Determinants of Adoption of Cocoa Rehabilitation Techniques among Cocoa Farmers in Boki Local Government Area of Cross River State, Nigeria

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Abstract

The study assessed the determinants of cocoa rehabilitation techniques (CRTs) among farmers in Boki Local Government Area (LGA) of Cross River State, Nigeria. The study employed a multistage random sampling technique to select cocoa farmers. The first stage was a purposive selection of the LGA. A total of eighty seven (87) cocoa farmers were randomly selected in the LGA. Well-structured questionnaire was used to elicit information from the farmers. CRTs considered in the study were coppicing, complete replanting, side grafting, top grafting, phased farm replanting, fertilizer application and planting under cocoa trees. Data was analyzed using simple descriptive statistics (means, frequencies, percentages), and inferential statistics. Semi-log function was chosen based on the R^2 value and number of significant variables. About 77.0% and 96.6% percent of the farmers were male and married, respectively. Mean age, household size, farming experience, age of cocoa farms and variance inflation factor (VIF) were 46years±10, 12±7,24 years ±9 and 18 years±10 and 1.75, respectively. It was revealed that age of farmers, farming experience and educational level of farmers significantly determined CRTs at 1 percent level of probability, respectively. Therefore, it is thus recommended that cocoa farmers in the study area should be encouraged to stay on the farms through provision of infrastructure to reduce rural-urban migration. Credit should be made accessible to the farmers so that they will be able to afford the costs involved in the practice of CRTs. CRIN and other stakeholders in cocoa production should ensure that farmers are encouraged to adopt and practice other CRTs.

Keywords: Determinants, Cocoa Rehabilitation Techniques, Cocoa farmers,

Introduction

Nigeria is the World's fourth largest cocoa producer after Ivory Coast, Ghana and Indonesia, producing about 12 percent of the total world production and Nigeria is the third producer in Africa (World Cocoa Foundation, 2014). Cocoa is the most prominent export crop in Nigeria in terms of production and export capacities (Nwachukwu *et al*., 2012). According to Adebile and Amusan (2011) cocoa contributes about 15 percent to the total Nigerian export in 1970 and also contributes $900 million to Nigeria's economy in 2012 (The *Sun,* 2013). Nigeria's cocoa production in 2011/12 was put at 300,000 MT, up from 280,000 MT in 2011. The projected increase is based on a favorable weather outlook and significantly higher grower prices, which encouraged farmers to increase the cultivated area (David and Nzeka, 2011). Nigeria's cocoa production continued to increase both in absolute quantity and as a proportion of total world production. Export of cocoa products from Nigeria was $822.8 million in 2010. This represents about 35 percent of the $2.32 billion earnings from non-oil

exports in 2010 for Nigeria (Mejabi, 2012). However, the main importers of cocoa from Nigeria are United States of America, Spain, France, Germany and Netherlands. Cocoa and its products exported from Nigeria to these countries include cocoa beans (whole or broken, raw or roasted), chocolate and other food preparations containing cocoa, cocoa paste (whether or not defatted) cocoa powder and cake and cocoa butter (World Cocoa Foundation, 2014). The abundance of suitable land and availability of farm labour enabled the peasant farmers to expand their cocoa hectarage without having to give up the production of their traditional crops (Oni, 2000). However, the fortune of cocoa turned upside down with the discovery of oil in large quantity and this has brought a downward trend in Nigerian cocoa production and position in the world market (Ayoola *et al,* 2000). It was reported that Nigerian cocoa output declined from 399, 200 tonnes in 2010 to about 298, 029 tonnes in 2016 with a growth rate declining from 16.2% to about 12.2% during the period (FAO, 2019). Cote d'voire which was placed at a distant third position in Africa with 143,000 tonnes behind Nigeria's 196,000 tonnes in 1970 is now the largest producer of cocoa in the whole world with 12, 824, 717 tonnes while Nigeria with 298,029 tonnes is currently the fourth largest producer after Cote d'ivoire, Ghana and Indonesia (FAO, 2019; ICCO, 2015).

Rehabilitation as a word has been used in many different ways and contexts. It has long not had a merging conceptual framework. Traditionally, the word has been used to describe a range of responses to incapability. Rehabilitation in this context is to enable cocoa farms with weaknesses to attain and maintain their maximum potentials during their life cycle.

According to Opeke (2005), rehabilitation is in two ways, the first is putting a cocoa field back into good condition, while the second way is clearing the old cocoa trees and replanting with young seedlings. It should be noted that the former way is seen to be more preferable to the farmers. This is because, it is cost effective, it enhances early maturity of cocoa trees and it generates quick returns to the farmers than the later. Rehabilitation techniques developed by the Institute include coppicing, complete replanting, side grafting, top grafting, phased farm replanting, fertilizer application and planting under cocoa trees. Empirical studies have been carried out by some authors on the number of years the productivity of cocoa tree is observed to be diminishing. The highest cocoa yield is achieved between 15 and 25 years and a profitable life span may be 50 years. In addition, yield declines gradually and production cost rises steadily from the 26th year of planting (Montogomery, 1981; Olaiya, 2001).

Over the years, some of these cocoa trees are seen to be diminishing in productivity due to old age and lack of adequate knowledge of rehabilitation of the old farms among the farmers. Hence, to address these issues, Cocoa Research Institute of Nigeria (CRIN) developed various Cocoa Rehabilitation Techniques (CRTs). This was done to regenerate old cocoa trees on cocoa farms and improve the income and livelihood of the farmers. In addition, it was observed that farmers are usually unwilling to destroy an old farm. In a bid to sustain and perhaps improve Nigeria's position on global scale in cocoa production, Cocoa Research Institute of

Nigeria (CRIN) has developed and disseminated different improved production packages on cocoa to farmers in Nigeria. These efforts have achieved some of its objectives. Productivity among farmers has been greatly enhanced and income increased. The study thereforess addressed the question of type of techniques, farmers' knowledge of cocoa rehabilitation techniques, and factors that determined cocoa rehabilitation techniques among farmers.

Objectives
The specific objectives of the study were to: profile the socio economic characteristics of the farmers in the study area ascertain types of cocoa rehabilitation techniques prevalent in the study area ascertain farmers knowledge of cocoa rehabilitation analyse the determinants of cocoa rehabilitation techniques among farmers in the study area

Methodology
The study was carried out in Boki Local Government Area (LGA) of Cross River State, Nigeria in 2016. Boki LGA has a population of about three hundred persons. It is bounded in the West by Ogoja, North by Obudu, South by Ikom Local Government Areas (LGAs). The study area is an agrarian LGA. Major crops grown include cocoa, coffee, timber and palm products. There are cocoa estates in the LGA. These include Integrated cocoa estates, Iso-Bendeghe cocoa estate, Boje cocoa estate, Integrated cocoa estate, Wula, Integrated cocoa estate, Banba and Integrated cocoa estate, Benyia Uman (Kekerete.tripod.com).

The study employed a multistage sampling technique to select cocoa farmers. The first stage was a purposive selection of

the LGA. This is because of the volume of cocoa production in the LGA. The second stage was a random selection of two villages (Ochor and Orimekpa) from the eleven (11) wards in the LGA. The third stage was a random selection of eighty seven (87) cocoa farmers in the LGA. Primary and secondary data were used for the study. Well structured questionnaire was used for the primary data. Secondary data was by the use of literatures. Data were collected on age of the farm, age of the farmers, marital status, household size, farming experience, educational level, membership of farmers' association, farm distance, tenure type, knowledge on cocoa rehabilitation, and type of cocoa rehabilitation techniques (CRTs). CRTs considered in the study were coppicing, complete replanting, side grafting, top grafting, phased farm replanting, fertilizer application and planting under cocoa trees. Data was analyzed using simple descriptive statistics (means, frequencies, percentages), and inferential statistics. Multicollinearity test was carried out. The model was explicitly specified as

$$LnFARMAGE = \alpha + \beta_1 AGE + \beta_2 GENDER + \beta_3 HHSIZE + \beta_4 MASTAT + \beta_5 EDLEVEL + \beta_6 MEMASS + \beta_7 FRMEXP + \beta_8 KOREHAB + \beta_9 CRDTACC + \beta_{10} FRMDIST + e$$

Where:
LnFARMAGE = Log of Age of the cocoa farm (Years)
AGE = Age of farmers (Years)
GENDER= Gender of farmers (1= Male; 0=Otherwise)
HHSIZE = Household Size (No. of person)
MASTAT = Marital Status (1= Single; 2=Married; 3=Divorced; 4=Widowed)
EDLEVEL= Educational Level (1=Primary; 2=Secondary; 3=Tertiary)

MEMASS= Membership of Association (1=Yes; 0= Otherwise)

FRMEXP= Farming Experience (1=1-10; 2=11-20; 3=Above 20)

KOREHAB=Knowledge of cocoa rehabilitation techniques (1= Yes; 0=Otherwise)

CRDTACC= Credit Accessibility (1= Yes; 0=Otherwise)

FRMDIST = Farm Distant (1=Homestead; 0=Otherwise)

α =intercept

β= parameter estimates

e = Stochastic random error.

Results and Discussion

Socioeconomic characteristics of cocoa farmers.

Table 1 shows the socio-economic characteristics of cocoa farmers in Boki Local Government Area (LGA) of Cross River State. The table reveals that majority (77.01%) of the farmers were male. The implication of this is that cocoa farming in the study area is largely dominated by male gender and thus may be able to withstand the tasks of CRTs. Similarly, Girei *et al* (2013) reported that in Africa, men are more in a crop that is perceived to have commercial value. In addition, the result conforms to the findings by Taiwo *et al* (2015) who reported that about 68.7% of farmers that practiced cocoa rehabilitation techniques (CRTs) in Southwest and South-South agro-ecological zones of Nigeria are male. In addition, the table reveals that majority (96.6%) of the farmers were married. Moreover, the mean age of the farmers is 46 years. The implication of this is that cocoa farmers in the LGA are still in their productive years and thus cocoa production in the study area is expected to

be on the increase. However, this is not in consonance with the findings by Adeogun *et al* (2010) and Adebiyi and Okunlola (2013) who reported that cocoa farmers in selected states of Nigeria were old and that most of the cocoa farmers in Oyo State have passed there productive age. Similarly, the table reveals that highest proportion (56.3%) of the farmers had access to secondary education. The implication of this is that the farmers may perhaps have access to information on good agricultural practices (GAP) with respect to cocoa production and farm rehabilitation. Furthermore, the table reveals an average household size of 12 persons with a Standard Deviation (SD) of $\pm$ 7. This implies that the farmers may perhaps utilize members of the household as labour for some operations relating to cocoa production and farm rehabilitation. This may reduce some production costs that may be incurred on the crop. Mean age of cocoa farms in the study area was about 18 years. This means that the cocoa farms are in their productive years. This is contrary to findings by Adeogun *et al* (2010) that cocoa farmers in selected states of Nigeria had aged trees that are older than thirty (30) years and it is expected that diminishing return on production will set in. Furthermore, the table shows that about 55.2% of the cocoa farmers had above 20 years farming experience. In addition, majority (95.4%) of the farmers reported that they have knowledge of cocoa rehabilitation and 70.1 percent of the respondents practiced side grafting as the most prevalent CRTs. This perhaps may be due to the awareness and trainings conducted by CRIN and other stakeholders in cocoa production. This is in conformity with the findings by Taiwo *et al* (2015).

Table 1: Socio economic characteristics of Cocoa Farmers

Variables	Frequency	Percentage (%)	Mean	Std. Deviation
Sex				
Male	67	77.01		
Female	20	22.99		
Age (Years)				
29- 38	28	32.18		
39- 48	19	21.84		
49 -58	34	39.08		
Above 58	6	6.90	**46**	**10**
Marital Status				
Married	84	96.55		
Separated	1	1.15		
Widowed	2	2.30		
Educational Level				
Primary	27	31.04		
Secondary	49	56.32		
Tertiary	11	12.64		
Membership of Farmers'Group				
Yes	85	97.70		
No	2	2.30		
Household Size				
1-10	41	47.13		
11-20	35	40.23		
Above 20	11	12.64	**12**	**7**
Age of cocoa farm (Years)				
Below 11	12	13.79		
11-30	67	77.01		
Above 30	8	9.20	**18**	**8**
Farming Experience (Years)				
1-10	7	8.00		
11-20	32	36.80		
Above 20	48	55.20	**24**	**9**
Farm Distance				
Homestead Farm	15	17.24		
Distant Farm	72	82.76		
Knowledge of cocoa Rehabilitation				
Yes	83	95.40		
No	4	4.60		
Side Grafting				
Yes	61	70.12		
No	27	31.03		

Source: Field Survey, 2016   Std. Dev: Standard Deviation

Test for Multicollinearity

Table 2 shows the result of the test for multicollinearity. Variance Inflation Factor (VIF) shows how multicollinearity has increased the instability of the coefficient estimates (Freund and Littell, 2000). The result revealed that multicollinearity among the variables considered was not a problem since the Variance Inflation Factor (VIF) values of the variables in the model are less than the critical value of 10. The estimated VIF results range from 1.14 to 3.65 with a mean value of 1.75. This shows that multicollinerity is not an issue in the model as these values for the explanatory variables are less than 10. The result is similar to Osman (2015), Kleinbaum *et al* (2014) and Tazeze *et al* (2012) who reported a VIF of less than 10.

Determinants of cocoa rehabilitation techniques (CRTs) among Cocoa Farmers

Table 3 shows the determinants of cocoa rehabilitation techniques (CRTs) among cocoa farmers. The table reveals that age of the farmers was highly significant at 1%

level of probability with positive coefficient. The implication of this is that farmers in the study area are taking advantage of their productive years to practice CRTs. This perhaps may mean that the younger the farmers, the more they practice CRTs (*Ceteris paribus*). In addition, the table reveals that educational level and farming experience of the cocoa farmers are highly significant at 1% level with positive coefficient. The implication of this is that these variables have direct proportion to the practice of CRTs in the study area. This means that the higher the level of education and farming experience the higher the practice of CRTs. This conforms to the findings by Taiwo *et al* (2015) who reported positive but significant relationships between CRTs and level of education and farming experience, respectively. However, sex, membership of association and credit accessibility have negative coefficients but are significant at 1% level of probability. This is contrary to *a priori* expectation. The implication of this is that the farmers even though belonged to an association may perhaps not have access to

Table 2: Result for test of Multicollinearity

Variable	VIF	1/VIF
Age of the farmer	3.65	0.27
Gender	1.41	0.71
Household size	1.38	0.72
Marital Status	1.27	0.79
Educational level of farmers	1.55	0.65
Farming experience	3.53	0.28
Farm Distance	1.14	0.87
Membership of Association	1.24	0.81
Knowledge of Rehabilitation	1.16	0.86
Credit Accessibility	1.19	0.84
Mean VIF	1.75	

Source: Data Analysis, 2016

Table 3: Factors Influencing the Adoption of Cocoa Rehabilitation Techniques

Variable	Coefficient	Standard Error	t-Value
Age of the farmer	0.0040***	0.0011	3.64
Gender	0.1079***	0.0181	-5.96
Household size	0.0013	0.0010	-1.30
Marital Status	0. 0036	0. 0146	0.25
Educational level of farmers	0.0241***	0. 0126	1.92
Farming experience	0.0114***	0.0012	9.50
Farm Distance	0.0197	0.0181	-1.09
Membership of Association	0.3489***	0.0476	-7.32
Knowledge of Rehabilitation	0.2589***	0.0329	7.86
Credit Accessibility	0.2126***	0.0300	-7.09
Constant	0.9848***	0.0907	10.86
R^2	0.8945		
Adjusted R^2	0.8806		
Number of Observation	87		

Source: Data Analysis, 2016

trainings on CRTs and money is needed to practice these rehabilitation techniques.

Types and Knowledge of cocoa rehabilitation techniques (CRTs)

Table 4 shows the types and knowledge of cocoa rehabilitation techniques (CRTs) among farmers in the study area.

The table revealed that all the farmers have knowledge of CRTs. This is expected based on the awareness and series of trainings on these techniques carried out by CRIN. In addition, the results are confirmation of the positive impacts the Ajassor sub -station of the Institute is making on cocoa farmers. The sub-station is located in the State. However, largest proportion (70.1%) of the farmers has knowledge of coppicing while 39.1% has knowledge of fertilizer application. The implication of this is that the farmers may perhaps develop more knowledge of coppicing because it is easily done when a

cocoa tree is diseased and old. Hence, farmers see this as a technique that may result into little or no loss to them as the new shoots will derive nutrients from the old and mother tree. Moreover, the result on fertilizer application is expected because fertilizer is not always available and affordable. Hence, cocoa farmers may not be willing to practice this technique.

Conclusion and Recommendations

It was revealed that age of farmers, farming experience and educational level of farmers positively determined CRTs in the study area. It was also observed that credit accessibility, membership of association and sex negatively determined the farmers' practices of CRTs in the study area. Therefore, it is thus recommended that cocoa farmers in the study area should be encouraged to stay on the farms through provision of infrastructure since majority of the farmers are in their productive years.

Table 4: Types and Knowledge of cocoa rehabilitation techniques (CRTs)

Types of CRTs	Knowledge of CRTs (%)	
	Yes	No
Coppicing	41.4	58.6
Complete replanting	41.4	58.6
Side grafting	70.1	29.9
Top grafting	63.2	36.8
Phased farm replanting	59.8	40.2
Fertilizer application	39.1	60.9

Source: Field Survey, 2016

This will reduce rural-urban migration. In addition, credit should be made accessible to the farmers so that they will be able to afford the costs involved in the practice of CRTs. Moreover, they should be encouraged to take active roles in the association by participating in all activities directed to CRTs in order to get up to date information on the advantages inherent in cocoa farms rejuvenation. Furthermore, CRIN and other stakeholders in cocoa production should endeavor to develop new CRTs that are gender friendly. This will ensure that cocoa farmers are encouraged to adopt and practice other CRTs irrespective of gender. Moreover, fertilizer should be made available and affordable to cocoa farmers to encourage the practice of this technique. Further studies should be carried out to ascertain the adoption of these techniques and the most preferable CRTs among cocoa farmers in the study area based on the results of high knowledge level.

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