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Factors Affecting Adoption of Cocoa Farm Rehabilitation Techniques in Oyo State of Nigeria

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Abstract: Despite the fact that some efforts have been made to increase cocoa production in Nigeria, Farmers are still producing below expected cocoa production figure due to old and moribund cocoa trees. This study assesses the factors affecting adoption of cocoa farm rehabilitation techniques in Oyo State. A multistage random sampling technique was employed to select one hundred and fifty (150) cocoa farmers. Data were collected through interview with the use of structured questionnaire and anayzed using descriptive statistics, correlation coefficient and logistic regression. The result revealed that farmers were old with mean age of 55years, 54.7 percent have been into cocoa production for at least twenty five years, while 75.3 percent of the cocoa farms were established more than twenty five years ago. Correlation coefficient showed that farm size and years of farming experience were significant factors affecting adoption of cocoa farm rehabilitation techniques. Also, source of finance and availability of information were significant factors that determine the probability of adoption. Based on the above findings, efforts should be made by research institutes, relevant farmers' organizations and Non-governmental organization (NGOs) in providing effective training workshops, credit facilities and input delivery system to encourage adoption of proven technologies.

Key words: Rehabilitation • Moribund • Proven technologies • Logistic regression • Adoption Factors • Cocoa technology • Oyo state

INTRODUCTION

The agricultural sector of the Nigerian economy has contributed immensely to rural development, industrial materials, food security and non-oil foreign earnings. Prior to the discovery and commercial exploitation of crude oil in the late 1960s, agriculture accounted for a significant contribution to the national export; improve standard of living and poverty reduction (1).

For sustainable food production and balance of payment surplus, the Federal Republic of Nigeria has revisited issues of the improvement of agricultural sector instead of depending solely on petroleum for national development by embarking on institutional efforts, such as cocoa rehabilitation techniques, cocoa trade liberalization, distribution of improved cocoa varieties, among others. These efforts have made the agricultural

sector to grow at an average rate of 7.5% per annum between 2002 and 2003 (2).

Although, cocoa accounts for less than 2% of Nigeria's export earnings, yet it provides employment for some 300,000 household in the country. In view of this, government is always conscious of measures that will increase production and income of the peasant farmer (3).

Cocoa (*Theobroma cacao*) came into West African sub-region from Brazil and was latter introduced into Nigeria from Fernando Po by Chief Squiss Ibeningo in 1874 (4). The Nigerian government of Nigeria developed interest in the cultivation of cocoa in 1887 and cocoa seedlings from the old Botanic Garden at Ebute Metta (Lagos) were sent up-country (Ibadan) for trial and was latter spread to various parts of Western Nigeria through various sources such as trade agent, ministries of agriculture and research institutes (5).

Estimates put Nigeria's cocoa acreage at 10,000 acres in 1912 and about 400, 000, hectares by 1945 (6). It remained at this level until the late fifties when further planting led to rapid increase in production. Climatic compatibility of cocoa with the Nigerian environment coupled with successful mix-cropping of cocoa with arable crops equally promoted the thriving of cocoa. By 1965, Nigeria became the second largest cocoa producer in the world with an annual output of about 270,000 tons (7, 8). However, with the advent of the oil boom of the 1970s, the cocoa sub-sector experienced a decline Sequel to this development, some institutional efforts were put in place, such as cocoa rehabilitation programme, cocoa trade liberalization, distribution of improved cocoa varieties to farmers at subsidized rate and few new plantings were carried out from the mid-1980s to most part of the 1990s. This effort yielded slight increase in cocoa production. Estimation put the current cocoa hecreage at about 600,000 – 700,000 hectares (9, 7).

In view of the need for increased cocoa production, institutional effort such as cocoa rehabilitation programme must be sustained. However, frequently practiced rehabilitation techniques considered for this study are complete farm replanting, phased farm replanting, selective tree replanting, planting under old cocoa trees, chupon regeneration, coppicing and improved chupon regeneration.

Meanwhile, (10) considered cocoa rehabilitation 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. He opined that the basic requirement in any situation is to identify the cause of the trouble leading to the need for rehabilitation and to device means to remedy it. According to (11), he observed that prime-forest land for cocoa cultivation is virtually exhausted and that research is needed on how to rejuvenate the exhausted cocoa soils and moribund cocoa trees for profitable cocoa output. He furthered that most of the existing cocoa farms in the country have passed the age of profitable production. He asserted that most of the rehabilitation efforts so far had not been as successful as desired and that research is needed to identify the problem and proffer solution. The focus of this study is to determine both sociological and agronomic factors that affect cocoa farm rehabilitation in Oyo State of Nigeria.

The main objective was to determine the factors affecting the adoption of cocoa farm rehabilitation techniques in the study area.

The Specific Objectives Were To:

- Ascertains the socio-economic characteristic of the respondents.
- Determine the improved technologies for cocoa farm rehabilitation.
- Determine the level of awareness of cocoa rehabilitation techniques in the study area.
- Examine the factors affecting the adoption of cocoa farm rehabilitation techniques that is available to the farmers and;
- Determine the effect of extension activities on farmers' adoption of rehabilitation techniques.

Hypothesis:

Ho: There is no significant relationship between socio economic characteristics of respondents and adoption of cocoa farm rehabilitation techniques.

MATERIALS AND METHOD

The study was carried out in Oyo State of Nigeria. A multistage random sampling technique was employed in data collection. Five local government areas (LGAs) were purposively selected because they are known for high cocoa production out of the nineteen (LGAs) producing cocoa in the state. Thereafter, two communities were randomly selected from each of the five (LGAs) making a total of ten communities. From each community, fifteen cocoa farmers were randomly selected making a total of 150 respondents in all the local government areas. Data were collected with the use of structured questionnaire and the data collected includes among others the socio-economic characteristics of the respondents, level of awareness of cocoa rehabilitation techniques, extension visit and the level of adoption of cocoa rehabilitation techniques. The awareness as well as adoption level were measured by considering the number of techniques the farmers were aware of after extension activities. Adoption was categorized into low, medium and high of adoption. Adoption of not more than two techniques was considered low, adoption of between three and four is medium, while adoption of more than five techniques was high.

Data were analyzed with the use of reference statistical tools such as correlation coefficient and logistic regression. descriptive statistics was used to analyze the personal and socio economic characteristics of the respondents, correlation coefficient was used to test the significant relationship between the respondents' socio-economic characteristics and the level of adoption of cocoa rehabilitation techniques while binary logistic step wise regression was used to determine the probability of adoption of cocoa farm rehabilitation techniques.

The binary logistic regression model was stated as follows:

Logit (p) =
$$b_0 + b_1 x_1 + b_2 x_2 + \dots b_n x_n$$

p = probability of adoption of innovation

 $b_1 - b_n$ = logistic regression coefficients.

 b_0 = constant term

 $x_1 - x_n$ = independent variables.

logit information is defined as the log odds

$$odds = \frac{P}{1 - P} = \frac{\text{Pr} \, obability}{\text{Pr} \, obability} \, of \, adoption}{\text{Pr} \, obability} \, of \, non - adoption}$$

$$\log it(p) = in \left\lceil \frac{P}{1 - P} \right\rceil$$

where In = natural logarithm

RESULTS AND DISCUSSION

Personal and Socio-Economic Characteristics: Table 1 showed that the age groups 46-55 years and 56-65 years were 34.7 percent and 36.7 percent respectively. The mean age was 55.0 years. This showed that most of the respondents were not in their economically active and productive age, hence there is low prospect for adoption of various cocoa farm rehabilitation techniques practices. Majority of the respondents (85.3 percent) were males, this situation may be an advantage to cocoa farm rehabilitation techniques as men can cope with strenuous farm management practices. Also, men are more concentrated in farm work than their female counterparts who are also involved in off-farm activities such as buying and selling of farm produce, storage of crops and

| Table 1: Socio-economic characteristics of respondents | | |
|--|-----|------|
| Age | | |
| 26 - 35 | 6 | 4.0 |
| 36 - 45 | 19 | 12.6 |
| 46 - 55 | 52 | 34.7 |
| 56 - 65 | 55 | 36.7 |
| Above 65 | 18 | 12.0 |
| Mean Age: 55 years | | |
| Sex | | |
| Male | 128 | 85.3 |
| Female | 22 | 14.7 |
| Marital status | | |
| Single | 4 | 2.7 |
| Married | 142 | 94.7 |
| Widowed | 2 | 1.3 |
| Separated | 2 | 1.3 |
| Household size | | |
| 1 - 5 | 35 | 23.3 |
| 6 - 10 | 80 | 53.4 |
| Above 10 | 35 | 23.3 |
| Mean = 8.0 | | |
| Education level | | |
| No formal education | 61 | 40.7 |
| Adult literacy school | 22 | 14.7 |
| Primary education | 36 | 24.0 |
| Secondary education | 22 | 14.7 |
| Tertiary education | 9 | 6.0 |
| Cocoa farming experience (years) | | |
| 1 - 10 | 41 | 27.3 |
| 11 - 20 | 27 | 18.0 |
| 21 - 30 | 23 | 15.3 |

Source: Field Survey, 2006.

Table 2: Awareness after extension visit

| | Y | O | | |
|--|-----------|------|-----------|------|
| | | | | |
| Variety | Frequency | (%) | Frequency | (%) |
| Awareness of complete farm replanting | 104 | 69.3 | 46 | 30.7 |
| Awareness of phased farm replanting | 73 | 48.7 | 77 | 51.3 |
| Awareness of planting under old cocoa tree | 132 | 88.0 | 18 | 12.0 |
| Awareness of selective tree replanting | 50 | 33.7 | 100 | 66.3 |
| Awareness of coupon regeneration | 47 | 31.3 | 103 | 68.7 |
| Awareness of coppicing and grafting | 19 | 12.6 | 131 | 87.4 |
| Multiple responses | | | | |

Source: Field Survey, 2006.

packing of farm produce. This finding agrees with (12) who reported that rural women engaged in off-farm activities. Majority (94.7 percent) were married. This indicates that majority of the respondents have family responsibilities which could encourage them to adopt new innovations to help them to earn more money.

According to results in table 1, majority of the respondents (76.7 percent) had household size of 6 members and above, while just 23.3 percent had between 1 and 5 members. The mean household size was 8. This means that the household size of the respondents was relatively large. This situation may enhance the level and the rate of adoption of technologies because the larger the household size, the more the farm labour that will be available to promote the practice of various rehabilitation techniques. This is in line with the finding of (13) who noted that cocoa farmer with large household size are capable of readjusting to sudden changes in labour supply at peak periods of labour demand.

About 59.3 percent of the respondents were literate with largest proportion (24.0 percent) having primary school education and 14.2 percent adult literacy education, 6.0 percent had tertiary education while 40.7 percent of the respondents had no former education and 14.7 percent also had secondary education. This distribution favours the adoption of rehabilitation techniques as farmers can easily understand the ideas behind different techniques introduced by subject matter specialists. Again, the table also showed that 39.4 percent of the respondents had above 30 years of farming experience, 27.3 percent had 1-10 years of farming experience. The mean number of years of farming experience was 22. The implication is that majority of the respondents, (56.7) percent had farming experience of 20-30 years and above which showed that the farmers have experience in different stages of cocoa managements.

Awareness of Cocoa Farm Rehabilitation Techniques:

Table 2 showed the level of awareness of cocoa farm rehabilitation techniques as 88.0 percent of the respondents aware of planting under old cocoa trees, 69.3 percent were aware of complete farm replanting, 48.7 percent of the respondents were aware of phased farm replanting, 33.7 percent were aware of selective tree replanting, 31.3 percent were of aware of coupon regeneration, while 12.6 percent were aware of coppicing and grafting. The respondents attributed this low awareness level of some techniques to poor extension visit.

Sources of Labour: Results in Table 3 showed that, some respondents, (58.0 percent) claimed to have used family and hired labour, (30.7 percent) used hired labour only while 10.0 percent of the respondents utilized sharecropper. The result indicated that there is tendency for better implementation of cocoa rehabilitation techniques, since most techniques are better implemented by the farmer themselves and assisted by hired labour.

The results in table 4 showed that the most important source of finance to cocoa farmers is from their personal saving (73.3 percent), the revealed that 16.7 percent of the respondents got their finance from cooperative society, 4.0 percent of the respondents claimed they got their finance from friends and neighbours while just 2.0 percent of the respondent got bank loan for their farm work. The result shows that a larger percentage (73.3 percent) depended on their personal savings as their source of finance while only 2.0 percent obtained bank loan. This could be as a result of inability of the respondents to meet up with the collateral security required by the banks. Few farmers have access to loan from non-governmental organizations and other credit agencies. Inadequate capital hinders adoption of some cocoa rehabilitation techniques as some of them

Table 3:Respondents' distribution based on sources of farm labour

| Labour Source | Frequency | Percentage |
|-------------------------|-----------|------------|
| Family member only | 2 | 1.3 |
| Family and hired labour | 87 | 58.0 |
| Hired labour only | 46 | 30.7 |
| Share croppers | 15 | 10.0 |
| Total | 150 | 100.0 |

Source: Field Survey, 2006.

Table 4:Distribution based on sources of finance of respondents

| Financial source | Frequency | Percentage |
|-----------------------|-----------|------------|
| Personal saving | 110 | 73.3 |
| Bank loan | 3 | 2.0 |
| Cooperative society | 25 | 16.7 |
| Friend and neighbours | 6 | 4.0 |
| Others | 6 | 4.0 |
| Total | 150 | 100.0 |

Source: field survey, 2006.

Table 5:Respondents' distribution based on age of cocoa farms

| Years | Frequency | Percentage | |
|--------------------|-----------|------------|--|
| Under 5 years | 1 | 0.7 | |
| 5-9 years | 2 | 1.3 | |
| 10 – 14 years | 3 | 2.0 | |
| 15 – 19 years | 10 | 6.9 | |
| 20 – 24 years | 21 | 14.0 | |
| 25 years and above | 113 | 75.0 | |
| Total | 150 | 100.0 | |
| | | | |

Source: Field survey, 2006.

Table 6: Distribution based on source of planting materials of the respondents

| Source of planting materials | Frequency | Percentage |
|------------------------------|-----------|------------|
| CRIN | 13 | 8.7 |
| CDU/ADP | 81 | 54.0 |
| CAN/CFAN | 6 | 4.0 |
| Self/relatives | 20 | 13.3 |
| No response | 30 | 20.0 |
| Total | 150 | 100.0 |

Source; field survey, 2006.

reject technologies beyond their financial capability. This agrees with (14) who asserted that farmers find it difficult to adopt profitable technologies due to inadequate facilities.

Results in Table 5 showed that 73.7 percent of cocoa farms were established more than 25 years ago, 14 percent of the cocoa farms were established between 20 and 24 years ago, 6.7 percent were established between 15 and 19 years ago while 2.0 percent were established between 10 and 14 years ago. It was also observed that 1.3 percent

was established between 5 and 9 years ago, while less than 1.0 percent of cocoa farms were established less than 5 years as at the time of investigation. The result showed that majority of the cocoa farms (73.7 percent) have gone pass their productive ages which shows need to rehabilitate cocoa trees in the study area. This is in line with the assertion of (15) and (16) that the highest cocoa yield is achieved between 15 and 25 years and that a profitable life span may be 50 years but that from the twenty-sixth (26th) year, yields decline gradually and production cost rise steadily.

Results presented in Table 6 showed 54.4 percent of the respondents obtained planting materials from Cocoa Development Units (CDU) and ADPs. 13.3 percent of the respondents got their planting materials from their personal nursery and relatives. Another 8.7 percent of the respondents obtained their planting materials from Cocoa Research Institute of Nigeria (CRIN), while, 4.0 percent of the respondents obtained planting materials from Cocoa Association of Nigeria (CAN) and Cocoa Farmers Association of Nigeria (CFAN). The result showed that majority (62.7 percent) of the farmers in the study areas obtained their planting materials from Government Institutions (CDU/ADPs and CRIN) which is an indication that the farmers in the study area complied with the directive of National Cocoa Development Committee (NCDC) which directed all farmers in cocoa producing states to collect improved planting materials from Government Institutions (CDU/ADPs and CRIN). Notwithstanding, few farmers (13.3 percent) got planting materials from their own personal cocoa farms, this is because they want to replicate the traits they prefer in their farms.

Adoption of the Techniques: Results in Table 7 showed that the planting under old cocoa trees was the most widely practiced rehabilitation technique (80.0 percent). This could be as a result of easy application of the technique. Many of these farmers adopted planting under old cocoa trees because improved seedlings were made available at a subsidized rate by Cocoa Development Unit (CDU) and farmers have easy access to them. About 52.0 percent of the farmers adopted complete farm replanting due to the fact that most of the cocoa farms have been abandoned for many years and as a result, there is little or no cocoa trees, therefore, such farms are completely replanted using improved planting materials. 25.0 percent of the farmers who wish to change the old or Amelonado variety in their farms adopted phased farm replanting, 10.6 percent of the respondents

Table 7: Distribution of adoption of cocoa rehabilitation techniques

| | Adopted | Adopted | | Not Adopted | |
|---------------------------------------|-----------|---------|-----------|-------------|--|
| Techniques | Frequency | (%) | Frequency | (%) | |
| Awareness of complete farm replanting | 78 | 52.0 | 72.0 | 48.0 | |
| Phased farm replanting | 38 | 25.30 | 112.0 | 74.7 | |
| Planting under old cocoa tree | 120 | 80.0 | 30.0 | 20.0 | |
| Selective tree replanting | 14 | 9.30 | 136.0 | 90.7 | |
| Coupon regeneration | 0 | 0.00 | 150.0 | 100.0 | |
| Coppicing | 16 | 10.60 | 134.0 | 89.4 | |
| Grafting/budding | 0 | 0.00 | 150.0 | 100.0 | |
| Multiple response | | | | | |

Source: Field survey, 2006.

Table 8: Distribution based on the level of adoption of cocoa rehabilitation techniques

| Rate of Adoption | Frequency | Percentage |
|------------------|-----------|------------|
| Between 1 – 2 | 120.0 | 80.0 |
| Between 3 – 4 | 16.0 | 10.6 |
| 5 and above | 14.0 | 9.3 |
| Total | 150 | 100.0 |

Source: field Survey, 2006.

Table 9: Dstribution based on reason for non adoption.

| Reasons | Frequency | Percentage |
|---------------------------------------|-----------|------------|
| Inadequate information | 41 | 27.3 |
| Inadequate capital | 62 | 41.3 |
| High cost of labour | 66 | 44.0 |
| Not aware of its existence | 16 | 10.7 |
| Complexity of the technology. | 60 | 40.7 |
| Not compatible with existing practice | 7 | 4.7 |
| | | |

Multiple response

Source field survey, 2006.

Table 10: Analysis of relationship between some selected socio-economic characteristics and the adoption of cocoa rehabilitation techniques

| Characteristics | r - value | Decision |
|----------------------|-----------|-----------------|
| Extension activities | 0.097 | Not Significant |
| Level of education | ,0.216 | ,, |
| Farm size | 0.035 | Significant |
| Farming experience | 0.041 | " |

Significant at 0.05 level (2 - tailed)

Source: field survey, 2006

adopted coppicing, this is because many farmers are not ready to cut down their cocoa trees and wait until the regenerated trees resume production. Also, many farmers are not very sure whether the regenerated trees will compensate for the waiting periods. Coupon regeneration and grafting/budding were not practiced at all. Chupon regeneration and grafting/budding are

considered technical, its application requires special skill, Highly technical technique requires adequate extension linkage with clientele.

From the results presented in Table 8, 80.0 percent of the respondents adopted between 1 and 2 technologies, 10.6 percent adopted between 3 and 4, while 9.3 percent adopted above 5 technologies. The findings showed that the rate of adoption of various cocoa farm rehabilitation techniques was generally low as shown in Table 8. Although, majority of the respondents adopted planting under old cocoa trees as the farmers consider it simple, ease and is in conformity with their farming system, while few farmers adopted coppicing and none of the farmers adopted coupon regeneration grafting/budding of the techniques available to them. However, all aforementioned techniques are essential in a moribund cocoa farm as individual cocoa trees require a specific technique. The adoption of various rehabilitation techniques was low because the farmers had not understood the idea behind various cocoa rehabilitation techniques.

Factors Affecting Adoption: Table 9 Showed that 27.3 percent of the respondents could not adopt a desired technology due to inadequate information about the technology, 41.3 percent complained about inadequate capital, 44.0 percent did not adopt due to high cost of labour while 40.7 percent were discouraged due to complexity of the techniques introduced to them. This is in consonance with (17) that most farmers have not been able to adopt most cocoa rehabilitation techniques due to complexity of some of the techniques.

The test result correlation coefficient as presented in table10 shows that farm size (r=0.035) and years of farming experience (r=0.041) are significantly related with the adoption of cocoa rehabilitation techniques available to the farmers in the study area. The implication of this is

Table 11:Empirical result of binary logistic regression model

| Variable | Logit Co-efficient | Standard Error | Wald Statistic |
|--------------------|--------------------|----------------|----------------|
| Constant | 15.034 | 4.45 | 6.634* |
| Farm size | 3.654 | 2.014 | 4.324* |
| Farming experience | 3.453 | 2.452 | 3.233* |
| Source of finance | 1.685 | 0.232 | 3.126* |

Model chi-square 58.895*

 $R^2 = 0.898$

Significant at 0.05 level.

Source: Field survey, 2006.

that, respondents who have reasonable farm size and years of farming experience should be used as contact to other farmers in the study area.

The results of logistics regression analysis presented in Table 11 shows that farm size, farming experience and source of finance are significant factors that determine the probability of adoption of cocoa rehabilitation techniques. The result shows that 58.785 is significant at 0.05 level, this (extension activities, farming experience and credit facility) showed 95% confident that the presence of the independent variables which are extension activities and credit facility in the model contributes significantly to the probability of adoption. The test also reveals that $R^2 = 0.898$, which showed that about 89% of the variation in the probability of adoption are jointly determined by the three variables using logistic regression method. The implication of the result is that, the number of visit made by extension agents to the farmers will determine the level of adoption which indicates that if farmers are visited regularly, they are ready to adopt the techniques available to them. Farmers who is experience in farming is likely to adopt new techniques introduced them. Also, Credit facility influences adoption, indicating that the more farmers have access to source of finance, the more they are likely to adopt cocoa farm rehabilitation techniques.

CONSLUSION

Based on the findings it could be concluded that farmers in the study area are already old with low level of adoption of cocoa rehabilitation techniques. However farm size and farming experience are the factors affecting adoption. Farmers were not regularly visited. Extension activities should therefore be intensified to encourage the adoption of cocoa rehabilitation techniques,

Policy Implication:

- Research institutes and relevant farmers' organization such as Cocoa Farmers Association of Nigeria (CFAN) and Cocoa Association of Nigeria (CAN) should organized training workshops on the application of various cocoa rehabilitation techniques through participatory approach to increase cocoa output.
- Farmers should organize themselves to form cooperative societies. This is quite important for enhancing accessibility to credit facilities and farm inputs for their farm work.
- Youths in cocoa producing areas should be encouraged to take up cocoa production through the provision of social amenities (similar to what is obtainable in the cities) to cocoa producing areas. This is quite imperative because most of the cocoa farmers in the study areas are old.

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