DETERMINANTS OF CONTACT FARMERS ADOPTION OF IMPROVED CASSAVA PRODUCTION TECHNOLOGIES IN IMO STATE, NIGERIA

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ABSTRACT

This study investigated the adoption level as well as the factors influencing the ADP contact farmer's adoption of improved cassava production technologies in Imo State of Nigeria under the Ecologically Sustainable Cassava production project (ESCapp) of the International Institute for Tropical Agriculture (IITA). A total of 120 ADP contact farmers and 30 extension agents who participated in this programme were purposively selected and data collected through a cross-sectional survey with the aid of a well-structured questionnaire. The data were analysed using the linkert scale method to determine the adoption level of the contact farmers while multiple regression analysis was used to isolate factors that are very critical to this study. The results showed that the grand mean adoption level of the farmers was 0.61 with the planting of improved cassava varieties having the highest adoption score of 0.72 while tillage practices had the least score of 0.49. The value of the coefficient of multiple determination (R^2) was 0.879 implying that the farmers' age (X_1), educational level of the contact farmers (X_2), level of extension contact (X_5), availability of production credit (X_6) as well as other farm inputs (X_7) were statistically significant factors influencing the adoption of improved IITA cassava production technologies in the state. It is therefore recommended that these factors should be seriously emphasized and incorporated in policy formulation and implementation of adoption of innovations for the rural farmers in the state.

Keywords: Determinants, Adoption, Innovations, Policy, Project, Formulation, Implementation

INTRODUCTION

The Imo state Agricultural Development Project (ADP) was launched in September 9, 1982 with the aim of achieving high food productivity, financing rural farmers through the provision of the necessary farm inputs and effecting changes in ways of reaching the rural farmers through the training and visit (T&V) system of extension work by making use of the extension agents. Other specific objectives include rapid transfer of technologies to the grassroot farmers, supply improved seeds, agro-chemicals and fertilizers as well as open up and rehabilitate access/feeder roads (Imo ADP 1990).

One major method by which technology is transferred especially from the researchers to the rural farmers is through its adoption, a function usually performed by the extension agents through its various institutions. Adoption however, can be viewed as a mental process which an individual passes through in deciding to use an innovation. Onyenweaku (1987), Rogers (1969) observed independently that prior to the adoption of new technologies by an individual farmer, he or she follows an adoption process which involves undergoing a number of mental processes like awareness, interest, evaluation, trial and adoption. Factors affecting the adoption of new technologies are many and varied. Existing literature is replete with the view that personal characteristics of the individual farmer affect to a large extent his adoption of new technology (Ugochukwu, 1989). Akubuilo (1982) and Crunning (1971) independently observed that poor supply of production farm inputs, poor transportation facilities, lack of supervision of the farmers as well as the unstable marketing system are among the important constraints to adoption of innovations.

Famoriyo and Nwagbo (1981) found that rural farmers in Nigeria have restricted access to credit, technical knowledge and material means of production. Williams (1981) on the other hand identified lack of appraisal and evaluation as the major successes or failure in achieving their stated objectives especially at the micro-level. Although the economic, personal and other socio-cultural factors are important in explaining farmers response to extension programmes geared toward increased productivity, Rogers (1969) opined that poor response by farmers to extension work and failure to adopt new ideas are essentially due to problems of low motivation, inadequate communication as well as the economic position of the farmers. Therefore to increase the rural farmer's productivity, they (farmers) need to learn and use new scientific, cultural methods and techniques in place of their traditional and outdated practices. The change agents therefore have to double their effort towards using all the available resources and techniques to teach the farmers the required production skills. It is the view of the experts that the declining crop yields culminating in high food prices can be halted if agricultural practice is accompanied with adoption and use of improved technologies. The interactions of agro- ecological and economic differences impose complex limits on the extent to which agricultural technologies can spread within and between regions. Some technologies diffuse widely, whereas others are very site-specific. Many contemporary studies especially as applicable to cassava farming in West Africa emphasize the profitability of new agricultural technologies as a significant factor affecting long run aggregate adoption patterns, which are in turn influenced by the spatial variation in resource endowments, e.g climate, agro-ecology, socio-economic factors, population density and proximity to input and output markets (Feder, Just, and Zilberman, 1985; Pender et al. 2001). While adopter diversity in resource endowment and relative prices is a key explanation for the typically observed S-shaped adoption curve over time, it is not the only one. Factors such as adequate information dissemination (Arrow 1962; Mansfield 1968); access to wealth or credit; risk aversion (Feder, Just and Zilberman, 1985); supply factors with respect to the intrinsic characteristics of the technology and its generation process (Olmstead, 1995) and imitation or learning by- doing processes (Foster and Rosenzweig 1995, Conley and Udry 2002), are just as important.

Our technique is applied to the spread of cassava technologies in West Africa, primarily through improved planting technologies as detailed in Nweke et al (2002). Much of the research generating these technologies is due to the International Institute for

Tropical Agriculture (IITA) headquartered in Nigeria, and their spread from Nigeria to other countries is a key test of the magnitude and determinants of cross-country spillovers in agricultural research. Nweke *et. al*. (2002) argued that the resurgence of cassava production systems in Ghana during the 1990s was primarily due to the successful diffusion of both improved varieties and mechanized processing following a positive shift in government policies with respect to expanding cassava research and development, adaptation and extension. According to FAO report (FAO, 1999) cassava yields during this period increased by as much as 40 percent in Ghana. The implementation of structural adjustment programs during this period also played a role through the devaluation of the exchange rate, by allowing garri to compete more effectively with imported staples such as rice (Camara et al. 2002). This is quite plausible given that the income elasticity for garri among Nigerian urban households has been found to be as high as that for rice (Nweke et al, 2002). The broad objective of this study therefore is to determine the adoption level as well as isolate the determinants influencing the adoption of the improved IITA cassava production technologies by the ADP contact farmers in Imo State.

THE IITA CASSAVA PRODUCTION TECHNOLOGIES

Cassava, *Manihot esculenta crantz*, is a perennial woody shrub with an edible root, which grows in tropical and subtropical areas of the world. It has the ability to grow on marginal lands where cereals and other crops do not grow well; it can tolerate drought and can grow in low-nutrients soils. In Africa, cassava provides a basic daily source of dietary energy, it roots are processed into a wide variety of granules, pastes, flours, etc; or consumed when freshly boiled.

IITA has played a leading role in the development of improved cassava varieties which are disease and pest resistant, low in cyanide content, drought resistant, early maturing, and high yielding. The improved varieties have been introduced through out Africa's cassava belt. Varieties with resistance to the major diseases give sustained yield of about 50% more than the local ones. Today, 60% of the area cropped with cassava in Nigeria is planted with improved varieties and Nigeria is the current world leader in cassava production (Nweke, *et. al*. 2002). Impact studies have revealed that in Nigeria the introduction of improved varieties has provided food for 50 million people. The benefits of IITA- improved varieties are not limited to Nigeria; improved cassava varieties are now used in most cassava – growing countries in Africa. IITA's biological control program has for a number of years been working to solve pest problems in cassava using natural and enviromnetally friendly methods. It has been a major player in the successful bio-control of the cassava mealybug and cassava green mite. Through the introduction of natural enemies there has been a 95% reduction in cassava mealybug damage and a 50% reduction in damage caused by the cassava green mite. To overcome cassava's low multiplication rate, IITA has developed a technique to make 2-node cuttings or ministakes that can make 50 plants from each parent cassava instead of 10 stakes as before. These ministakes are easily moved and protected in plastic sacks until they can grow on and hardened in individual plastic bags or nursery beds before being planted in the field. In the area of post harvest, IITA's scientists have been developing effective and simple machines and tools which reduce processing time and labour, as well as production losses. With these machines, losses can be reduced by 50% and labour by 75%. During the past three decades IITA has trained more than 9000 researchers and technicians in Africa. For example, training in processing and utilization of high cassava flour has been carried out in 10 African countries. As a result, the private sectors in Madagascar, Nigeria, Tanzania and Uganda have begun using high quality cassava flour as a raw material for processing into secondary products such as biscuits and noodles (Nweke *et. al*. 2002).

METHODOLOGY

Improved cassava production technologies recently introduced to the farmers from the International Institute of Tropical Agriculture (IITA) through the Agricultural Development Project (ADP) to improve their farm output and consequently increase their farm income, is the focus of this study. Little is known about the level of adoption of these technologies that is; planting distance, planting date, planting angle and time of weeding with the agro-chemical to be used and the factors that influence their adoption among the cassava farmers in the state. Factors influencing the adoption of these technologies under ESCapp (Ecologically Sustainable Cassava Production Project) and not the individual technology perse is the main focus of this study as well as the methodology adopted.

This study was conducted in Imo State. The state consists of three major Agricultural Zones namely; Owerri, Orlu and Okigwe with 27 Local Government Areas. A visit was made to the ADP state office headquarters in Owerri. This enabled the researchers to collect the list of all their contact farmers in each agricultural zone. A total of 120 respondents participating in the ESCapp technology package were purposively selected comprising 40 from each zone and a total of 30 extension agents. Data were collected with the aid of structured questionnaire and interview schedule conducted by trained enumerators. The data collected were analysed using both the descriptive statistics such as mean, percentage and frequency distribution. Also, the Linkert scale method as well as the econometric tool such as the multiple regression analysis were equally used.

The model used is implicitly stated as;

$L = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, U)$

Where,

L = level of farmers adoption of the ESCapp cassava technologies.

X_1 = Farmer's age (yrs)

X_2 = Educational level (yrs)

X_3 = Household size

X_4 = Number of years of experience in adoption of innovation.

X_5 = Extension contact (1 if often, 0 otherwise)

X_6 = Availability of production credit. (1 if available and used, 0 otherwise)

X_7 = Availability of farm inputs (1 if available and used, 0 otherwise)

X_8 = Dummy variable for occupational type, (1) for farming and '0' if otherwise.

U = Stochastic error term.

RESULTS AND DISCUSSION

The result of this study showed the socio-economic characteristics of the respondents in Table 1. The average age of the respondents is 49 implying that the highly strong and energetic farmers adopt more than the very old or young farmers. This is in line with the findings of Brown (1972) and Akintola (1986) who reported that older and younger farmers are less flexible in changing their cultural perception than the middle aged farmers who are restless and ready to explore an experiment in anticipation of breakthrough. Generally the majorities of the respondents (80%) are less than 60 years of age, hence are still within their productive age and can easily accept and adopt innovations.

The analysis of the data on the level of education of respondents showed that about 44% of them had not more than primary education. The average years spent in school was 8years. This to a great extent is an indication of a high preponderance of very low level of education among the respondents, this could be a militating factor affecting respondents ability to use any accepted innovation effectively especially in areas of recommended practices as well as dosage prescriptions. Education is an important tool that facilitates the adoption of improved technologies by increasing the farmer's knowledge and understanding of new farm practices (Voh, 1982; Uwakah, 1983).

The household size of the contact farmers was found to be about 8 persons per household. This is a large size and could adversely affect adoption of innovation by the farmers.

The level of experience of the ADP contact farmer's adoption of the IITA cassava production technologies in the state was 6 years on the average. This level is relatively low but however it is a very important factor required by every farmer in the field. It is expected that the higher the number of years of experience a farmer has, the more effectively he will be willing to adopt innovations.

The availability and sources of credit to enable a farmer adopt an innovation is a sine-qua-non factor influencing the adoption of innovation. However, more than 50% of the respondents still source their credit from their personal income which is very small and do not encourage the adoption of innovations.

Table 1: Socio-economic Characteristics of ADP Contact Farmers on Adoption of Innovations

Socio-economic characteristics	Number of respondents	Percentage of respondents
Age (years)		
31-40	31	25.83
41-50	46	38.33
51-60	19	15.83
61-70	18	15.00
71 and above	6	5.00
Total	**120**	**100.00**
Educational Level (Yrs)		
No formal education	32	26.67
1-6	21	17.50
7-13	40	33.33
14-20	15	12.50
21 and above	12	10.00
Total	**120**	**100.00**
Household size		
1-5	33	27.50
6-10	65	54.17
11-15	13	10.83
16-20	7	5.83
21 and above	2	1.67
Total	**120**	**100.00**
Years of experience in adoption of ADP innovations		
1-5	76	63.33
6-10	27	22.50
11-15	12	10.00
16-20	5	4.17
21 and above	0	0.00
Total	**120**	**100.00**
Availability and sources of production credit		
Personal income	60	50.00
Friends and relatives	24	20.00
Money lenders	18	15.00
Banks (commercial)	16	13.00
Others	2	1.67
Total	**120**	**100.00**

Source: Field Survey Data, 2003/2004.

Table 2: Distribution of the ADP Contact Farmers according to their Adoption of the IITA Improved Cassava Production Technologies using the Linkert Scale Method.

Adoption stages	Planting improved cassava varieties	Planting distance	Planting angle	Planting date	Fertilizer application	Weeding interval	Agro-chemical application	Tillage practices
Awareness	93.20	73.20	72.41	72.60	83.40	74.30	94.33	34.30
Interest	50.32	62.40	42.33	60.14	62.90	60.30	80.24	62.40
Evaluation	60.50	70.30	38.60	56.50	60.30	58.44	41.30	50.40
Trial	80.40	60.59	45.90	49.50	68.10	52.90	60.10	50.00
Use	74.70	80.14	50.52	44.33	67.41	76.30	32.50	45.60
TOTALS	359.12	346.63	249.76	283.07	342.11	322.24	308.47	242.70
Mean Adoption Score	0.72	0.69	0.50	0.57	0.68	0.64	0.62	0.49

Grand Mean Adoption Score: L = 0.61 **Source:** Field Survey Data, 2003/2004.

Table 2 shows the distribution of the ADP contact framers according to their adoption of the eight technologies investigated. The highest adoption score was 0.72 for the planting of improved cassava varieties introduced; NR3055, NR30572, NR8082, NR8083 and TMS 1425. The least adoption score was 0.49 for tillage practices because the implements such as tractors were not available at the right time. The grand mean (L) adoption score was 0.61, that is about 61% of the entire IITA cassava production technology package was adopted by the ADP contact farmers in Imo State.

Table 3: Multiple Regression Results of the Determinants of the Effective Framers Level of Adoption of Improved IITA Cassava Production Technologies in Imo State.

Explanatory variables		Linear function Coefficients	t-ratios	Semi-log function coefficients	t-ratios	Double log function Coefficients	t-ratios	Exponential function coefficients	t-ratios
Farmers age	X_1	-0.01502	-2.721*	-0.72322	-2.716*	0.001298	2.318	-0.064019	-2.408
Educational level	X_2	0.00523	3.708*	0.02880	0.688	0.000384	0.514	0.003063	0.733
Household size	X_3	0.007855	0.624	0.031130	0.429	0.00039	0.307	0.004382	0.604
Years of experience	X_4	0.007196	1.055	0.091890	1.126	0.00056	0.824	0.01267	1.556
Extension contact	X_5	0.394678	3.571*	3.98326	3.599*	0.03113	2.788*	0.328071	2.968*
Availability/use of credit	X_6	0.120242	2.921*	1.26381	1.073	0.00732	0.616	0.092019	0.781
Other farm inputs	X_7	0.332672	3.858*	3.55331	3.877*	0.03428	3.934*	0.353790	4.097*
Occupation	X_8	0.030528	0.276	0.00792	0.065	0.01186	1.059	-0.00484	-0.398
Constant term		0.621247		3.45330		0.040006		-0.21742	
R^2		0.8788		0.37727		0.349148		0.363067	
F-Values		6.938752*		2.8915*		0.102115		0.48042	
N		120		120		120		120	

Source: Computer Analysis of the Field Survey Data, 2003/2004

(*) Significant at 1%

Four functional forms Linear, Double log, Semi- log and Exponential were fitted into the data, however only the result of the Linear function was used for further analysis because it gave the best fit. The results in Table 3 showed that the farmer's age, educational qualification, extension contact, availability of production credit as well as other necessary farm inputs were all highly significant (1%) factors influencing the contact farmer's level of adoption of IITA improved cassava production technologies. Furthermore, they were all positively related to the farmer's level of adoption except that of age. The coefficient of age (X_1) was significant at (1%) level but negatively signed indicating a reduction in the farmer's level of adoption as he gets older. This is in line with *a priori* expectation as the farmer will be less concerned with risk taking hence preferring to maintain the *status quo.*

The coefficient of the educational level of the respondents (X_2) was significant at (1%) and positively signed. In this case, increase in literacy level will most likely result in an increase in the farmer's level of adoption of ADP's innovations. This is quite expected and is in line with Orebiyi (1981) who observed that education is an investment in human capital which is able to raise the skills and qualities of man , narrows his information gap and increase his allocative abilities thereby leading to more productive performance.

The coefficient of extension contact (X_5) was significant at (1%) and positively signed indicating that the more the extension contact with the farmers, the higher will be the likelihood of their level of adoption of innovations. This is expected because the level of interaction and rappour between the extension agents and the farmers will be high and more frequent thereby creating a favourable environment for information dissemination between both parties.

The availability of production credit (X_6) and other necessary farm inputs (X_7) were both significant at (1%) and positively correlated. The more the farmers have access to production credit and other necessary farm inputs and use them, the greater will be their level of empowerment to adopt innovations. This in real sense can translate to greater level of adoption with a multiplier effect on increase in output level and hence increase in farm income.

The coefficients of household size (X_3), years of experience in adoption of innovation (X_4) and the farmers type of occupation (X_8) were not statistically significant at any level hence were ignored. The value of the coefficient of multiple determinations (R^2) was 0.8788 implying that; the farmers' age, literacy level, extension contact availability of production credit as well as other necessary farm inputs account for 87.88% of the variations in the level of adoption of ADP contact farmer's adoption of the IITA cassava production technologies in Imo state, Nigeria. The F-ratio of 6.938752 was found to be significant at (1%) which shows that the joint effect of all the included variables were significant.

CONCLUSION

This study revealed that, the grand mean adoption score was 0.61 while the farmers literacy level, extension contact, availability of production credit as well as other necessary farm inputs were found to be the major factors influencing an increase in the level of adoption of IITA improved cassava production technologies while the level of adoption decreases with increase in the farmer's age. Therefore, there is a need for the adoption level of the farmers to be increased. This can be achieved by emphasizing the above influencing factors in any policy programme on adoption designed for them. This can be achieved through increase in awareness of any new innovation aimed at improving their agricultural productivity.

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