Cocoa Farmers' Participation in Farmer Field School Approach in Abia State, Nigeria

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Abstract

The study analyzed cocoa farmers' participation in Farmer Field School Approach in the three cocoa producing Local Government Areas of Abia State namely; Bende, Ikwuano and Umuahia North. Purposive and multistage random sampling technique was used in selecting 240 cocoa farmers (120 Farmer Field School Cocoa farmers and 120 non Farmer Field School Cocoa farmers). Instrument for data collection was through a structured questionnaire and were analyzed with descriptive statistics and tobit regression analysis. Results indicate that farmers were actively involved in the training of cocoa technologies in agrochemical application with mean ratings of ($\bar{x}$=3.77), pruning techniques ($\bar{x}$=3.75), fertilizer application ($\bar{x}$=3.60), cocoa marketing ($\bar{x}$=3.58), plantation establishment ($\bar{x}$=3.50), cocoa bean storage ($\bar{x}$=3.40), nursery establishment, and nursery establishment and cocoa bean processing ($\bar{x}$=3.20) respectively. The tobit regression estimates of extent of farmers' participation in the programme reveals that household size, education farming experience, labour use and attendance to trainings were critical determinants to farmers participation. The result of paired "t" test showed that farm size, farm output and farm income of beneficiary Farmer Field School Cocoa Farmers were significantly higher than the non Farmer Field School Cocoa Farmers at 1.00% level of probability. Bad road network ($\bar{x}$=3.59), price fluctuation of dried cocoa beans ($\bar{x}$=3.47), inadequate land ($\bar{x}$=3.31), inadequate incentives ($\bar{x}$=3.22) and location of school ($\bar{x}$=3.13), were identified constraints to farmers participation in the programme. Policies aimed at providing rural infrastructures, subsidy on farm inputs and review of Land Use Act of 1990 were advocated for effective farmers' participation and increased cocoa production.

Keywords: Participation, Cocoa, Farmers, Field School, Approach

INTRODUCTION

Agricultural development which involves improved land use techniques, mechanisation of production process, crops and animal improvements, better pest and diseases of crops and animal control techniques, crops and animal nutrition, conservation of natural resources, and modern methods of agro information delivery are part of the broad process of socio-economic changes which take place at farm levels and other levels of the society (Agbamu, 2006). Cocoa is grown in fourteen states of Nigeria, which include Abia, Akwa Ibom, Cross River, Delta, Edo, Ekiti, Ogun, Ondo, Osun, Oyo, Kogi, Kwara, Adamawa, and Taraba states (STCP, 2006). In Nigeria an average small scale farmer generates less than 5 bags of dried cocoa beans (estimated at 300kg per hectare) per season, considering return on investment and production capacity (Oluyole, 2005). For crops such as cocoa, this has been grown in West Africa (including Nigeria) since the early 1900s. Nigeria produces about 250,000 metric tonnes of cocoa (Adesina, 2012). Nigeria as developing country had long ago commercialized her cocoa production and was rated the second highest producer of cocoa in world ranking until 1971, when its export declined from 21, 6000 to 15000 metric tonnes in 1986 thus, reducing the country's market share to about 6% and to the fifth largest world producer of cocoa with about 385,000 metric tonnes per annum, an increase of 215,000 metric tonnes from the year 2000 (Erelu, 2008). By these ratings Nigeria competed favourably with other front liners in cocoa industry like Ivory Coast, Indonesia and Ghana. Prior to the oil boom of the

mid 70's cocoa was one of the highest foreign exchange earners in Nigeria and for a long time the crop has been generating substantial foreign earnings for the country (Onwumere and Alimba, 2010).

The cocoa sector still offers a large sizable number of people employments both directly and indirectly (Oluwale, 2004). Cocoa serves as a source of foreign exchange and employment (Olayemi, 1973; Abang, 1984; Folayan *et al*., 2006). Cocoa is used for drinks such as chocolate, for candies, cosmetics, soap and pharmaceuticals. Cocoa and its processed product like chocolate contain flavanol, which has a cardiovascular health benefit (Schroeter *et al*., 2006; Taubert *et al*., 2007). Similarly, Davison *et al*., (2010) reported that flavanol rich cocoa lowers human blood pressure. One of the major ways that cocoa farmers receive information is through extension services. However, in most cocoa producing countries, cocoa extension services/agents are inadequate (David *et al*., 2006).Information is important in generating and disseminating agricultural technologies. Adequate information is an integral part of agricultural development. The quality of information required has the potentials of improving efficiency in all the spheres of agriculture, the associated issue of food security, the need to increase yield, the need to improve quality and the need to avoid costly mistakes (Ebewore and Emuh, 2013). The farmers need to participate in agricultural development programmes because, the beneficiaries, through involvement, develop greater responsiveness to new method of production, technologies and higher services offered. In the last twenty years, many efforts have been made in trying to change research and development in agriculture to better involves farmers, (LEISA, 2006). According to Hellin *et al*., (2006), the most effective way for participatory research processes to benefit a greater proportion of farmers is by close coordination and collaboration with organizations that are better placed to link farmers and researches due to their relatively long-term contact with farmers. These organizations focus on development, they ensure that research results reach greater number of farmers and that in the process more farmers are empowered (Ajani and Onwubuya, 2010).

In the early seventies, Nigeria operated many agricultural programmes. Despite all these programmes, the performance of agricultural sector has continually fallen below expectation, and the output from agricultural sector especially cocoa, is not making a significant impact on the nation's economy. Low productivity in cocoa has been blamed on poor farmer maintenance practices, planting low yielding varieties and incidence of pest and diseases (Anon and Abekoe, 1999). To revamp cocoa and declining trend in production, the country has taken bold step by setting up the National Development Committee (NCDC) on 2nd December, 1999. The committee was to promote cocoa production through designing and implementation of programmes involving new planting stock and rehabilitation of old plantations (STCP, 2006).

In order to fill this technology dissemination gap, government through the National Cocoa Development Committee has adopted the Farmer Field School Approach as a vehicle for farm extension delivery. Farmer Field School Approach (FFSA) is a participatory training approach that can be considered both as an extension tool and a form of adult education. It focuses on building farmers capacity to make well-informed crop management decision through increased knowledge and understanding of the agro-ecosystem. Farmer Field School participants make regular field observations and use their findings, combined with their own knowledge and experience, to judge for themselves, what, if any, action needs to be taken (David *et al*., 2006).

In view of the stated facts this paper tends to analyze extent of farmers' participation in cocoa production through Farmer Field School Approach in Abia State. Specific Objectives were to; describe socio-economic characteristics of cocoa farmers' in the study area, ascertain levels of cocoa farmers' participation in Farmer Field School technologies, determine the influence of socio-economic factors on the extent of cocoa farmers participation in the programme, compare the effect of the programme between participating and non participating cocoa farmers' cocoa farmers' farm size, farm output and farm income and ascertain farmers constraints to participating in the programme.

Hypotheses

H_{O1}: Socio-economic variables such as age, household size, education, farm size, labour use, farming experience, farm income, chemical use and attendance to trainings do not influence cocoa farmers' participation in the programme.

Ho_2: There is no significant difference between participating farmers farm size, farm output and farm income.

METHODOLOGY

Bende, Ikwuano and Umuahia North and Ikwuano Local Government Areas (LGA's) were purposively chosen because they were the major cocoa producing areas in the state. Multistage random sampling technique was used in selecting participating cocoa farmers. First, two (2) Farmer Field Schools each were randomly selected out of the four (4) schools that make up the LGA's; **Bende- (**Okpooenyi and Isiala schools), **Ikwuano-** (Iberenta and Itunta schools) and **Umuahia North-** (Okweyi and Azueke schools). This gave a total of six (6) Farmer Field Schools. Finally, twenty (20) participating cocoa farmers each were randomly selected from the selected schools to give a total of one hundred and twenty (120) farmers. Also, one hundred and twenty (120) non Farmer Field School cocoa farmers (FFSC) were selected from the areas were the participating farmers were chosen to give a grand sample size of two hundred and forty thousand (240) farmers.

Data were collected on farmers' socioeconomic characteristics, participation in Farmer Field Schools, influence of socio-economic factors on the participation of cocoa farmers in the programme, effect of participating in the programme on cocoa farmers' farm size, farm output and farm income and constraints they faced in their participation in Farmer Field Schools. Participation in Farmer Field School was measured on eight – item scale comprising types of training conducted amongst cocoa farmers in Farmer Field School in Abia State. Occasionally, Seldom, Never and were scored as 4, 3, 2 and 1 respectively. Constraints to farmers' participation in Farmer Field School were also measured in eight – item statement comprising list of possible constraints. It was operationalised ; high, moderate, low and no constraint as scores of 4,3,2 and 1 were assigned respectively. Objectives 1, 2 and 5 were analyzed with descriptive statistics such as frequency counts, percentages and mean scores, objectives 3 and 4 were achieved with tobit regression analysis and paired "t" test respectively.

Model specifications

The tobit regression analysis is expressed thus;
Since the level of participation of cocoa farmers, cannot be negative (the threshold is zero) the dependent variable can be written using an index function approach.

$Ii = B^T X + ei$ ---------- (1)

$Yi = O$ if $Ii = T$ ---------- (2)

$Yi = I$ if $I > T$ ---------- (3)

Where,

Y represents a limited dependent variable, which simultaneously measures the decision to participate in the technologies and intensity of participation.

I^x is an underlying talent variable that indexes participation.

T is an observed threshold level

X is the vector of independent variables affecting participation.

βi is a vector of parameters to be estimated

ei = error term.

If the non variable T becomes a continuous function of the independent variables and O otherwise for t he generated case, the value of log likelihood function is given as, empirical model are presented below;

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9 + ei)$

Y = level of participation in technologies (measured by numbers of participation scores of the respondents)

X_1 = Farmers age (in years)

X_2 = Household Size (Number)

X_3 = Educational status (measured by the number of years a farmer spent in school)

X_4 = Farm Size (Hectares)

X_5 = Labour Use (Man days)

X_6 = Years of farming experience

X_7 = Farm income (table amount in Naira a farmer realized from his farm)

X_8 = Chemical Use (Litres)

X_9 = Attendance to Trainings (Number of times)

ei = Error term

The paired treatment test is explicitly stated in accordance with Nwaobiala, (2013)

$$t = \frac{x_1 - x_2}{\sqrt{\frac{s^2 1}{n1} + \frac{s^2 2}{n2}}} \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

$n_1 + n_2 - 2$ degrees of freedom..... (5)

Where "t" = Student "t" statistic

$\overline{X}_1$ = Sample mean for FFSC farmers

$\overline{X}_2$ = Sample mean for Non FFSC farmers

S^2_1 = Sample variance for FFSC farmers

S^2_2 = Sample variance for Non FFSC farmers

n_1 = Sample size for FFSC farmers

n_2 = Sample size for Non FFSC farmers

RESULTS AND DISCUSSION

Socio-economic characteristics of cocoa farmers in the study area

Table 1 shows the socio economic characteristics of both farmer groups. The result shows that the mean ages of FFSC farmers were 49.50years as against 51.67% of Non FFCS farmers. Also, FFSC farmers and Non FFSC farmers had mean farming experience of 18.50 years and 19 years respectively. Farming experience had been shown to enhance the participation and adoption of improved farming techniques, thereby increasing output (Nwaobiala and Onumadu, 2010). The Table also reveals that the mean farm size of FFSC farmers was 4.5 hectares while, the Non FFSC farmers had 4 hectares. This result conforms to the findings of (Onwumere and Alimba, 2010). The mean annual farm income of FFSC farmers and Non FFSC farmers were N1.556m and N1.124m respectively.

Table 1: Mean distribution of selected socio-economic characteristics of Farmer Field School Cocoa Farmers and Non Farmer Field School Cocoa Farmers in the study area. (N= 120 FFSCF and N= 120 Non FFSCF)

	FFSC FARMERS	NON FFSC FARMERS
Variables	Mean	Mean
Age (years)	49.50	51.67
Farming Experience (years)	18.50	19.00
Farm Size (Hectares)	4.50	4.00
Annual Farm Income (N)	1.556(M)	1.124 (M)

M= Million

Levels of cocoa farmers' participation in Farmer Field School

The result in Table 2 shows the levels of farmers' participation in the programme technologies in the study area. The Table indicates that a moderate proportion of cocoa farmers ascribed training in chemical application (fungicide, herbicide among others) (29.12%) with mean rating of 3.77 as technology they occasionally participated. Also, training in pruning techniques (34.83%) and fertilizer application (23.33%) with mean ratings of 3.75 and 3.60 respectively were technologies farmers were actively involved. Williams *et al*., (1998) affirmed that application of fertilizer and Diuron against black pod infestation has proved to be effective. Pruning of cocoa branches and fertilizer application are important techniques in cocoa production that enhances cocoa output (Obatunde *et al*., 2003). Furthermore, the cocoa farmers participated in training on marketing of cocoa dried beans (28.33%), plantation establishment (35.83%) and storage technologies (25.83%) with mean ratings of 3.58, 3.50 and 3.40 respectively. Finally, a moderate proportion of cocoa farmers 26.67 % and 21.67% always participated in processing and nursery technologies with mean ratings of 3.0. This implies that the farmers were actively involved in the technology, since the mean is greater than 3.0. This result confirms that all the technologies disseminated by Farmer Field School facilitators were yield enhancing which increases cocoa production in the study area.

Factors influencing cocoa farmers' participation in Farmer Field School in Abia state

Data on Table 3 shows the tobit regression estimates of the determinants of farmers' participation in the programme technologies in Abia State, Nigeria. The Chi^2 (χ^2) is highly significant at 1.00% level of probability, indicating goodness of fit of the regression line. The coefficient for household size (0.8026) was positively signed and highly significant at 1.00% level of probability. This implies that increase in household size will lead to a corresponding increase in intensity of participation in Farmer Field School. Nwaru, (2004) reported that large household sizes are expected to enhance labour availability especially where the household members are of labour age especially in cocoa production that requires more labour.

The coefficient of education (0.5761) was positive and significant at 5.00% level of probability. This implies that as education increases the probability of participating in the programme increases. This is in agreement with *a prior expectation*. Generally education is thought to create a favourable mental attitude for the acceptance of new practices especially of information intensive and management practices (Caswell *et al*., 2001 and Onyenweaku *et al*., 2010). The coefficient of labour (0.1897) was

positively signed and highly significant at 10.00% level of probability. This implies that increase in labour will lead to increased participation in Farmer Field School. This is expected and in accordance with a*priori* expectation.

The coefficient for farming experience (0.3171) was positively signed and highly significant at 1.00% level of probability. This is in agreement with *aprior expectation*. The positive sign implies that as farming experience increases, the tendency for farmers' participation in the programme technologies increases. The positive effect of farming experience is thought to stem from accumulated knowledge obtained from years of observations and experimenting with various technologies (Bonabana-Wabbi and Taylor, 2008).

Attendance to trainings made positive effect (0.3308) on participation and is highly significant at 1.00% level of probability. This result is in consonance with the findings of Nwaobiala and Onumadu, (2010), where they found positive relationship between training and participation in Rural Extension project.

Therefore, the null hypothesis of factors influencing farmers' participation in the programme is hereby rejected.

Table 2: Levels of participation of cocoa farmers in Farmer Field School in Abia state

FFS Training Cocoa Technologies	**Always**	**Often**	**Occasionally**	**Seldom**	**Never**	**TFFS**	**Mean**
Training in Nursery Establishment/Techniques	85(17)	128(26.67)	132(36.67)	28(11.67)	13(10.83)	386	**3.20**
Training in Plantation Establishment	130(21.67)	140(35)	129(35.83)	20(8.33)	6(5)	425	**3.50**
Training in Agro Chemical Application	165(27.50)	164(34.17)	105(29.17)	16(6.67)	3(2.5)	453	**3.77**
Training in Pruning Techniques	165(27.50)	172(35.83)	90(25)	20(8.33)	4(3.33)	451	**3.75**
Training in Fertilizer Application	180(30)	112(23.33)	99(27.50)	32(13.33)	7(5.83)	430	**3.60**
Training in Cocoa Bean Storage	155(25.83)	116(24.17)	90(25)	36(15)	12(10)	409	**3.40**
Training in Cocoa Bean Processing	160(26.67)	92(19.17)	66(27.50)	50(20.83)	18(15)	386	**3.20**
Training in Cocoa Marketing	170(28.33)	128(26.67)	93(25.83)	32(13.33)	7(5.83)	430	**3.58**

Table 3: Tobit regression estimates of determinants of cocoa farmers' participation in Farmer Field School technologies in Abia state, Nigeria

Variables	**Parameters**	**Coefficients**	**Standard Error**	**t-ratio**
Age	X_1	0.1021	0.1279	0.84
Household Size	X_2	0.8026	0.2853	2.83***
Educational status	X_3	0.5761	0.2340	2.50**
Farm Size	X_4	3.8870	4.4647	2.81***
Labour Use	X_5	0.1807	0.1091	1.74*
Farming experience	X_6	0.3171	0.0643	4.93***
Farm income	X_7	0.0794	0.0651	1.22*
Chemical Use	X_8	-0.0002	-0.0003	-0.53
Attendance to Trainings	X_9	0.3308	0.5655	3.62**
Constant		45.8295	13.679	3.36***
LR Chi^2	χ^2	55.68***		
Prod. Chi^2		0.01		

*, ** and *** significant at 10.00%, 5.00% and 1.00% respectively.

Comparing the effect of Farmer Field School participation on Farm size, Farm output and Farm income

Farm sizes:

The farm sizes of the farmer groups were statistically analysed and compared (Table 4). The mean farm sizes of FFSC farmers were 4.87 hectares while that of the Non FFSC farmers was 3.54 hectares. The difference in mean farm size between the two farmer groups was 1.33 hectares. The result of calculated "t" test was 5.36 which are greater than the tabulated "t" of 3.58, is statistically significant at 1.00% level of probability. This result is not surprising, because the cocoa field school farmers expanded their enterprise by planting improved varieties of cocoa seedlings.

Farm output:

The output of both farmer groups were statistically compared and analysed. The result shows that the mean output of FFSC farmers was 20,656.53kg (2.65 tons), while the Non FFSC farmers were 12,576.85kg (1.26 tons). The mean difference was 8,079.68kg. The result of calculated "t" test (5.41) was greater than tabulated "t" (3.58) and is significant at 1.00% level of probability. This implies that the output of beneficiary farmers were significantly higher than the non beneficiary farmers. This may be attributed to access to yield enhancing technologies by the beneficiary cocoa farmers

Farm incomes:

Farm incomes generated from the sales of seed yams by both farmer groups were statistically compared. The mean annual farm income for the beneficiary farmers was N3.639, 268 while, the Non beneficiary farmers had N2, 316,685. The difference in mean annual farm income between the two groups of farmers was N1322, 583. The result shows that the calculated "t" was 6.22 which are greater than tabulated "t" of 3.58 is highly significant at 1.00% level of probability. It therefore shows that the REP farmers had more income than the Non REP farmers. The result is in agreement with the findings of Nwaobiala, (2010) where farm incomes of Agip - Green River Project (GRP) farmers were significantly higher than the Non GRP farmers in the Niger Delta Regions of Nigeria.

Therefore, the null hypothesis of no significance difference between farm size, farm output and farm income of both farmer groups is hereby rejected.

Table 4: Paired T- test result for the difference in farm size, farm output and farm income of FFSC Farmers and Non FFSC Farmers (120 = FFSC Farmers and 120 = Non FFSC Farmers)

Group Pairs	Group Mean	Standard Deviation	t-calculated	t-tabulated
FFSCFFS	4.87			
NFFSCFFS	3.54			
Pair 1: FFSCFFS – NFFSCFFS	1.33	2.72	5.36***	3.58
FFSCFFO	20656.53			
FFSCFFO	12576.85			
Pair 2: FFSCFFO – NFFSCFFO	8079.68	16353.34	5.41***	3.58
FFSCFFI	3639268			
FFSCFFI	2316685			
Pair 3: FFSCFI – NFFSCFI	1322583	212468.4	6.22***	3.58

*, ** and *** significant at 10.00%, 5.00% and 1.00% level of probability respectively.

Where,
FFSCFFS = Farmer Field School Cocoa farmers farm size
NFFSCFFS = Non Farmer Field School Cocoa farmers farm size
FFSCFO = Farmer Field School Cocoa farmers farm output
NFFSCFO =Non Farmer Field School Cocoa farmers farm output.
FFSCFI = Farmer Field School Cocoa farmers farm income.
NFFSCFI = Non Farmer Field School Cocoa farmers farm income.

Constraints to participation of cocoa farmers in Farmer Field School

The constraints to participation of cocoa farmers in the programme are shown in Table 5. The results indicate that 77.50% of cocoa farmers complained of bad road network with mean of 3.59 as a major constraint. Asiabaka (2008) identified inadequate land and rural infrastructure (roads) as major constraints to farmers' participation in Nigeria agricultural programmes. Also, a good proportion of farmers (70.83%) and 53.33% claimed that price fluctuation of processed cocoa bean and inadequate land with mean ratings of 3.47 and 3.31 respectively were constraints. Inadequate incentives (57.50%) such as defraying transportation costs to training venues, fertilizers and agrochemicals and among others and location of school (52.50%), with mean ratings of 3.22 and 3.13 respectively were also perceived constraints to effective participation of farmers in Farmer Field School Approach in the State. Eremie (2006) assert that incentives to farmers' increases participation and ownership of their investments.

Table 5: Constraints to Cocoa Farmers' Participation in Farmer Field School in the study area

Constraint Items	High Constraint	Medium Constraint	Low Constraint	No Constraint	Mean
Bad Road Network	372(77.50)	15(4.17)	44(36.67)	--(--) 431	**3.59***
Location of School	252(52.50)	33(9.17)	90(37.50)	1(0.83) 376	**3.13***
Infrequent Visits by Facilitators	136(28.33)	120(33.33)	45(12.50)	20(16.67) 321	**2.67**
Inadequate Incentives	276(57.50)	54(15)	6(13.33)	10(8.33) 386	**3.22***
Poor Awareness of the Programme	176(36.67)	69(19.17)	84(35)	11(9.17) 340	**2.83**
Non Follow-up of Recommended Practices	84(17.50)	96(26.67)	48(20)	68(56.67) 296	**2.46**
Bad Perception on Past/ Similar Programme	196(40.83)	57(15.83)	68(28.33)	18(15) 339	**2.82**
Price Fluctuation	340(70.83)	27(7.5)	46(19.17)	3(2.5) 416	**3.47***
Inadequate Land	256(53.33)	69(19.17)	58(24.17)	14(11.67) 397	**3.31***

Decision Rule 3.0 and above is Constraint
Less than 3.0 is no Constraint
High Constraint (5), Constraint (4), Moderate Constraint (3), Low Constraint (2), No Constraint (1)
Values in parentheses are percentages.

CONCLUSION AND RECOMMENDATIONS

The study had revealed that Farmer Field School Approach played a complementary role in extension delivery and technology dissemination in the State. The high level of participation had shown that the technologies transferred were beneficial to cocoa farmers by increasing their farm size, farm output and farm income. The study showed that household size, education, farming experience, labour use and attendance to trainings were factors that influenced to farmers participation in the programme.

The study therefore recommends that;

1. Review of the Land Use Act of 1990 in Nigeria will facilitate access to land by landless peasantry who produce bulk of the agricultural produce.
2. The programme should subsidize farm inputs such as fertilizer, improved cocoa seedlings and herbicides and ensure timely supply of

these inputs taking cognizance of the fact that farming is time bound.

3. Rural infrastructural facilities such as good feeder roads, electricity and pipe borne water, among others need to be provided by relevant agencies to curb youth rural-urban migration. These facilities would help to adding value to cocoa processing and in turn increased pricing.
4. Since education had positive influence on cocoa farmers' participation, deliberate policy should be enacted to strengthen access to education to farmers. In order to achieve this, adult education centres should be located in the rural areas to complement Farmer Field School Approach stated objectives.

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