SOCIO-ECONOMIC FACTORS AFFECTING ADOPTION OF INNOVATIONS BY COCOA FARMERS IN ONDO STATE, NIGERIA

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ABSTRACT

This study analyzed the socio-economic factors affecting adoption of innovation by cocoa farmers in Ondo State. Primary data were collected in a cross-sectional survey of 120 randomly selected cocoa farmers. These were drawn in a multi-stage random sampling process that purposively covered two dominant cocoa producing Local Government Areas (LGAs) of Ondo State Nigeria, namely: Idanre and Ondo West. The data were collected using a structured interview schedule, designed to elicit information on the socio-economic characteristics of the cocoa farmers, the various innovations available to the cocoa farmers for improved cocoa production, the adoption rate of the innovations, and the constraints faced by the cocoa farmers. The data were analyzed using descriptive statistics, and multinomial logistic regression. The study found that most 65.0% of the cocoa farms were operated by males, with a mean age of 51.11years. Majority 72.5% had primary school education, with mean cocoa farm size of 6.32 hectares. The study also showed that the adoption rates of disseminated innovation/technologies in the area was low. Adoption models indicated that sex and level of education of the farmer affected the adoption decisions of cocoa farmers concerning the disseminated technologies analyzed in this study. The study also revealed in addition that high cost of inputs, lack of funds, lack of supporting inputs, scarcity of complimentary inputs, problem of diseases / pests as the most serious problem / constraint faced by the cocoa farmers. The study concluded that most of the cocoa farmers in the study areas did not adopt cocoa innovations disseminated to them and that the adoption rate innovations of the cocoa farmers was low. The study recommended that government and other stakeholders need to invest in extension service in sensitizing cocoa farmers in the study areas of new innovations as this have the potential to increase adoption rate as well as farmers productivity and income.

Keywords: Cocoa farmers, multinomial logit, adopters, innovation uptake, Ondo State.

INTRODUCTION

Evidence has shown that the growth rate of cocoa production has been declining, which has given rise to a fall in the fortune of the sub-sector among other reasons. Folayan et. al., (2006) noted that cocoa production in Nigeria witnessed a downward trend after 1971 season, when its export declined to 216,000 metric tons in 1976, and 150,000 metric tons in 1986, therefore reducing the country's market share to about 6% and to fifth largest producer to date. Quite a number of strategies that attempt to bring about significant increases in cocoa production have been campaigned, of which the effective combination of measures is aimed at increasing the level of farm resources committed to the cocoa production and combining the enterprises in an optimal manner. Innovation in agriculture has occurred over time and for ages through chance and through the purposive but also informal actions of farmers seeking for new and better ways and methods of production. But the performance of Nigerian

agriculture so far indicates that the farmers have neither used nor absorbed most of the technologies being introduced to them (Akande, 1999). This appears to be the case considering the findings of Yayock and Misari (1990) which showed that there existed a wide gap between farmers' improved technology yields and farmers' traditional technology yields. This scenario, the authors attributed to the gap between available agricultural information on innovations, improved practices and its use. Thus, in agricultural information use studies, it is usual to investigate the personal and social characteristics of farmers in order to understand their relative influence in the farmers' information use behaviours (Onu, 1991). First of all, innovation uptake is dependent on the capacity of the user to access innovation and later use it. This capacity is dependent on certain cultural, socio-economic, personal, political and geographical variables. It also includes the appropriateness of the information, the credibility of the information channel, and the information provider's characteristics. Characteristics of an innovation also play a key part in its adoption by an individual.

Many researchers like Welsch, (1965); William et. al., (1971); and Ezeano (2010) have investigated factors related to the adoption of improved farm practices and the isolated variables include farmer age, education, years of experience, social and tenural status, agro-climate, location, farm size, credit, and characteristics of the innovation itself such as relative advantage, compatibility, complexity, divisibility and communicability, techniques of communication, amount of participation and the use of traditional culture. Lawal and Oluyole (2008) conducted a study to determine rate of adoption of technologies developed by Cocoa Research Institute of Nigeria (CRIN) and factors which promote adoption of these technologies among cocoa farming households in Oyo state. The authors results showed that 73% of the farmers interviewed did not adopt the technologies, while 27% adopters who were casual workers on CRIN plantations worked or had a link with technical staff than non-adopters. All adopters were below 60 years and 80% had at least primary education, and the significant determinants of adoption of research results were age of farmer and visit by CRIN scientists, access to credit, participatory approaches to research and regular training/ visits on use of technologies. The authors concluded that young farmers are more receptive than older ones as the older ones are not always ready to part with the old techniques for new ones. And also concluded that the more the number of visits by scientists to the farmers, the more the research results will be adopted and consequently higher productivity leading to improved welfare. Furthermore, factors which promoted the adoption of agricultural research results and technologies developed and disseminated by Cocoa Research Institute of Nigeria included sensitization on the advantages of the technologies, literacy, age, technical information and exposure to the technology. In addition, involvement of farmers and participatory approach to researches (more farmer-oriented and collaborative) so that the farmers' problems can be tackled by research and also the need for farmers to have access to credit to enable them take up the new challenges.

Encouragement of farmers to increase/improve their stock of social capital by participating in farmers association or group as this can also influence their adoption of technologies and access to other services that may improve their welfare as also stated by Cramb (2005). Ayoade and Akintonde (2012) revealed that a positive and significant relationship exists between the constraints encountered and adoption level of Agricultural Innovation. It was also revealed that late adoption of innovations was due to irregular visits of extension agent. Unstable market price, insufficient finance and inadequate supply of innovation were the most serious constraints revealed in the study. According to Oladele and Kareem (2003), farmers are sometimes unable to adopt an innovation even though they have mentally accepted it, because of economic and situational constraints.

There is a high demand for cocoa and Nigeria has a potential to develop cocoa production. This research work is of great importance to increasing cocoa production in Nigeria in general and in Ondo state in particular. The focus of this research will be on evaluating the various innovations already disseminated to cocoa farmers. It will open up areas for further research and spell out the innovations that are available for improved cocoa production, efficient use and bring about substantial and significant increase in yield. The objectives of the study were to describe the socio-economic characteristics of cocoa farmers in the study area, describe the various innovations available for improved cocoa production in the study area, determine the adoption rate of the innovations, and describe the constraints faced by cocoa farmers in the study area.

METHODOLOGY

The study was conducted in Ondo State. The State is located in the south western zone of Nigeria between latitude 7°10′ North and longitude 5°05′ East of the Greenwich Meridian. The climate area is highly favourable for the agrarian activities of her teeming population of 3,441,024 persons (National Population Census (NPC), 2006). The tropical climate of the state is mainly of two seasons: rainy season (April-October) and dry season (November-March) with temperature ranges between 21°c to 29°c and humidity is relatively high. The state is divided into 18 Local Government Areas (L.G.As). The State has an annual rainfall of between 2000mm to 1150mm per annum. Multi stage random sampling techniques was adopted details of which can be obtained from Nmadu et al. (2014). The data for this study was analyzed using descriptive statistics such as mean, frequency and standard deviation, and multinomial logistic regression. The adoption rates of the innovations analyzed using multinomial logistic regression. The dependent variable (adoption rate) was categorized into three using adoption scores (i.e. ratio of adopted to disseminated technologies) as follows:

Adoption Scores	Adoption Level
1-3	Low adopters
4-6	Moderate adopters
7 and above	High adopters

Under the multinomial response model, if there are N categories, the probability that a farmer is in a particular category

$$Pij = \frac{exp\,(ijXi)}{\sum_{j=1}^{3}(exp(ij\,Xi)} \qquad (1)$$

Where *j* is equal to 1 if the adoption level is low, 2 if moderate and 3 if adoption level is high. *Xi* represents a vector of explanatory variables for farmer i^{th} with *j* level of adoption, and β the coefficient of the parameters.

The explicit form of the function is specified as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + e. \quad \dots\dots\dots\dots\dots (2)$$

Where Y= dependent variable as defined above i.e. low adopters=1, moderate adopters=2, high adopters=3, X_1= Age of farmers (in years), X_2= Sex of the farmer. Male=1, female=2, X_3= Level of education (years spent in formal education), X_4= Home size (1 if less than 5; 2 if 5-10; 3 if above 10 people), X_5= Farm size (hectares), X_6= Farming experience (years), X_7= Membership of cooperative (Ordinary member=1, cumulative=2, official=3), X_8= Labour (man-days), X_9= Quantity (kg), X_{10}= Access to agricultural credit (access=1, no access=0), X_{11}= Income (Naira), X_{12}= Access to extension agents (access=1, no access=0)

RESULTS AND DISCUSSION

Table 1 is a presentation of the socio-economic profiles and characteristics of respondents while Table 2 shows the sources of information about new or improved cocoa innovations. Table 3 gives innovations available (disseminated) for improved cocoa production and level of their usage while Table 4 presents the coefficients of the socio-economic factors affecting adoption of innovations by cocoa farmers in Ondo State and Table 5 shows the various constraints faced by cocoa farmers in adopting innovations in Ondo State.

The result of the socio-economic characteristics of the respondents is presented in Table 1 which revealed mean age was 51years.The findings revealed that majority of the respondents are old there is literarily low involvement of the youths in cocoa farming, consequently there is need to encourage youth involvement in cocoa production. This implies that cocoa farmers are getting older and replacement by younger ones is needed. The presence of older farmers on the farm will negatively impact on labour availability (Ladele, 1998). Thus, the farmers would tend to be slow in accepting new innovations in line with Amos (2007) that found that an average cocoa farmer in Ondo State is old and concluded that young farmers are more receptive than older ones as the older ones are not always ready to part with the old techniques for new ones. Majority 65.0% of the respondents in the study area were males while 35.0% of them were females. This implies that men dominate in cocoa production than the female farmers, though the female farmers have their own roles to play, especially, in the maintenance and processing of cocoa beans as indicated by Adetunji *et al*. (2007). Data in Table 1 revealed that the farmers have a mean household size of approximately 6 people. Since majority (52.5%) of respondents have household size of 6 people, it therefore means that the farmers have a fairly large household which could probably serve as an insurance against short falls in supply of farm labour. Household size has a great role to play in family labour provision in the agricultural sector (Sule *et al*., 2002).

Table 1 also revealed that majority 90.0% of the respondents are married. The large percentage of married respondents shows that more members of farm family are likely going to be available for cocoa production in the study area. Farm labour force used to be restricted to family population and the size of active family members. Awe (1995), opined that family labour is still an important component of labour for small scale farmers. He further posited that by virtue of large family size, there is pressure on land, which has become fragmented, and hence small farm holdings abound. The effect is that such farmers who are constrained by inadequate land area may not readily adopt an extension package that requires large scale farming. Table 1 further revealed that about 72.5% of the respondents have primary education, 11.7% have secondary education, 14.2% have tertiary education and 1.7% has other forms of formal education. Although, cocoa farmers in the study area are literates who could read and write, this could serve as a drive in adopting cocoa technologies. According to Obinne (1991), education is an important factor influencing farm innovation uptake. Majority 60.8% of the respondents as shows in Table 1 cultivate farm lands of 1 to 5 hectares, 22.5% cultivate 6 to 10 hectares of land while 16.7% cultivate farm lands above 10 hectares, with farm size per household averaged 6.32 hectares of cultivated land. Results in Table 1 further revealed that a greater proportion 30.8% of the respondents had farming experience of 11 to 20 years, while 27.5% and 21.7% of them had farming experience of 1 to 10 years and 21 to 30 years, respectively. Those that had above 30 years of farming experience accounted for 20%. Their mean farming experience was approximately about 21 years. These findings imply that the respondents have not had long period of farming experience which could be

Table 1: socio-economic characteristics of respondents

Socio-economic factor	Frequency	Percentage	Socio-economic factor	Frequency	Percentage
Age			Farm size (ha)		
21-30	11	9.2	1 – 5	73	60.8
31-40	19	15.8	6 – 10	27	22.5
41-50	26	21.7	11 – 15	9	7.5
51-60	34	28.3	16 – 20	5	4.2
Above60	30	25	21 – 25	4	3.3
Mean	51.11		26 – 30	2	1.7
Gender			Mean	6.32	
Female	42	35	Farming Experience		
Male	78	65	1 – 10	33	27.5
House hold size			11 – 20	37	30.8
No response	4	3.3	21 – 30	26	21.7
01-May	45	37.5	31 – 40	14	11.7
06-Oct	63	52.5	41 – 50	10	8.3
Nov-15	7	5.8	Mean	21.3	
16-20	1	0.8	Member of cooperative		
Mean	6.38		No	43	35.8
Marital status			Yes	77	64.2
Single	6	5	Source of finance		
Married	108	90	Personal		
Widowed	6	5	No	29	24.2
Level of education			Yes	91	75.8
Primary	87	72.5	Loan		
Secondary	14	11.7	No	51	42.5
Tertiary	17	14.2	Yes	69	57.5
Others	2	1.7			

Source: Field survey 2013

Table 2: Distribution of respondents source of information about new innovations

Sources of information	Frequency	Percentage
Extension agents	33	27.5
Print media	5	4.2
Group leaders	20	16.7
Radio	40	33.3
Television	22	18.3
Total	120	100

Source: Field survey 2013

Table 3 Distribution of respondents according to innovations available (disseminated) for improved cocoa production and level of usage

Innovations	Awareness		Usage	
	Freq.	**%**	**Freq.**	**%**
Hybrid cocoa seedling	39	32.5	34	28.3
Site selection	28	23.3	16	13.3
Sowing nursery	28	23.3	29	24.2
Transplanting	24	20	29	24.2
Spacing	24	20	33	27.5
Planting density	32	26.7	3	2.5
Fertilizer	29	24.2	3	2.5
Use of agrochemicals/fungicides	32	26.7	3	2.5
Weed control/ herbicides	26	21.7	3	2.5
Pest control/ management	26	21.7	0	0
Harvesting	24	20	0	0
Pruning and fermentation	24	20	0	0
Storage	27	22.5	0	0

Source: Field Survey, 2013

Table 4 Estimated coefficients of the socio-economic factors affecting adoption of innovations by cocoa farmers in Ondo State

Variables	Low adopters	Moderate adopters	High adopters
Age (years)	0.0556	0.0833	-0.1389
	-0.74	-1.12	
Sex (years)	3.1641	4.0094	-7.1735
	(1.64) ***	(1.99) ***	
Level of education (years)	0.2042	0.4095	-0.6137
	(1.44) ***	(2.05) ***	
Household size	-0.0503	-0.2023	0.2526
	(-0.18)	(-0.70)	
Farm size (hectares)	-0.0695	0.1312	-0.0617
	(-0.24)	-0.47	
Farming experience (years)	-0.0265	-0.0257	0.0522
	(-0.44)	(-0.41)	
Membership of organization	-1.9993	1.234	0.7653
	(-0.82)	-0.38	
Labour (man-day)	-0.0079	0.0005	0.0074
	(-0.42)	-0.07	
Quantity (Kg)	0.019	0.0006	-0.0196
	-1.5	-1.03	
Access to	2.8243	1.8258	-4.6501
	-1.17	-0.6	
Income (naira)	-0.0000423	-1.09E-08	4.231E-05
	(-1.49)	(-0.51)	
	-1.4194	-9.393	10.8124
	(-0.39)	(-1.88)	

Number of observations = 54, Number in parentheses are Z-values, Log likelihood = - 25.128563, LR Chi-square = 50.97, Pro > Chi-square = 0.0004, Pseudo R^2 = 0.5035, *** = Significant at 1% level of probability
Source: Field data analysis, 2013

Table 5: Demographic distribution of constraints faced by cocoa farmers in adopting innovations in Ondo State

Constraint	Non-adopters	Adopters					
			1	2	3	4	5	Rank
	Freq	Freq	%	%	%	%	%	
High cost of inputs	68	52	31.7	4.2	0	4.2	3.3	1
Lack of supporting inputs	69	51	15.8	10	4.2	9.2	3.3	7
Problem of diseases / pests	68	52	13.3	11.7	3.3	6.7	8.3	8
Non-appropriateness of the technological package to the Local environment	68	52	2.5	20.8	10	7.5	2.5	10
Non-availability of the improved package	68	52	7.5	19.2	8.3	5.8	2.5	4
Non-Profitability of the new technology	68	52	2.5	10.8	11.7	13.3	5	19
Superiority of the old technology to the newly introduced one	68	52	0.8	5.8	15	15.8	5.8	22
Incompatibility of the new technology with the norms and customs of the local environment	68	52	4.2	2.5	9.2	23.3	4.2	23
Lack of clear understanding of the newly introduced package	68	52	3.3	18.3	5.8	12.5	3.3	12
Low level of educational attainment	68	52	1.7	19.2	1.7	14.2	6.7	13
Low level of income	68	52	5.8	20.8	4.2	8.3	4.2	5
Insufficient Programs designed to convince and encourage change	68	52	0.8	18.3	6.7	10.8	6.7	14
Perception of the old technology as better than the new one	68	52	0	11.7	8.3	16.7	6.7	20
Inconsistence of the innovation with the existing farming system, values and needs	68	52	3.3	8.3	5	20.8	5.8	21
Inadequate information about the newly introduced	68	52	5.8	12.5	5.8	15.8	3.3	15

technological package							
Complexity of the introduced innovation, Failure of some demonstration plots set –up by the extension agents	68	52	8.3	7.5	3.3	16.7	7.5	17
Lack of regular contact with extension agents	68	52	4.2	13.3	5	15	5.8	16
Poor attitude towards change and risk	68	52	4.2	10.8	5	18.3	5	18
Lack of access and control over production resources such as land and credit facilities	68	52	10	16.7	1.7	10.8	4.2	6
Scarcity of complimentary inputs	68	53	15	12.5	1.7	7.5	7.5	2
Lack of funds	68	53	18.3	9.2	5	5.8	5.8	3
Tedious and technical nature of the procedures involved in the technique	68	53	7.5	15.8	4.2	12.5	4.2	11
Lack of access to adequate credit	68	53	11.7	13.3	5	12.5	1.7	9

1=Serious problem, 2=Problem, 3=Not sure, 4=Not a problem, 5=Not a serious problem
Source: Field survey, 2013

disadvantageous in up taking or adopting new cocoa innovations and technologies. Table 1 also revealed the level of involvement of cocoa farmers in farmers' organizations. The finding reveals that many 64.2% of respondents belonged to one organization or the other, while 35.8% did not belong to any organization. According to Yahaya and Omokhaye (2001), the social involvement of cocoa farmers through their participation in farmers' co-operatives will enhance diffusion of information among the farmers. Also, it is essential that cocoa farmers be involved in social organizations as it will enhance their access to government assistance in form of loan and other. Table 1 further shows that, about 75.8% of the farmers financed their farm projects through personal savings, 57.5% of them financed their cocoa farms through loan from a cooperative society. This means that personal savings constitute the major source of fund for maintaining cocoa farm in the study area and thus agree with Nkang *et. al.,* (2006) findings that access to bank loan by cocoa farmers is a big problem due to lack of collateral and the risky nature of agricultural production.

Distribution of respondents according to their source of information is presented in Table 2 which shows that most of the respondents 33.3% acquired information about new innovations through radio, 27.5% through extension agents, 18.3% through television, 16.7 through group leaders, while 4.2% acquired information through print media. The efficiency of extension organizations providing information to cocoa farmers on improved cocoa technologies will play a significant role in the level of farmers innovation uptake with respect to cocoa production (Adeogun *et.al.,* 2009).

Table 3 shows the agricultural innovations disseminated to cocoa farmers for improved cocoa production and level of usage in the study area which includes: hybrid cocoa seedling accounting for 32.5%, site selection 23.3%, sowing nursery 23.3%, transplanting 20%, spacing 20%, planting density 26.7%, fertilizer 24.2%, use of agrochemicals/fungicides 26.7%, weed control/ herbicides 21.7%, pest control/management 21.7%, harvesting 20.0%, pruning and fermentation 20.0%, storage 22.5%.

The adoption rate of cocoa technologies or innovation is believed to be affected by several factors. An attempt was made to determine the level of innovation uptake (adoption rate) among the few adopters who adopted some of the innovations. This was done using multinomial logistic regression analysis. Table 4 shows the factors that influence the rate of adopting a technology by cocoa farmers in the study area. The results in Table 4 indicate that sex and level of education are positive and significantly associated with the innovation uptake (adoption rate) of the disseminated cocoa technologies. The positive sign implies that the

probability of adopting a disseminated cocoa technology is seen to increase with the sex and level of education of cocoa farmer (adopters) in the study area.

Table 5 reveals the constraints encountered by respondents in the adoption of innovations. It also ranks the level of constraints encountered by the respondents as serious problem, problem, not sure, not a problem and not a serious problem. The table rates high cost of inputs as the most serious problem/constraint accounted for 31.7%, followed by lack of funds 18.3%, Lack of supporting inputs 15.8%, Scarcity of complimentary inputs 15.0%, Problem of diseases / pests 13.3%. Other problems / constraints as their seriousness declines are: Perception of the old technology as better than the new one 11.7%, Lack of access and control over production resources such as land and credit facilities 10.0%, Lack of access to adequate credit 11.7%, Complexity of the introduced innovation and Failure of some demonstration plots set –up by the extension agents 8.3%, Tedious and technical nature of the procedures involved in the technique 7.5%, and Non-availability of the improved package 7.5% as the least problem / constraint.

CONCLUSIONS

The study showed that most of the cocoa farmers in the study areas did not adopt cocoa innovations disseminated to them and that the adoption rate of the cocoa farmers was low. The study further indicated that sex and level of education are positive and significantly associated with the uptake (adoption) of the disseminated cocoa technologies. The findings of this research may be of tremendous help to the growth and development of cocoa sub-sectors of agriculture in the study area. In order to improve on the efficiency of innovation uptake among cocoa farmers in the study area, it is recommended extension agents should be well involved in disseminating these technologies by using open field days, demonstration and control plots so as to encourage farmers in adopting the technologies, Government and other stakeholders need to also invest in extension service in sensitizing cocoa farmers in the study areas of new innovations as this have the potential to increase adoption rate as well as farmers productivity and income. Finally, the limitation placed upon the production of cocoa due to high cost of inputs, lack of supporting inputs and scarcity of complimentary inputs should be removed so that farmers can be encouraged to produce more when cocoa production inputs like planting materials, agrochemicals are available and affordable.

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