IPM technologies.

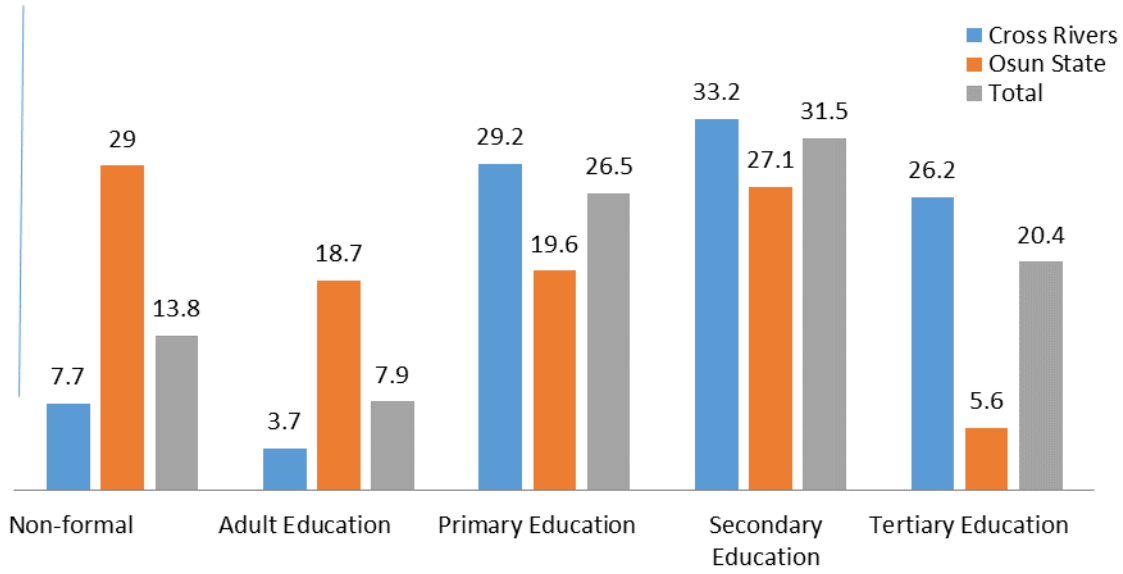

Figure 1: Educational qualification of respondents
Source: Field survey, 2015

Respondents' enterprise characteristics

The yield of cocoa beans is measured in terms of kilogrammes harvested in the last cropping season as presented in Figure 2. The results show that the trend in the yield was almost the same in Cross Rivers and Osun State as majority (61.9%) and (82.2%) respectively produced 1000kg and below which implies that they are smallholder farmers. In Cross Rivers State 24.7% produced 1001-2000kg, 7.8% produced 2001-3000kg, 3.0% produced 3001-4000kg while very few (2.6%) produced more than 4000kg. In Osun State 15.0% produced 1001-2000kg, 2.8% produced 2001-3000kg while none produced more than 3000kg. The total mean value (1006.22kg) was moderate for both states. The level of cocoa production in this study could be due to moderate adoption of the IPM technology by the

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respondents. The result corroborates the findings of Famuyiwa (2014) that majority of the farmers were not producing at maximum level which could be as a result of farm age, insect pests and disease incidences and not adhering to recommended practices.

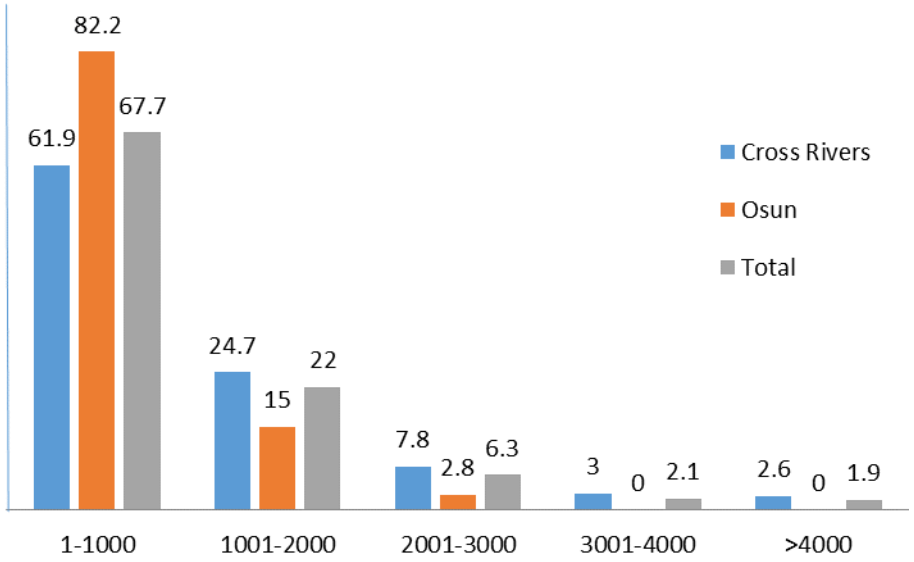

Figure 2: Distribution of respondents based on yield
Source: field survey, 2015

Respondents' income

In Cross River State most (74.9%) of the respondents earned more than ₦200, 000 and some (15.5%) earned over ₦800, 000 which is enough to sustain IPM adoption among the farmers. Only few (25.1%) of the respondents earned less than ₦200, 000. In Osun State, most (57.0%) of the respondents earned below ₦200, 000 while some (43.0%) earned above ₦200, 000. Among the respondents that earned above ₦200, 000, some earned above ₦800, 000 which is reasonable income for a farmer to remain in adoption of IPM practices. The overall result shows that most (65.9%) earned more than ₦200,000 while few (34.1%) earned below ₦200,000. The mean of the income generated in Cross Rivers State was (485223.01±554099.29) while Osun had (244703.80±206111.08). The income generated from any agricultural investment serves as motivation to the farmer to adopt an innovation. The income generated by majority of the farmers is adequate to sustain the implementation of

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IPM adoption in their cocoa farms. This will increase the rate of adoption of the technology by the respondents. The high income could be attributed to good farm maintenance, reduction of pest and diseases incidence as well as adequate access to information on IPM implementation through the FFS training especially in Cross Rivers State. According to Arimi (2015) farmers income may affect technology utilization because low income farmer may find it difficult to invest on technology that would enhance farm productivity.

Table 3: Distribution of respondents based on income generated

Income generated (₦)	Cross Rivers State Percentage (n=271)	Osun State Percentage (n=107)	Total Percentage (n=378)
<200,000	25.1	57.0	34.1
200,001-400,000	29.5	24.3	29.4
400,001-600,000	20.3	13.1	17.5
600,001-8,000,000	9.6	1.9	6.9
>800,000	15.5	3.7	12.1
Total	100.0	100.0	100.0

Mean=485223.01, SD±554099.29 Mean =244703.80, SD±206111.08، Mean =417139.25 SD±493560.28
Source: field survey, 2015

Benefits of the Respondents

The result in Table 4 shows the respondents' perceived benefits from the IPM farmers field school (FFS) training. More yield (0.98±0.135) was ranked by the respondents as the most important benefit to them, followed by higher product quality (0.97±0.159), higher income (0.96±0.206), as a result of their involvement in FFS training in Cross Rivers State. In Osun State, more yield was ranked highest

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with a mean of (1.00±0.000), this was followed by higher product quality and higher income (0.99±0.097). The overall result shows that more yield was ranked highest with a mean of (0.99±0.114), followed by higher product quality (0.98±0.144), higher income (0.97±0.182). The other benefit items to all the respondents were reduction in pesticide use, (0.91±0.283), more healthy trees (0.90±0.298), less pest (0.89±0.308), better environment (0.84±0.368), higher pest resistance(0.80±0.401), better soil condition (0.69±0.463), lower cost (0.67±0.470) and less labour required (0.57±0.496). It could therefore be inferred that cocoa farmers in the study area had benefited from adoption of IPM which reflected in terms of improved knowledge and skill acquisition in cocoa production as well as economic gains in terms of yield and income. This finding is supported by the findings of Ajayi and Okafor (2006) that FFS farmers usually derive much benefit from FFS training which lead to the improvement of their welfare.

Table 4: Distribution of respondents based on benefits from IPM adoption

Benefits from IPM	Cross Rivers State			Osun State			Total		
	Mean	SD	Rank	Mean	SD	Rank	Mean	S.D	Rank
a) More yield	0.98	0.135	1st	1.00	0.000	1st	0.99	0.114	1st
b) Higher product quality	0.97	0.159	2nd	0.99	0.097	2nd	0. 98	0.144	2nd
c) Higher pest resistant	0.75	0.434	9th	0.93	0.264	4th	0. 80	0.401	8th
d) Higher income	0.96	0.206	3rd	0.99	0.097	2nd	0. 97	0.182	3rd
e) Better environment	0.84	0.366	7th	0.83	0.376	6th	0.84	0.368	7th
f) More healthy trees	0.89	0.319	5th	0.94	0.231	3rd	090	0.298	5th
g) Lower cost	0.73	0.444	10th	0.52	0.502	7th	0.67	0.470	10th
h) Less labour required	0.71	0.454	11th	0.20	0.399	9th	0.57	0.496	11th
i) Reduction in pesticide use	0.93	0.256	4th	0 .87	0.339	5th	0.91	0.283	4th
j) Better soil condition	0.76	0.428	8th	0.51	0.502	8th	0.69	0.463	9th
k) Less pest	0.88	0.328	6th	0.93	0.248	4th	0.89	0.308	6th

Source: field survey, 2015

Table 5 reveals that significant relationship exists between sex (X^2 =120.9, p<0.05), age (X^2 =315.8, p<0.05), education (X^2 =96.6, p<0.05) farming experience (X^2 =422.4, p<0.05) and benefit of IPM adoption in Cross Rivers State while in Osun

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State the same variables were significant. In the result of overall States there were significant relationship of sex (X^2 =130.4, p<0.05), age (X^2 =449.8, p<0.05), education (X^2 =67.7, p<0.05) farming experience (X^2 =750.4, p<0.05) and benefit of IPM adoption The null hypothesis is rejected as all variables show significant relationship. The contingency coefficient (CC) shows very weak relationship of the variables with adoption behaviour; sex 5.5%, marital status 16.6%, education16.8%, religion 27.1%

This finding is supported by the study of Huffman (2001) who posited that education expands individual scope of inference and paradigm, whereas training re-enforces individual's experience and up-grade the skills for effective implementation of any novel technology. Education enhances individual farmer's ability to access and process agricultural information, and the application of information in improving on-farm activities. Educational status is assumed to influence cocoa production technologies positively because with higher level of education the farmer would be in a position to technically and economically assess the new crop or technology to clear doubts and uncertainties associated with it and enhance its adoption. The significant relationship of sex implies that men and women have roles to play in the adoption of IPM in cocoa farms. However, cocoa farming is labour intensive which is confirmed by Oladipupo *et al*. (2010) findings that men are more decisive, aggressive, logically ambitious and have strength to withstand the rigours of farming. According to Aneani (2012) since cocoa farming is dominated by male farmers, it is expected that more male cocoa farmers would adopt technologies than their female counterparts, other things being equal. This is because women have less access to credit and land as collateral than men, as well as relying mostly on hired labour which is scarce due to migration of the rural youth to the urban areas to seek for jobs with relatively better remuneration.

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Table 5: There is no significant relationship between selected socio-economic characteristics and benefits of IPM adoption.

Variables	**X^2**	**P**
Sex	120.9	0.000
Age	315.8	0.000
Education	96.6	0.000
Farming experience	422.4	0.000
Osun State		
Variables	**X^2**	**P**
Sex	15.7	0.000
Age	64.9	0.002
Education	18.2	0.001
Farming experience	149.3	0.000
Total		
Variables	**X^2**	**P**
Sex	130.4	0.000
Age	449.8	0.000
Education	67.7	0.000
Farming experience	750.4	0.000

Source: field survey, 2015

Conclusion and Recommendations

The farmers rated more yield as the highest benefit derived from IPM adoption. Sex, age, education and farming experience had significant relationship with the benefit of IPM adoption.

More youths should be encouraged to take up cocoa farming to enhance sustainability of IPM adoption. The encouragement could be through the availability and accessibility of soft loans from government and Banks to youth farmers. Establishment of two FFS in all the 14 cocoa producing states in Nigeria to facilitate the training of farmers on IPM technology which will increase adoption and farmers' income. The farmers need to be given more extension support to increase their

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knowledge in IPM to enhance productivity. This could be done through regular monitoring of farmers' activities by extension agents

References

Adeogun, S.O., Olawoye, J. E. and Akinbile, L.A. (2010). Information sources to cocoa farmers on cocoa rehabilitation techniques (CRTs) in selected states of Nigeria. *Journal Media and Communication Studies*, 2(1): 9-15.

Ajayi, M.T. and Okafor, C. (2006). Extension Agents' perception of participatory agricultural extension approaches adopted by Agricultural Development Program (ADP) in Ondo State, Nigeria. *Int. J. Agric. Biol. Sci*., 4(1): 20-25.

Aneani F., Anchirinah V. M, Owusu-Ansah, F. and Asamoah, M. (2012). Adoption of Some Cocoa Production Technologies by Cocoa Farmers in Ghana Sustainable Agriculture Research Vol. 1, No. 1.103-117

Asogwa, E.U., Anikwe, J. C. and Ndubuaku, T.C.N. (2004). Reports and recommendations on the evaluation of Kizan KJ – 16 Knapsack sprayer for protection of cocoa farms in Nigeria. Tech. Rep. CRIN, Ibadan, Nigeria, P4.

Ejechi, M. E. (2015). Determinants of Adoption of Cassava Technologies by Male Farmers in Nasarawa State, Nigeria. *Journal of Agricultural Extension.* 19(1): 122-131

Famuyiwa B. S, Torimiro, D. O., Obatolu, B. O., and Uwagboe, E. O. (2014). Preventive Measures Adopted by Nigerian Farmers for the Environmental Hazards in Cocoa Plantations. *Journal of Agricultural Extension* Vol.18 (2):99-111

Huffman, W.E. (2001). Human capital: Education and agriculture, in: G.L Gardner and G.C. Rausser, eds Handbook of Agricultural Economics, Vol. 1B, Amsterdam, TheNetherland: Elsevier Science

International Cocoa Organization (2012). Introduction to cocoa market. Supply: Production http://www.bloomberg .com/news/2012-01-17/Accessed March 2014

Oluyole, K.A, Adebiyi S, Adejumo M.O. (2007). An Assessment of the Adoption of Cocoa Rehabilitation Techniques among Cocoa Farmers in Ijebu East Local GovernmentArea of Ogun State, Nigeria. *Journal of Agricultural Research and Policies*.:2(1):56-60.

Uwagboe, E. O. (2011) Effect of integrated Pest Management (IPM) utilisation on cocoafarmers' yield in selected states of Nigeria. Unpublished M.phil thesis. University of Ibadan, Faculty of Agriculture and Forestry.