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ASIAN JOURNAL OF SCIENCE AND TECHNOLOGY

ISSN: 0976-3376

Asian Journal of Science and Technology
Vol. 5, Issue 1, pp. 067-070, January, 2014

RESEARCH ARTICLE

DETERMINANTS OF SUSTAINED USE OF IMPROVED CASSAVA PRODUCTION TECHNOLOGIES AMONG SMALLHOLDER FARMERS IN IMO STATE, NIGERIA

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ARTICLE INFO

Article History:
Received 21st October, 2013
Received in revised form
04th November, 2013
Accepted 02nd December, 2013
Published online 25th January, 2014

Key words:
Improved Cassava,
Production technologies,
Smallholder farmers,
Sustain used.

ABSTRACT

The study determined sustained use of improved cassava production technologies by Smallholder farmers in Imo State, Nigeria. Specifically, it examined farmers level of sustained use of the technologies; determined sustained use of the technologies in relation to farmers socio-economic characteristics; and ascertained sustained use of the technology in relation to technology attributes. A multi-stage sampling procedure was used to select 180 respondents which formed the sample size. A structured questionnaire was used to collect the primary data which was analyzed using percentages, mean statistic and logistic regression model. Results showed that the mean level of sustained use of the technologies was 2.53 indicating very low level. Farm size, education level and income were significant at 1% level while the coefficient of farming experience and organizational membership were significant at 5% level implying important determinants of sustained use of the technologies. On the contrary, age and distance of farm land were negative and non-significant at 5% level indicating non important determinants of sustained use of the technologies. Results further showed that outputs, profitability, compatibility, availability, complexity, credibility and adaptability were all important technology attributes influencing sustained use of the technologies in the state. The study recommends the development of appropriate technologies for farmers use for this will boost their interest in the technologies and hence sustain its use.

INTRODUCTION

One of the basic needs of human beings is food, and agriculture has gone a long way in the provision of this food. Cassava being a stapple food crop for many people in the tropics supplies about 70% of the daily metric intake of 50 Million Nigerians (Ugwu *et al.*, 1993). It is the most widely cultivated crop in the Southeast part of Nigeria in terms of area devoted to it and number of farmers growing it (Nweke *et al.*, 1997). The International Institute for Tropical Agriculture (IITA), Ibadan, and National Root Crop Research Institute (NRCRI), Umudike worked together to develop various improved cassava production technologies to improve the output of cassava farmers in Nigeria. Some of these improved production technologies are planting improved cassava varieties, appropriate spacing, fertilizer application, weeding, planting angle, planting date and harvesting time. Impact studies have revealed that in Nigeria, the introduction of improved cassava production technologies have provided food for over 30 Million people (FAO, 1995). The study further revealed that it has some inherent characteristics which make it attractive, especially to the smallholder farmers in Nigeria.

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Cassava is available all year round making it preferable to other more seasonable crops such as grains, peas, beans and other crops for food security. And to ensure sustained use of its production technologies and other agricultural technologies, it should be highly productive, socially desirable, culturally compatible and economically feasible to majority of the farmers, because for a new technology to significantly influence agricultural production and development, the farmers must not only adopt them but use them correctly (Farrinde, 1995). As posited by Jamison (1989), many factors influence the sustained use, partial or total rejection of a technology. According to him, such factors includes misapplication, shortage of input, increase in cost of production and decrease in returns, all these can lead to discontinuance or limited use of a technology. Farmers in Imo State have been involved in Cassava production for decades, but their outputs have declined in recent years to the extent that they can no longer produce enough food for their household consumption (Onu and Ohajianya, 2005). The decline in cassava yield is traceable to the low level of sustained use of improved cassava technologies (Angba, 2000). This is in view of the fact that few farms have sustained the use of improved cassava production technologies. The study broadly determined sustained use of improve cassava

production technologies by smallholder farmers in Imo State, Nigerian. Specifically, it:

i) ascertained farmers improved cassava production technologies sustained use decision stages;
ii) examined farmers level of sustained use of the improved cassava production technologies;
iii) determined sustained use of improve cassava production technologies in relation to farmers socio-economic characteristics; and
iv) determined sustained use of improved cassava production technologies in relation to technology attributes.

Hypothesis

- There is no significant relationship between sustained use of improved cassava production technologies and farmers socio-economic characteristics.
- There is no significant relationship between sustained use of improved cassava technologies and technology attributes.

MATERIALS AND METHODS

The study was carried out in Imo State which is located in the Southeastern part of Nigerian. The state lies between latitudes $5^0$45′N and $6^0$35′N of the equator and longitudes $6^0$35′E and $7^0$28′E of the Greenwich Meridian (Microsoft Corporation, 2009). It has an average annual temperature of 28^0C, and average annual relative humidity of 80%, average annual rainfall of 1800-2500mm and altitude of about 100m above sea level (Imo ADP, 1990). Food crops produced in the State includes yam, cassava, cocoyam, plantains, rice and maize. Most of the cassava farmers in the State are smallholders that practice sustained use of improved cassava production technologies (Ohajianya and Onyenweaku, 2002). A multi-stage sampling procedure was adopted to select the respondents (Smallholder cassava farmers). First was the purposive selection of three Local Government Areas (LGAs) from each of the three Agricultural zones of the state where cassava is predominantly grown. Second was the random selection of two communities from each of the LGAs, given a total of 18. Third was the random selection of 10 smallholder cassava farmers with proven record of sustained use of improved cassava production technologies from each of the selected communities making a sample size of 180. Primary data were collected through the use of structured questionnaire administered to the respondents. Data were analyzed using percentages and logistic regression model. The logistic regression model employed for analysis generally is:

$$Ls = g(x) = In\left[\frac{P(y=1/Xi}{P(y=0/Xi)}\right] = bo + \Sigma bi\, Xi$$

Where

$Ls = In\ (P/_{1-P})$

Therefore

$In\ (P/_{1-P}) = bo + bi\ Xi + b_2X_2 + \ldots\ldots\ldots + bn\ Xn + e$

Where

P = probability of sustained use of improved cassava production technology
In = natural logarithm function
bo = constant
bi-bn = regression coefficient
X_1-Xn = explanatory variable
e = stochastic error term

Objectives i and ii were analysed using simple percentages. Objectives iii was analysed and hypothesis 1 tested using logistic regression model stated as:

$In\ (P/_{1-P}) = f\ (AG, Fz, Exp, Dt, Ed, Om, Ic)e$

Where

AG = Age of farmer (years)
Fz = farm size (hectares)
Exp = Experience in cassava farming (years)
Dt = Distance of farm land (km)
Ed = Education level (years)
Om = Organization Membership (dummy variable, 1 for member, 0 for otherwise).
Ic = Income (₦)
E = error term

Objective iv was analysed and hypothesis 2 tested using logistic regression model stated as:

$In\ (P/_{1-P}) = f\ (Q, Avl, Com, PT, CRD, Cop, ADT)\ e$

Where
Q = Output of improved cassava variety (kg)
AVL = Availability of improved technology components (dummy variable, I if the the technology components are available, and O if Otherwise).
Com = Complexity of technology use (dummy variable, I if the technology is simple, and O if otherwise)
PT = Profitability of technology (₦)
CRD = Credibility of technology used
Cop = Compatibility of technology used (dummy variable, I if compatible and O if otherwise)
ADT = Adaptability of technology used (dummy variable, I if the technology adapts to the soils and climate of the area, and O if otherwise).
e = error term

RESULTS AND DISCUSSION

Table 1 ascertained farmers improved cassava production technologies sustained use decision stages. Analysis of mean percentages reveals that, on the average, 4.8%, 6.7%, 10.2, 10.9% and 18.8% of the farmers were unaware, aware, at the interest, evaluation and trial stages of improved cassava production technologies respectively. Also, an average of 48.6% of the farmers adopted the technologies with only 28.1% of the farmers sustaining the use of the nine improved cassava production technologies introduced to them by the Imo State Agricultural Development Project (ADP). The levels of sustained use of the improved cassava production technologies was determined in Table 2. The scores were

arranged in descending order for all the technologies. Using an interval of 2, farmers were grouped into three major categories of sustained users (Low, Medium and High). Low sustained users were individual farmers who sustained the use of 1-3 out of the 9 technologies, while the medium and high sustained users were farmers who sustained the use of 4-6 and 7-9 technologies respectively. Results indicates that the mean level of sustained use of the various technologies was 2.53, which was very low. This is in agreement with Angba (2000) who posited that decline in cassava yield is traceable to the low level of sustained use of improved cassava technologies, and therefore implies that most cassava farmers discontinued the use of the improved cassava production technologies adopted earlier.

Result in Table 4 determined sustained use of improved cassava production technologies in relation to technology attributes. Findings reveals that the chi-square value of 137.182 with a ratio of 7.999 was highly significant at 1% level indicating that the model fitted well to the data. Coefficients for output (Q), profitability (PT), and compatibility (Cop) were significant at 1% level, while the coefficient of availability (AVI), complexity (Com), credibility (CRD) and adaptability (ADT) were significant at 5% level. This implies that all the investigated variables were important technology attributes influencing sustained use of improved cassava production technologies in Imo State. Therefore, the hypothesis of no significant relationship between sustained use of improved cassava production technologies and technology

Table 1. Distribution of farmers according to their improved cassava production technologies sustained use decision stages

Improved Cassava Production Technologies	Unaware (%)	Aware (%)	Interest (%)	Evaluation (%)	trial (%)	Adoption (%)	Discontinuance (%)	Sustained (%)
Planting improved variety	0.0	0.7	6.8	8.4	10.3	73.8	12.1	61.7
Appropriate spacing	2.9	3.9	7.2	10.8	11.6	63.6	20.9	42.7
Planting date	8.3	5.2	6.9	13.3	30.9	35.4	30.6	4.8
Planting angle	4.2	6.7	8.7	15.6	32.4	32.4	29.5	2.9
Fertilizer application	0.0	0.0	3.6	4.9	6.3	85.2	10.7	74.5
Use of herbicide	20.6	19.7	30.2	9.5	8.7	11.3	9.9	1.4
Weeding interval	3.8	10.2	12.4	17.6	38.3	17.7	14.3	3.4
Proper tillage	1.7	10.3	9.8	8.7	7.6	61.9	10.5	51.4
Harvesting time	1.5	3.6	6.4	9.2	22.8	56.5	46.0	10.5
Mean percentage responses	4.8	6.7	10.2	10.9	18.8	48.6	20.5	28.1

Source: Survey data, 2006.

Table 2. Distribution of farmers according to their levels of sustained use of the improved cassava production technologies

Sustained use scores	Frequency	Percentage
Low (1-3)	157	87.2
Medium (4-6)	14	7.8
High (7-9)	9	5.0
Total	**180**	**100**

Mean level of sustained use = 2.53 out of 9 technologies

Sustained use of improve cassava production technologies in relation to farmers socio-economic characteristics was determined in Table 3. Result shows that the logistic regression produced a highly significant chi-square, which indicates that the equation gave a good fit to the data. Findings reveals that farm size, level of education and income were positive and significant at 1% level, while the coefficient for farming experience and organization membership were positive and significant at 5% level. This implies that the variables are important determinants of sustained use of improved cassava production technologies in the state. On the other hand, age and distance of farm land were negative and non-significant at 5% level, indicating that the variables are not important determinants of sustained use of the technologies in the State. Therefore, the null hypothesis of no significant relationship between sustained use of improved cassava production technologies and farmers socio-economic characteristics is rejected with respect to the significant variables and accepted with respect to the non-significant variables.

Table 3. Results of logistic regression analysis on relationship between sustained use and socio-economic characteristics

Explanatory variables	Logistic coefficient	T-ratios
Age (AG)	-0.499	-1.607
Farm size (FZ)	0.098	3.513**
Farming experience (EXP)	1.074	2.563*
Distance of farmland to farmers home (DT)	-0.014	-1.133
Level of education (Ed)	0.557	3.812**
Organization membership (OM)	0.109	2.514*
Income (IC)	1.717	3.412**
Constant	-7.502	3.916
Chi-square	74.229	5.447**
Model probability	0.0003	
Sample size	180	

*= significant at 5%
**= significant at 1%
Source: Survey data, 2006.

Table 4. Results of logistic regression analysis on relationship between sustained use and technology attributes

Explanatory variables	Logistic coefficient	T-ratios
Output of improved cassava variety (Q)	1.065	3.115**
Availability of improved technology components (AVL)	0.127	2.505*
Complexity of technology use (COM)	-1.019	-2.443*
Profitability of technology use (PT)	0.643	3.891**
Credibility of technology use (CRD)	1.009	2.327*
Compatibility of technology use (COP)	0.837	2.406*
Adaptability of technology use (ADT)	1.113	2.209*
Constant	-17.803	-4.997**
Chi-square	137.182	7.999**
Model probability	0.0001	
Sample size	180	

*= significant at 5%
**= significant at 1%
Source: Survey data, 2006.

attributes was rejected because there was a significant relationship between sustained use and the technology attributes.

Conclusion

Having determined sustained use of improved cassava production technologies by smallholder farmers in Imo State, Nigeria, it was found that most farmers discontinued the use of the improved cassava production technologies adopted earlier which indicates that there was low level of sustained use of improved cassava production technologies by the farmers. The study further revealed that output, profitability, compatibility, availability, complexity, credibility and adaptability were important technology attributes influencing sustained use of improved cassava production technologies in the area.

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