FACTORS INFLUENCING YAM MINISETT TECHNOLOGY ADOPTION BY FARMERS IN ENUGU STATE NIGERIA

IRONKWE A.G*., R. P. A. UNAMMA, A. C. NWOSU** AND O. ELEMUCHE****

* National Root Crops Research Institute, Umudike, P. M.B.7006,Umuahia,
Abia State, Nigeria adanmaglory@yahoo.co.uk.
**Michael Okpara University of Agriculture, Umudike, P. M. B. 7267, Umuahia, Abia state, Nigeria.

ABSTRACT
The study was designed to examine the factors influencing yam minisett adoption by farmers in Enugu state, Nigeria. A multi-stage random sampling technique was used to select 96 yam growing farmers in the state. Interview schedules were used to elicit information from the respondents. Data were analysed using statistical tools like frequency, percentages, means and probit model. The results revealed high level of awareness (93.75%) and high rate of adoption (88.74%) of the technology by the farmers. However, further investigation showed that the extent of adoption was low (24.71%). The probit results indicated that age (P = 0.05), farm size (P = 0.01), educational status (P = 0.10), membership of farmers' association (cooperatives (P = -0.01), frequency of extension contact (P = 0.01) and access to credit (P = 0.10) were the variables that significantly influenced adoption of the technology. High cost of labour (82%), scarcity/ high cost of fertilizer (81%), scarcity of minisett dust (70%) and lack of loan (57%) were among others, the problems encountered by the farmers in adopting the technology. The study recommended that research and extension should step up promotion of the technology by ensuring that the complementary input are made available to the farmers to enhance adoption of the technology. The farmers should also be encouraged to increase their farm size and join cooperative/farmers association to have easy access to credits, information, input to enable them adopt the technology to increase their seed yam production in the State.

KEYWORDS: yam, minisett, adoption, farmers, labour cost, credit

INTRODUCTION

Yam is one of the staple tuber crops of economic important. It is mostly grown in the three major agro-ecological (Southeast, Southwest and North central) of Nigeria (Orkwor, Asiedu and Ekanayale,1998). The crop is an important source of carbohydrates in the diet of most Nigerians contributing about 20 percent of their daily caloric intake (Onyenweaku and Mbuba,; 1991, Asumugha and Chinaka, 1998). Yam has ritual, socio-cultural and economic significance in addition to direct use for family food (Orkwor, *et al*, 1998). It is regarded as prestigious and men's crop. As such men who distinguish themselves in large scale production of quality yams acquire yam title (Ezeji).

However, the cost of yam production is observed to be higher compared with other tubers in the country (Chikwendu, Chinaka and Omatayo, 1994). This is largely due to the high cost of seed yam and low multiplication ratio of the weight of seed yam to that of ware yam. Consequently, on the average, about 20% of the annual yam harvested is used as seed yam. This situation has caused yam cultivation to suffer a sever set back due to high cost of production (Asumugha and Chinaka, 1998). To address this problem, the National Root Crops Research Institute, Umudike in collaboration with International Institute for Tropical Agriculture, Ibadan developed the yam minisett technology as a quick and easy way of multiplying healthy seed yams (Otoo *et al*, 2001). This technology has been transferred to farmers in the country through the various States Agricultural Development Programmes (ADPs) for adoption.

The effectiveness of any research efforts is that the technologies developed must have been extended to and adopted by the ultimate users to increase their production. Thus, after developing and transferring technologies, efforts should be made to find out the reactions of the users and their constraints. Even though pervious adoption studies on the technology on the State recorded low adoption (Ogbodu, 1995, Aniedu 2006), however, since adoption is a gradual and continues process, there is need to carry out adoption studies on regular basis to monitor and ascertain trend of events in the farmers' fields. Hence, this study was designed to determine the current rate and extent of adoption of the technology and some socio-economic factors influence its adoption by farmers in the State.

METHODOLOGY

Study Area.

The study was conducted in Enugu state of Nigeria in 2009. The State is located in the South Eastern zone of Nigeria and is one of the 36 States in Nigeria. The state is divided into three main agricultural zones (Enugu East, Enugu West and Enugu North). The work was carried out in two agricultural zones (Enugu East and Enugu North) of the State. Agriculture is the major occupation of the people. Almost all the families farm either as primary or secondary occupation. The major food crops grown are yam, cassava, rice, maize, melon, cocoyam, sweet potatoes, groundnuts and varieties of vegetables. These crops are grown in small holder plots usually in mixtures of at least two or three simultaneous crops.

The Data:

A multi stage random sampling technique was used in data collection. Two out of the three agricultural zones were randomly chosen (Enugu East and Enugu North). From each zone, two blocks were randomly selected out of six blocks. From each block, two circles were randomly chosen from four circles. In each circle 12 yam growing farmers were randomly selected from a list of yam farmers from the extension agents in charge of the circles. This gave a total of 96 farmers for State. Interview schedule was used in eliciting information on socio-economic characteristics of the farmers and their production activities including inputs, output and income. The whole 96 interview schedules were retrieved and used in the analysis.

Data were analysed with sample statistics and probit model (maximum likelihood estimate).
The probit model is specified as:

$Y^*_i = B^i X_i + E$

$Y_i = 0 \text{ if } Y^*_i \leq 0 \text{ and } Y_i = 1 \text{ if } Y^*_i => 0$

Where

Y^*_i = an underlying latent variable that indexes adoption of technology (Ekwe, Nwachukwu and Ekwe, 2008)

Y_i observable dummy variable that indexes the adoption of technology

B^1 = A vector of estimated parameter

E = The error term.

X_i = Individual socio-economic characteristics considered in the study

X_1 = Farmer's age in years

X_2 = Farmers household size number

X_3 = Farmer's farm size in hectares

X_4 = Land ownership a dummy variable that takes the value of unity for owners of land and zero other wise.

X_5 = Farmer's level of education in years

X_6 = Farmer's farming experience in years

X_7 = Membership of farmer' association/cooperative societies, a dummy variable which takes the value of unity for members and zero other wise.
X_8 = Frequency of contact with extension annually
X_9 = Access to credit, a dummy variable which takes the value of unity if the farmer has access to credit and zero other wise.
The coefficient of age is expected to be negative and those for the other variables positive.

RESULT AND DISCUSSION

Average statistic of farmers: The average statistics of the sampled farmers are presented in Table 1. On the average, a typical yam farmer is 52.12 years old with 7.18 years of education, 25.37 years of farming experience and an average household size of about 8 persons. The average farmer had an average of 15 times of extension contact annually cultivated 0.21ha for seed minisett production, employed 24.92 Mandays of labour spent, N45,290.00 on input including labour, and produced an output of 1,71.69kg of seed yam.

Table 1: Average statistics of sampled yam farmers.

Variables	Means
Age	52.1146
Farming experience	25.3646
Household size	7.5000
Educational status	7.1771
Farm size	0.2122
Frequency of extension contact	15.0000
Total cost of production	45,290.01
Labour Mandays	24.9271
Output	1712.686

Source: Field Survey, 2009

Table 2 reveals the awareness, adoption and components of the technology adopted by the farmers. From the Table, 93.75% of the sampled farmers were aware of the existence of the technology while 88.54% have adopted and still practicing it. On the extent of adoption based on the number of the component of the technology adoption by he respondents, the Table shows that 57.29% of the respondents adopted land preparation, 19.79% adoption use of seed beds, 58.33% adopted time of planting (when rains are stead), 33.33% adopted seed dressing chemical (minisett dust) while 48.96% adopted spacing (25cm x 100cm) and 29.17% adopted the use of fertilizer. This implies that not all the farmers who adopted the technology are using all the components of the technology. Use of seed beds, fertilizer and seed dressing chemical (Minisett dust) recorded the least.

Table 2: Awareness, adoption and components of technology adopted by the respondents

Variables	Frequency	% age
Awareness		
No	6	6.25
Yes	90	93.75
Adoption		
No	11	11.46
Yes	85	88.54
Components of technology adopted		
Land preparation	55	57.29
Use of seed bed	19	19.79
Set size (25 to 50gm)	56	58.33
Time of planting (rains are steady)	55	57.29
Use of seed dressing chemical	32	33.33
Spacing (25cm x 100cm)	47	48.96
Fertilizer application	28	29.17

Source: Field Survey, 2009

Result of the probit analysis in Table 3 reveals that the constant was negative but significant at 1% level while the Chi-square was positive and significant at 1% level showing goodness of fit of the set of data used in the model. This means that the data fitted the model used in the analysis.

The coefficient of farmers' age is positive and statistically significant at 1% level indicating direct relationship between age and adoption. This is contrary to a priori expectation that adoption of new technologies decreased with increase in age. The result is in contrast to the usual negative relationship between age and the ordinary or usual adoption where a farmer is defined to have adopted an innovation if he is younger. However, the result agrees with the findings of Ekumankama and Nwankwo, (2002); Okounade, Olaniyi and Ogunleye (2005); but differs from that of Ironkwe, Asiedu and Chinaka (2007) who found a negative and significant relationship between age and adoption of yam minisett in Abia state, Nigeria.

The coefficient of farm size (2.664***) is positive and significantly related to adoption at 1% level. This is in consonance with a priori expectations that farmers with larger size of farm adopt new innovation more than the smaller one because the latter could afford to take risk to invest relatively smaller portion to venture into an uncertain enterprise, and hence adoption becomes possible. The result is consistent with those of Ironkwe et al 2007; Imoh and Essien 2005; Okoro (1999), Ironkwe, Ekwe and Asiedu (2008); Abiola and Omoabungan (2001).

The coefficient of education is positive and statistically significant at 10% indicating that education is directly related to adoption. This result agrees with a priori expectations that education increases adoption and enhances farmers' ability to understand and evaluate new production techniques and is consistent with the results of Imoh and Ession (2005); Ironkwe *et at* (2007) but differs from that of Ekumakama and Nwankwo who found no significant relationship between education and adoption.

The coefficient of membership of farmers association /cooperative is negative but statistically significant at 1% level indicating that membership of farmers' association/ cooperative is inversely related to adoption. This result is contrary to a priori expectations that members of cooperatives/ farmers' association adopt technologies more easily than non-members because they have more access to agricultural information, credit and other production inputs as well as more enhanced ability to adopt innovations. The result disagrees with the reports of

Ironkwe (2002), but is consistent with the findings of Ekumakama and Nwankwo (2002); Ironkwe, Asiedu and Chinaka (2007).

The coefficient of frequency of contact with extension is positive and statistically significant at 1% level showing that frequency of extension contact is directly related to adoption. This result is in consonance with a prior expectation that adoption of technology increases with increase in the intensity and effectiveness of extension services rendered to farmers. This is because the more the farmers meet with extension agents, the more they acquire more relevant information and therefore have the confidence to adopt the technology. Hence, extension is necessary ingredient in agricultural development. The result also agrees with the findings of Ironkwe, Ekwe and Asiedu (2008); Cleaver (1997), Sule, Ogunwale and Atala (2002); Onyenweaku and Mbuba (1991).

The coefficient of credit access is positive and statistically significant at 10% level indicating direct relationship with adoption. This result is consistent with a priori expectation that farmers with more available credit are likely to adopt new technology easily. The result also agrees with the finding of Onyenweaku (1988) who reported positive and significant association on credit and adoption of the seed yam minisett technique in Imo state.

Table 3: Profit model estimation of determinants of yam minisett adoption in Enugu State

Variables	**estimates t-values**
constant	-3.5113(-10.7906)***
Age ($X_{1)}$	0.0164(2.3034)***
House-hold size (X_2)	-0.0157(2.3034)
Farm size (X_3)	1.0617(2.66540)***
Land Ownership (X_4)	-0.0087(-0.0740)
Educational status (X_5)	0.0206(1.8113)*
Farming Experience (X_6)	-0.0044(-0.5808)
Membership of Farmers association (X_7)	
Co-operatives	-0.3531(-2.6844)***
Frequency of Contract with Extension (X_8)	0.0226(3.6013)***
Access to credit (X_9)	0.2807(1.9217)*
Chi- Square	

Table 4 shows the problems the farmer uncounted in process of adopting the technology. The most important ones were high cost of labour (96.47%), scarcity / high cost of fertilizer (95.29%), scarcity of minisett dust (82.35%), lack of loan (67.06%) and insect / diseases attack (40%). This result implies that the scarcity / high

cost of production and complementary inputs are adversely affecting the rate of adoption of the technology in the State. The result is similar to the finding of Chikwendu *et al* (1996); Ironkwe, Ekwe, Asiedu (2008).

Table 4: Problems the farmers encountered in using the technology.

Variables	Frequency	Percent
High cost of labour	82	96.47
Scarcity / High cost of Fertilizer	81	95.29
Scarcity of minisett dust	70	82.35
Lack of loan	57	67.06
Insect / Diseases attack	34	40.00
Tediousness of the job	22	25.88
Produces small size of seed yam	8	9.41
Lack of market	5	5.88
Not compactable to our farming system	4	4.71

Sources: Field survey, 2009

Table 5 reveals the level of adoption based on the number of components of the technology adopted by the respondents. The table indicated that 5.88% of the respondent were using between 1 - 3 out of seven (7) components of the of technology which gives us low level of adoption, 69.41% were using between 4 - 5 components while 24.71% were using between 6 - 7 components. This implies that even though the adoption rate was high (88.54%), the level of adoption, based on the use of the entire components of the technology, was low (24.71%). This might be as a result of some of the problems the farmers encountered in the adoption of the technology as revealed in Table 4 example, scarcity / high cost of fertilizer, scarcity of minisett dust etc which are important inputs required in the adoption of the technology. This result confirmed the reports of Iwueke (1991); Okoli and Akoroda. (1995) who observed that farmers were not adopting the entire package of the technology in some States in the country.

Table 5: Extent of Adoption of yam minisett technology by farmers in Enugu state

components	Frequency	Percent
1 – 3	5	5.88
4 – 5	59	69.41
6 – 7	21	24.71

Source: Field Survey, 2008

CONCLUSION

The relevance of the adoption of yam minisett technology for increased seed yam production can not be over-emphasized. The results of the study revealed that even though there was increased in the rate of adoption, there was low extent of adoption of the technology observed among the farmers in the State. This suggests that majority of the farmers were not adopting the entire packages of the technology. The farmers were constrained in the process of adoption by scarcity/high cost of labour and complementary inputs.

However, the results of the probit model showed some of the factors that influenced the adoption of the technology by farmers in the study area. Such factors as: farm size, age, educational status, membership of cooperative societies, frequency of extension contacts and access to credit. These results gave pointers to policy directions for increased seed yam production through the adoption of yam minisett technology.

Policies and programmes aimed at improving farmers' access to farm land, extension messages, credits, complementary inputs and education will be useful in increasing their adoption of the technology. Such policies

would involved the establishment of functional and sustainable micro credit schemes and farmers cooperatives, and also greater investment on education and extension services to enhance enlightenment and promotion of the technology among farmers. Such policies should also be targeted more at older farmers to increase adoption of the technology.

Finally, the Research Institute, which developed the technology, should also assist the farmers by making the minisett dust available and affordable to farmers. In the other hand, the extension agencies should consolidate efforts in the effective promotion of the technology among the farmers to ensure full and adequate adoption of the technology for increased seed yam production in the study area.

REFERENCES

Abiola, R.O. and O.B. Omoabugan (2001). Women Involvement in food crop production, processing and marketing in Nigeria. In: Industrialization in Nigeria. Bullion publication of the Central Bank of Nigeria Vol. 25 No. 3 July/ Sept. pp 39- 43.

Aniedu, C. (2006). Gender factors in access and use of improved yam technologies by farmers in south eastern Nigeria. An unpublished Ph.D. Dissertation in Department of Rural Sociology and Extension, Michael Okpara University of Agriculture, Umudike.

Asumugha, G.N. and C.C. Chinaka (1998). Socio-economic and cultural variables influencing adoption of yam minisett technique in three Eastern states of Nigeria. Sustainable Agricultural Development in a Changing Environment Proceeding of the 32nd Annual Conference of the Agricultural Society of Nigeria held at Federal College of Agriculture, Ishiagu, Ebonyi state, 13 16 Sept. pp 56- 60.

Chikwendu, D.O., C.C Chinaka and A.M. Omatayo (1994). Adoption of minisett technique of seed yam production by farmers in the Eastern forest zone of Nigeria. Journal of Discovery Innovation. 7 (4): 367 - 371.

Cleaver, M.K. (1997). A strategy to develop agriculture in Sub-Saharan Africa and a Focus for the World Bank, African Technical Series, World 203, Washington D.C.

Ekwe, K.C., I. Nwachukwu and C.C. Ekwe (2008). Determinants of improved gari processing technology utilization and marketing profil among rural households in South Eastern Nigeria. Nigerian Journal of Rural Sociology 8 (1): 1- 8.

Ekumankama, O.O. and G. Nwankwo (2002). Radio Broadcasts: A study of adoption of Agricultural Innovations in Umuahia Zone, Abia state. Journal of Agricultural Extension Vol. 6, 2002. pp 17- 24.

Imoh A.N. and M.U. Essien (2005). Adoption of improved cassava varieties among small scale farmers in Ikot-Ekpene agricultural zone of Akwa Ibom state, Nigeria. Agricultural Rebirth for Improved Production in Nigeria. Proceedings of the 39th Annual Conference of the Agricultural Society of Nigeria held at the University of Benin, Benin City, Nigeria October 9th 13th pp 1- 7.

Ironkwe, A.G., R. Asiedu and E.C. Chinaka (2007). Women farmers' participation in yam minisett adoption in South Eastern Nigeria. Journal of Global Approach to Extension Practice (GAEP) 3 (2): 62- 69.

Ironkwe, A.G., K.C. Ekwe and R. Asiedu (2008). Determinants of adoption gaps in yam minisett technology among women farmers in Abia state, Nigeria. Nigerian Journal of Rural Sociology. 8(1): 33- 40.

Ironkwe, A.G. (2005). Adoption of yam minisett technology by women farmers in Abia state, Nigeria. An unpublished MSc. Thesis in Department of Rural Sociology and Extension, Michael Okpara University of Agriculture, Umudike Abia state, Nigeria.

Iwueke, C.C. (1991). Appraisal of yam minisett technique by farmers in South-eastern states of Nigeria In: Olukosi J.O., Ogungbile A.O. and Kalu B.A (eds) Appropriate agricultural technologies for poor farmers. National Farming Systems Research Network ABU, Zaira, Nigeria. pp 247- 254.

Ogbodu, B.C. (1995). Report on extension activities in Enugu state of Nigeria. Proceeding of 10th Annual zonal Farming Systems Research and Extension Workshop in Southeastern Nigeria held at National Root Crops Research Institute (N.R.C.R.I.), Umudike, December4th to 8th 1995..

Okwor, G.C., R. Asiedu and I.J Ekanayaku (1998). Food yam; Advances in Research. Publication by IITA, Ibadan and NRCRI, Umudike, Nigeria. pp 1- 10.

Okoro, F.U. (1999). Technological adoption gaps in yam minisett technique among yam growers in Owerri Agricultural Zone of Nigeria. Journal of Agricultural Extension Vol. 3. pp 122- 128.

Okoli, O.O. and M.O. Akoroda (1995). Providing seed tubers for the production of food yam. A review article in African Journal of Root and Tuber Crops, 1(1): 1-6.

Okunade, E.O., O.A. Olanjiyi and K.Y. Ogunleye (2005). Adoption of improved cassava technologies among farmers in Surulere Local Government Area of Oyo state. Agricultural Rebirth for Improved Production in Nigeria. Proceedings of the 39th Annual Conference of the Agricultural Society of Nigeria held at the University of Benin, Benin City Nigeria, October 9th 13th. pp 15- 18.

Onyenweaku, C.E. and A.C. Mbuba (1991). The adoption of yam minisett techniques by farmers in Anambra state of Nigeria. Nigerian Journal of Agricultural Extension 6 (1 and 2) 26 - 33.

Otoo, J.A., O.O. Okoli and P. Ilona (2001). Improved Production of Seed yam. IITA Research Guide No. 63, IITA Ibadan. pp 1- 4,.

Sule, A.M; S.A. Ogunwale and T.K. Atala (2002). Factors affecting adoption of fishing innovations among finishing entrepreneurs in Jebba Lake Communities. Journal of Agricultural Extension 6: 48- 60.