Determinants of Adoption of Selected NRCRI Cocoyam Technologies among Farmers in Umuahia South Local Government Area of Abia State, Nigeria

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Abstract

The study examined "determinants of Adoption of selected National Roots Crops Research Institute (NRCRI), Umudike Umuahia, cocoyam technologies among farmers in Umuahia South Local government Area. This study was guided by the following specific objectives; to describe the socio – economic characteristics of cocoyam farmers in the study area, identify the cocoyam technologies introduced to the farmers, determine the level of adoption of the technologies among cocoyam farmers, determine the socio-economic factors influencing adoption of these cocoyam technologies, identify problems which affected the rate of adoption of cocoyam technologies in the study area. Multistage random sampling was used to select 3 blocks 2 circles from each block, and 2 sub circles from each circle. Finally, 10 cocoyam farmers were randomly selected from each of the 12 sub- circles, making a total of 120 cocoyam farmers. Primary data were collected from respondents by the use of structured questionnaire. Findings, indicated that majority of the farmers were between 40 and 60 years of age. Cocoyam farming was dominated by females. The farmers were literates by education assessment, and had farming experience between 6 to 15 years. Major findings revealed that 7 out of 19 technologies disseminated by NRCRI, had mean score (X_2) above 3.00, and they include, control of CRRBC, cocoyam chips/flakes, cocoyam soup thickener, cocoyam flour, starch production, planting debt, and use of manure. The coefficient of age (-2.71) was negative and significant at 1% level of probability. Any increase in age will lead to corresponding decrease in adoption.

The coefficient for education (4.45), farming experience (3.64), household size (3.74), extension contact with farmers (3.2), were positive and significant at 1% level of probability while coefficient of gender and access to credit was negative and significant at 1% level of probability. Poor infrastructural facilities, lack of fund to invest, poor knowledge of cocoyam technology, poor storage facilities, rot and decay of cocoyam, pest and disease attack among others, were constraint factors in cocoyam technology adoption. The study recommended that there should be awareness creations by extension in the used of various cocoyam technologies for production. There should be government policies towards encouraging young female farmers to increase adoption of cocoyam. Policies aimed at provision of free education to the females and encouragement in cocoyam farming must be put in place. Credit facilities should be made available to the cocoyam farmers by the government. All the constraints factors from the study are paramount to adoption of cocoyam and should be addressed by the State and Local government in conjunction with extension department.

Keywords: Adoption, NRCRI, cocoyam, Technologies, farmers

Introduction

Nigeria is the world's largest producers of cocoyam (FAO, 2006). Cocoyam (Xanthosoma and colocasia spp) is an important staple crop cultivated in the southern part of Nigeria (Ojiako *et al*., 2007). Being an important food security crop in Nigeria, it is variously grown by resource poor farmers, mostly women who intercrop cocoyam with yam, maize, plantain, banana, vegetables and rice (Ikwelle *et al*, 2003). Colocasia esculenta otherwise known as taro is more popular than xanthosoma sagittaifolium, otherwise known as tannia.

The potentiality of cocoyam is not only attributed to its use as source of food for man, industrially, cocoyam is used for production of alcohol, medicines, flour, starch and feed for livestock (Eke and Oti, 2005). Nevertheless, through contributory effort of the National Root Crop Research Institute (NRCRI) Umudike, Abia State, Nigeria about nine cultivars of cocoyam that are resistance to disease and have high yield capacity are identified in Nigeria. They include: NX5001, NX5OO2, NX5003, NX5004, NCE002, NCE 003, NCE 004, NCE 005, and NCE 006 (Mbanaso *et al*., 2008).

However, cocoyam has hitherto suffered stiff competition from yam which is preferred for consumption and from cassava which yields more heavily and required less care (Okoye, 2006). It is widely believed that there has been a declining trend in production as well as shortage of supply of this crop in our domestic market. This is believed to be (Spores, 2003). FAO (2003) Posited that about 852 million men, women, children are chronically hungry due to extreme poverty while up to 2 billion people lack food security intermittently due to varying degrees of poverty. The contribution of cocoyam will indeed help to achieve food security in Abia State and nation Nigeria at large. Chiri *et al* (1996) has observed that in Nigeria only 24% of the cropable land for cocoyam is under cultivation, also cocoyam research and development has been meager compared with other tropical root crops and mainly grown by resource poor farmers largely women (Ikwelle and Igbokwe, 2001). In Umuahia South, L.G.A of Abia State, cocoyam is produced for consumption, sale, and for use as raw materials in the industrials sector, all of which create high demand for cocoyam and cocoyam products. The researchers therefore embarked on the determinants of adoption of selected NRCRI cocoyam technologies among farmers in Umuahia south LGA, Abia State, Nigeria.

Objectives

The specific objectives were to:

- **i)** Descriptive the socio-economic characteristics of rubber farmers in the study area.
- **ii)** Identify the cocoyam technologies introduced to the farmers
- **iii)** Determine the level of adoption of the technologies among cocoyam farmers.
- **iv)** Determine the socio-economic factors influencing adoption of these cocoyam technologies.
- **v)** Identify problems, which affected the rate of adoption of cocoyam technologies in the study area.

Material and Methods

The study was conducted in Umuahia south of Abia State, Nigeria. It is located at the central point of Abia State, covering an area of 23sq.km, with a total population of 139,058 (NPC 2006). It is located at latitude 5^0 45^1E – $7^0 73^1$N and long 5^0 23^1E and 7^0 25^1N. It is tropical with wet and dry season.

Crops cultivated include cassava, yam, plantain, banana, maize, vegetables, cocoyam and ecological crops such as oil palm, rubber and citrus. The people also engage in livestock farming such as poultry, piggery, goatry and sheep production.

Multi – stage random sampling technique was used to select samples from the population. In the first stage 3 blocks were selected at random. In the second stage, 2 circles were selected randomly from the blocks. This gave a total of 6 circles, while 2 sub – circles were selected from each, making a total of 12 circles. Finally, 10 cocoyam farmers were randomly selected from each of the 12 sub-circles, giving a total of 120 cocoyam farmers as respondents for the study. Primary data were collected from farmers by the use of structured questionnaires.

Objectives i, ii, were analyzed with the use of frequency tables, means and percentages, objectives iii was analysed with the use of multiple regression analysis, while objective iv was analysed with frequency, percentage and rank order method.

Model Specifications

Multiple regression procedure was used to analyze the socio-economic determinant of farmers on the adoption of selected NRCRI cocoyam technologies.

The implicit form of the model is given thus:

$Y = f(X_1 + X_2 + X_3 + X_4 - - - - - - (X_n)$

Where:

Y = Adoption rate of cocoyam technologies (adoption rate refers to the extent of the use of cocoyam technologies).

X_1 = Age of farmers in years
X_2 = Level of education in years
X_3 = Household size in numbers
X_4 = Farmers experience in years
X_5 = Number of extension contacts
X_6 = Gender (dummy variable; 1 = male, 0 = female)
X_7 = Membership of co-operative society (dummy variable; 1 = members, 0 = non members)
X_8 = Occupation
X_9 = Credit facilities

Mean of Adoption

The extent of adoption by the respondent will be measured by using the seven point Likert scale; unaware (0), aware (1), interest (2), evaluation (3), trial (4), adoption (5), rejected (6), following Okoye *et al*, (2009).

To determine the mean of adoption level $\bar{X} = \Sigma x$

the mean score $\bar{X}$, of each item was computed by multiplying the frequency of each response pattern with its appropriate nominal value and dividing the sum with the number of respondents to the items. This can be summarized with the equation below.

$$\bar{X} = \frac{\Sigma fn}{n}$$

Where $\bar{X}$ = Mean score

Σ = Summation

N = frequency

n = likert nominal value

$$\bar{X} = \frac{0 + 1 + 2 + 3 + 4 + 5 + 6}{7} = \frac{21}{7} = 3.0$$

Results and Discussion

Table 1 reveals that 42.5% of the cocoyam farmers were between 50-60 years of age, followed by 35.8% who were between 40 – 50 years of age. This supported poison and Spencer (1991) who put the ages at between 40 and 60 years when farmers are more likely to adopt cocoyam technologies. Result indicates that 54% of the respondents were female while 45.8% were males. The implication of this result is that it had consolidated previous results that the crop is indeed women's crop (Okorji, 1985).

The study disclosed that majority (45%) had primary education and 33.3% had tertiary education. The more the farmers advance in education, the more they tend to understand the importance and need for adopting improved technologies (Oguni Fiditimi, 1981). Most respondents 44.17% had between 6 – 10 years of farming experience, followed by 32.5% whose farming experience was above 15 years. This corroborates with (CIMMYT, 1993). That older farmers have experience, resource and authority for trying a new farm technique than younger farmers.

Furthermore, the study revealed that 34.2% of the cocoyam farmers had between 1.0 – 1.5 hectares (ha) of land, followed by 25% who had 0.5 – 1.0 and 1.5 – 2.0 hectares. This is in line with Ekong (2005) who stated that small land holdings still persist in Nigeria based on inheritance and prone to fragmentations. The study shows that majority (40.8%) of the cocoyam farmers had household size of between 11 and 15 persons, followed by 39.2% who had between 6 and 10 persons. The study found out that 41.7% of the respondents belonged to co-operative societies and that 36.7% were involved in full time farming.

However, table 2 shows the distribution of respondents according to level of adoption of NRCRI cocoyam technologies by farmers. The control of (CRRBC $\bar{X}$, 3.73), cocoyam chips flakes (X, 3.86) cocoyam soup thickener ($\bar{X}$, 4.07), cocoyam flour (X, 3.23), Planting depth (X, 3.50), Starch (X, 3.13), and use of manure (X 3.27) respectively, had mean score (X), higher than the mean score value of 3.0 and so adopted. All other technologies were less than 3.0, therefore they were not adopted. The main reasons given by farmers for adoption of the seven out of the nineteen technologies include, profitability, easy to handle, cultural acceptance, and it is not labour intensive.

Table 3, shows the relationship between socio-economic variables (Age, educations, household size, farm experience ,gender, number of extension contact, co-operative society, occupation and the adoption of cocoyam technologies). Of all the functional form tried, the double log functional form had the highest R^2 value of 0.800, numbers of significant variables and according to a *prior* expectation. The coefficient for age (-2.71) was negative and significant at 1% level of probability. This implies that any increase in age will lead to a corresponding decrease in rate of adoption. This is in agreement with a prior expectation because older farmers are not amenable to risk (Okoye, *et al* 2009). The coefficient for education (4.45) was positive and significant at 1% level of probability. This implies that any increase in education level is expected to lead a corresponding increase in rate of adoption. Educated farmers are expected to be more receptive to improved farming techniques, than the less educated ones, Okoye *et al* (2004). The coefficient for farming experience (3.64), household size (3.74), extension contacts with farmers (3.12), was positive and significant at 1% level of probability and the coefficient for gender (-3.22) was negative and significant at 1% level. This implies that the rate of adoption for females was more than the males; while the coefficient for access to credit (-3.68) was negative and significant which implies that the cocoyam farmers had no access to credit and this affected adoption.

Table 4 shows the distribution of respondents according to constraints in cocoyam production technologies in Umuahia South Local Government Area of Abia State, Nigeria. Percentage and ranks order were employed. Data showed that poor infrastructural facilities, lack of fund to invest, poor knowledge of cocoyam technology, poor storage facilities, lack of credit, rot and decay, among others on the table, were ranked (1^{st}, 2^{nd}, 3^{rd}, 4^{th}, 5^{th}, 6^{th}). The study also showed that other constraints had percentages ranging from 60% - 80%, which were equally important constraint variables.

Table 1: Socio –Economic Characteristics of the Farmers

Variable	**Frequency**	**Percentage**
Age(yrs)		
<30	-	-
30-40	23	19.2
40-50	43	35.6
50-60	51	42.5
>60	3	2.5
Total	**120**	**100.0**
Sex		
Male	55	45.8
Female	65	54.2
Total	**120**	**100.0**
Level of education		
Primary education	54	45
Secondary education	26	21.7
Tertiary education	40	33.3
Total	**120**	**100.0**
Farming experience (yrs)		
1-5	7	5.83
6-10	53	44.17
11-15	21	17.5
>15	39	32.5
Total	**120**	**100.0**
Farm size (hectare)		
0.25-0.50	6	5
0.50 – 1.0	30	25
1.0 – 1.5	41	34.2
1.5 – 2.0	30	25
2.0 – 2.5	12	10
>2.5	1	0.8
Total	**120**	**100.0**
Household size		
1-5	22	18.3
6-10	47	39.2
11-15	49	40.8
15-20	2	1.7
Total	**120**	**100.0**
Extension contact		
Once a month	32	26.7
Twice a mouth	56	46.7
Once in two month	17	14.1
Twice in two month	15	12.5
Total	**120**	**100.0**
Membership of cooperative		
No	70	58.3
Yes	50	41.7
Total	**120**	**100.0**
Primary occupation		
Full time	44	36.7
Part time	76	63.3
Total	**120**	**100.0**
Access to credit		
No	98	81.7
Yes	22	18.3
Total	**120**	**100.0**

Source: field survey data, 2010

Table 2: Distribution of Cocoyam Farmers According to Level of Adoption of NRCRI Cocoyam Technologies among Farmers in Umuahia South Local Government Area, Abia State, Nigeria

S/No	Cocoyam Technologies	Unaware	Aware	Interest	Evaluation	Trial	Adoption	Rejection	Adoption Score
1.	Plant population	24	20	16	16	20	16	8	2.57
2.	Minisett technique	28	12	16	16	12	24	12	2.76
3.	Weed control methods	32	12	12	16	20	16	12	2.63
4.	Fertilizer application	20	72	-	4	4	8	12	1.77
5.	Stand geometry	64	12	4	4	-	16	28	2.33
6.	Compatible crop mixture	28	40	8	4	12	16	12	2.33
7.	Line mounding/planting	36	20	20	4	12	12	16	2.33
8.	Pest control	8	52	24	4	-	24	8	2.33
9.	Early planting	4	88	16	8	-	-	4	1.40
10.	Control of CRBC	12	36	-	4	-	8	60	3.73
11.	Cocoyam chips/flakes	18	12	16	-	-	4	-	3.86
12.	Cocoyam soup thickener	12	8	4	8	-	80	8	4.07
13.	Cocoyam flour	16	20	12	12	8	36	16	3.23
14.	Starch production	12	28	12	20	4	16	28	3.13
15.	Time of planting	8	72	12	8	12	8	-	1.73
16.	Plant spacing	32	48	12	4	12	8	4	0.97
17.	Planting debt	8	12	24	4	16	52	4	3.5
18.	Use of manure	8	40	8	-	-	48	16	3.27
19.	Harvesting	12	76	4	-	-	28	-	0.93

Table 3: Multiple Regression Analysis of Determinants of Selected NRCRI Cocoyam Technologies among farmers in Umuahia South LGA, Abia state, Nigeria

Variable	Linear	Exponential	Double log+	Semi log
Constant	42.486	3.725	4.268	69.494
	(18.25)***	73.77	(16.04)***	(5.39)***
X_1 = age	-0.015	-0.0003	-0.127	-5.976
	-0.71	-0.71	(-2.71)***	(-2.64)***
X_2 = education	0.714	0.014	0.126	6.609
	(6.68)***	(6.02)***	(4.45)***	(4.81)***
X_3 = household size	0.941	0.021	0.166	7.471
	(10.16)***	(10.30)***	(3.74)***	(3.47)***
X_4 = farming experience	0.308	0.006	0.089	4.165
	(5.32)***	(4.92)***	(3.64)***	(3.50)***
X_5 = no. of extension contacts	0.223	0.004	0.157	7.147
	(0.80)***	(0.65)***	(3.12)***	(3.05)***
X_6 = gender	-1.987	-0.047	-0.086	-3.656
	(-2.65)***	(-2.90)***	(-3.22)***	(-2.83)***
X_7 = Members of cooperative	1.97	0.036	-0.013	-0.082
society	(2.09)***	(1.73)*	-0.47	-0.06
X_8 = Occupation	-1.991	-0.036	0.025	1.128
	(-1.93)*	(-1.77)*	0.70	0.66
X_9 = Access to credit	10.354	-0.233	-0.257	-11.767
	(-4.69)***	(-4.87)***	(3.68)***	(-3.48)***
R^2	0.797	0.793	0.800	0.787
Adjustment R^2	0.778	0.774	0.760	0.744
F- value	42.87	41.92	20.05	8.48

Source: Field survey Data 2010

* Significant at 10%

** Significant at 5%

*** Significant at 1%

\+ = Lead equation

Figure in parenthesis are the t- values.

Table 4: Distribution of Cocoyam Farmers According to Constraints in Cocoyam Technologies Adoption in the Study Area

s/no	Constraints	Frequency	Percentage	Rank order
1	Rot and decay during storage	104	86.7	5th
2	Poor storage facilities	108	90	4th
3	Lack of credit	108	90	4th
4	Pest and disease	100	83.3	6th
5	High cost of planting material	104		
6	Limited land	100	83.3	6th
7	Distance from farm to market	100	83.3	6th
8	High cost of labour	76	63.3	7th
9	Poor infrastructural facilities	120	100	1st
10	Poor knowledge of cocoyam technologies	112	93.3	3rd
11	Labour unavailability	104	86.7	5th
12	Low price of product	100	83.3	6th
13	Low soil fertility	100	83.3	6th
14	Lack of extension contact	104	86.7	5th
15	Poor feeder roads	72	60	8th
16	Lack of fund to invest on cocoyam technologies	116	96.7	2nd

Source: Field survey Data 2010

Conclusion

Based on the findings of this study the following major conclusion was made. The adoption age for cocoyam production was between 40 – 60 years old, this is in line with Poison and Spencer (1991), that adult farmers dominated cocoyam production in the area. Adoption of cocoyam was found to be in line with advance in education. The level of adoption of NRCRI cocoyam technologies was not quite impressive. Out of the 19th technologies, disseminated to the farmers, only 7 had means score (X) above 3.0. In table 2, the coefficient for age gender and access to credit had a negative relationship with rate of adoption of cocoyam technologies and were significant. The coefficient for education, household size, farming experience, number of extension contact and access to credit, had positive relationship with rate of adoption. Table 4, shows that all constraints bedeviling the rate of adoption of cocoyam technologies were accepted and they ranged from 60% to 100% and also in rank order of acceptance.

Recommendations

Awareness creation in the use of the various technologies by extension would be a necessary step towards increased cultivation and production of cocoyam. The study revealed that age and gender had a negative relationship with rate of adoption. There is therefore need for government policies towards encouraging the female farmers who are younger more active and agile to increase adoption. The study also revealed that education and farming experience were positive. The result therefore calls for policies aimed at provision of free education especially to the girl – child and encourage those who are experience to study the production and increase adoption of cocoyam technologies.

Furthermore, the coefficient for number of extension contacts was positive and access to credit was negative but significant at 1% level of probability. This calls for government policies targeted on improved extension service delivery system to the farmers to enable them improves on where they are currently. There is also the need for improvement on government policies on access to credit especially to the women, since they constituted the majority in cocoyam production in the area investigated. The state and local government in conjunction with extension departments should help to address all the constraint factors impeding cocoyam technology adoption in the study area, since all the factors are paramount.

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