academicJournals

Vol. 5(3), pp. 48-53, May, 2013
DOI 10.5897/JABSD12.038
ISSN 2141-2340 © 2013 Academic Journals
http://www.academicjournals.org/JABSD

Journal of Agricultural Biotechnology and Sustainable Development

Full Length Research Paper

Factors determining farmers' participation in *Striga* resistant maize variety (SAMMAZ 11) production in Ushongo Local Government area of Benue State, Nigeria

Yusuf O.[1]*, Sani I.[2], Usman S.[2] and Dawang C. N.[3]

[1]Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University, Zaria, Nigeria.
[2]National Agricultural Extension Research and Liaison Services (NAERLS), Ahmadu Bello University, Zaria, Nigeria.
[3]Department of Agricultural Technology, Plateau State College of Agriculture, P. M. B. 01, Garkawa, Mikang LGA, Plateau State, Nigeria.

Accepted 7 May, 2013

Parasitic weed called *Striga hemonthica* has been found to be a serious problem in Ushongo Local Government Area. It was in the light of this that farmer-led approach was employed to create awareness to farmers on the available improved technology in *Striga* control. A demonstration plot was designed where *Striga* resistant maize variety (SAMMAZ 11) was grown. One hundred and twenty farmers participated in the programme from three villages were used for the study during the introduction of the SAMMAZ 11 variety to the villages. A total of 75 farmers were randomly selected out of the 120 participants. 75 non participant farmers were also randomly selected for the study, making a total of 150 respondents that were used for the study. Primary data were collected and analysed using descriptive statistics and logit regression model. The logit regression result shows that years of education, access to credit, access to improved planting material and number of extension contact had significant and positive effects on farmers' participation. The study further revealed that household size, membership of cooperatives and years of experience were all positively related to participation in the production of *Striga* resistant maize variety, though they were not significant. Based on the findings, it was recommended that both state and local governments should employ more extension agents to ensure more effective extension information dissemination and delivery. Also, farmers should be encouraged to organise a revolving loan scheme among themselves to aid them in the purchase of inputs for production.

Key words: Farmers, *Striga*, maize variety, production, Benue State.

INTRODUCTION

Maize is the second most important cereal crop in the farming systems of the Guinea savannah in Nigeria after sorghum. Guinea savannah accounts for 70% of the maize produced in the country and yields from farmers field range from 1.5 to 2.5 tons per hectare (Tarfa et al., 2004). Maize belongs to the grass family and its botanical name is *Zea mays*. It is a cereal grain also known as corn, which has been domesticated in Mesoamerica (Anonymous, 2009). It spreads to the rest of the world after European contact with America in the 15th and 16th

*Corresponding author. E-mail: oyusuf@abu.edu.ng, oziyusuf@gmail.com, alhuseyn@yahoo.com. Tel: 08032846638.

century. Portuguese introduced maize to West Africa in the 16th century (Onwueme, 1979). Maize is becoming a miracle crop for Nigeria's agricultural and economic development (Ademola and Akinwumi, 1993). It has determined the cropping pattern of predominantly peasant farmers especially in the northern states. The traditional area of maize cultivation in Nigeria has been in the south of latitude 8°N where it can be grown twice a year. Where it has been traditionally grown as a popular crop, has led to the increasing importance and expansion of maize production in this zone (Ologunde, 1987).

Hussaini et al. (2001) reported that maize production in Nigeria has since been transformed from that of a minor crop by being grown around the homestead to a major commercial grain crop, competing with sorghum and millet as a strategic crop in the grain economy of the nation (Tarfa et al., 2004). Haliru et al. (2009) reported that *Striga* is one of the major causes of reduction in crop yields especially in the arid and semi arid areas, resulting in poverty, food shortages and reduction in the standard of living of the rural farmers.

In Ushongo Local Government Area (LGA), there is soil degradation due to continuous cropping and *Striga* infestation, resulting in low yield. In some cases, the parasite puts farmers completely out of production, thus, denying farmers of any benefit derived from the crop. *Striga* infestation is the most important constraint to maize production in the LGA. It is against this background that this project was initiated to promote *Striga* resistant maize variety (SAMMAZ 11) to the communities in the LGA.

Therefore, evaluation of the factors determining farmers' participation in *Striga* resistant maize variety (SAMMAZ 11) production in the study area is very imperative in order to the challenges in the study area. Thus, the present study attempts to estimate logit regression model for examining socio-economic factors influencing farmers' participation in *Striga* resistant maize variety (SAMMAZ 11) production in Ushongo Local Government area of Benue State.

LITERATURE REVIEW

Several researchers have been conducted on the application of logit model in agriculture. Ogungbile et al. (2002), applied logit model to determine factors affecting adoption of ICSV111 and ICSV400 sorghum varieties in Guinea and Sudan savanna of Nigeria.

A comprehensive review on the adoption or participation on a particular technology and socio-economic factors influencing such adoption or participation in agriculture has been reviewed by many researchers; these socio-economic variables include age, educational status, household size, access to credit, extension contact, access to improved planting materials and years of experience.

Age

Obeta and Nwabo (1999) posited that younger farmers are more flexible to new ideas and risks; hence, they are expected to adopt innovations more readily than older farmers. According to Ogungbile et al. (2002), farmers' age may influence adoption in several ways; the nature of influence of age on adoption is indeterminate. Older farmers may have more resources that make it more likely for them to try new technologies. It is therefore expected that the age of the farmer will be positively related to participation in improved *Striga* resistant maize varieties production.

Years of education

According to Damisa and Igonor (2007), educational attainment is said to have a positive influence on adoption of new technology because a well educated person will be able to easily comprehend the technicalities associated with improved practices. For the purpose of this study, the educational level of the respondents is expected to be positively related to participation in improved *Striga* resistant maize varieties production.

Household size

According to Ogungbile et al. (2002), the adoption index may be either positively or negatively related to the household size, depending on the magnitude of age structure and the amount of labour contributed among members. The household size in this study is expected to be positively related to participation in improved *Striga* resistant maize variety production.

Access to credit

This refers to the ability or having the opportunity to acquire credit for agricultural production. Miller (1977) posited that if credit is provided under proper conditions, well managed production credit can give agricultural development a rapid growth by accelerating the rate of adoption of improved technology by farmers who would otherwise be prevented from using it. For the purpose of this study, access to credit is expected to have positive relationship with participation in improved *Striga* resistant maize variety production.

Extension contact

This refers to the number of contacts farmers had with extension agents and number of trainings farmers received through attendance of workshops, seminars and film shows. According to Damisa and Igonor (2007), it is

expected that the higher the number of contacts farmers have with extension agents, the more the participation of farmers in training such as workshops and seminars and hence, the higher the acceptance of new technologies. The number of extension contact with farmers is expected to have positive impact on participation in improved *Striga* resistant maize variety production.

Access to improved planting material

This refers to farmers having the opportunity to get and use the improved planting material on their farms. In this study, it is expected that access to improve planting material will be positively related to participation in improved *Striga* resistant maize variety production.

Years of experience

The impact of years of experience on adoption or participation is somehow ambiguous. As experience increases, age also increases, the time horizon in which to reap the benefits of adoption decreases, while risk aversion and learning by doing with current management practices may increase (Herath and Takeya, 2003). On the other hand, greater experience could also lead to better knowledge of spatial variability on the field and more accurate assessment of the benefit of adoption (Damisa and Igonor, 2007). Considering the above explanation, the impact of experience is expected to be positively related to participation in the study area.

Membership of cooperatives

This indicates whether the respondents belong to any cooperative or not. There is a priori expectation for membership of cooperative(s) which is assumed to have positive impact on participation.

MATERIALS AND METHODS

Three villages were purposively selected for this study. The three villages were the villages that participated in the demonstration of the SAMMAZ 11 during the introduction of the maize variety to the people of the local government area. There were 120 participants from the three villages (40 from each village) in the studied area. 25 respondents were randomly selected from each village, making a total of 75 participating farmers. Also, 75 non participating farmers were also randomly selected from the three villages. In all, a total of 150 respondents were used for this study. Structured questionnaire was used extract information from the 150 (both participating and non participating) farmers.

Analytical techniques

Data collected were analyzed using logit regression model. Multivariate binary choice logit approach was estimated to analyse the participation decision regarding the improved *Striga* resistant maize variety production. Socio-economic factors hypothesized as influencing participation in improved *Striga* resistant maize variety production are age, educational status, household size, access to credit, extension contact, access to improved planting materials, years of experience and membership of cooperation.

Binary logit model is a type of regression model where the dependent variable is converted into a dichotomous binary variable, coded 1 for farmers participating in improved *Striga* resistant variety production and 0 otherwise.

Model specification

The logit regression model is based on the cumulative logistic distribution function as expressed by Gujarati (1995):

$$Pi = \frac{1}{1+e^{Zi}} \quad (1)$$

If Pi represents the probability of participating in improved *Striga* resistant variety production, the probability otherwise is 1 – Pi:

$$Pi = 1 - \frac{1}{1+e^{Zi}} \quad (2)$$

$$\frac{Pi}{1-Pi} = \frac{1+e^{Zi}}{1+e^{-Zi}} = e^{Zi} \quad (3)$$

The ratio of Equations 1 and 2 is the odd ratio in favour of participating in improved *Striga* resistant variety production. Then, if we take the natural log of Equation 3, we have:

$$Li = \ln\left(\frac{Pi}{1-Pi}\right) = Z \quad (4)$$

Where Li = the log odds which is also called the logit.

$$Z = \alpha + \beta_1 X_1 + \beta_2 X_2 + ...\beta_8 X_8 \quad (5)$$

Where Z is an observable variable in the sense that although, X's are generated from field, the β's are not observable. In order to attain the value of Z, the likelihood of observing the sample needs to be formed by introducing a dichotomous response variable Yi such that:

$$Yi = \begin{cases} 1 \text{ if } i\text{th respondent participated in improved } \textit{Striga} \text{ resistant variety production} \\ 0 \text{ if otherwise} \end{cases}$$

X_1-X_8 are the socio-economic variable/attributes of the respondents

Where: X_1 = Age of the respondents (Years); X_2 = Years of education (Years); X_3 = Household size (Numbers); X_4 = Access to credit (1, having access and 0 otherwise); X_5 = Number of extension contact (Numbers); X_6 = Access to improved planting materials (1, having access and 0 otherwise); X_7 = Years of experiencing in farming (Years); X_8 = Membership of cooperative(s); β_1 - β_8 = regression coefficients; α = constant term.

RESULTS

The socioeconomic characteristics of the respondents are presented in Table 1. The study revealed that majority of the respondents (66%) were within the ages of between 26 and 45 years, indicating that youths and matured adults are actively involved in agricultural activities. Also, 10% of the respondents had no formal education. Majority of the respondents (78%) had primary and secondary education, while only 12% had tertiary education. This implies that most of the respondents would be able to comprehend extension guides and understand written messages on innovation. The household size of the respondents ranged from 3 to 18. Majority of the respondents (66%) had household size of between 6 and 15. A large household size may reduce the cost of production for the farmer if all the household actively participation in production activities of the respondents. The respondents received between ₦5,000 and ₦40,000 to support their farming activities. According to the respondents, all the participants had access to credit which has aided them in the adoption of SAMMAZ 11 in the study area. The non participant farmers said they had no access to credit, that was why they were unable to participate in the production of SAMMAZ 11 during the introduction of the variety access to credit is very important for the purchase of necessary inputs by the farmers. Also, all the participating farmers in the SAMMAZ 11 production had access to improved planting material while the non participating farmers had no access to improved planting material. This was one of the constraints the farmers had that led to non adoption of the variety. Access to the planting material is very essential because without access to improved planting material, there is no way the farmers can adopt that technology. They also had extension contact at various levels. 58% of the respondent had extension contact only once or twice, while 16% had no extension contact at all. Frequent extension contacts encourage the farmer on the new technology and the extension agent directs the farmer wherever he goes wrong. The years of experience of the farmers ranged from 2 to 18 years. Majority of the respondents (76%) had years of experience of between 2 and 10 years. Experience is positively related to age, that is, as experience increases, age also increases. A well experience farmer would be able to practice the new technology appropriately.

The result of the logit regression model estimated to identify socio-economic factors influencing participation in improved *Striga* resistant maize variety production is presented in Table 2. Variables considered include age (X_1), educational status(X_2), household size (X_3), access to credit(X_4), extension contact(X_5), access to improved planting materials(X_6), years of experience(X_7) and membership of cooperation(X_8). The study revealed that variables such as X_2, X_4, X_5, and X_6 were the significant variables influencing participation in improved *Striga* resistant variety production in the area and they all have positive relationship with participation. This implies that they were all in line with the a priori expectation. Variables such as X_1, X_3, X_7, and X_8 were all not significant. The result X_1 was contradictory to the priori expectation. This may be due to the fact that resources do not depend on the age of the farmer, a younger farmer may be richer than an old farmer, that is why it is insignificant.

The X_2 was significant at 1% level of significance while X_4, X_5, and X_6 were all significant at 5% level of probability. The percentage of accurate prediction was 87%. The log likelihood index indicated that about 46% of the total variation in the dependent variable was explained by the logit model. The logit regression result was presented in Table 2.

DISCUSSION

Farmers have seen that *Striga* resistant (SAMMAZ 11) can improve their yield. Variables such as years of education, access to credit, number of extension contact and access to improved planting materials were the significant variables influencing *Striga* resistant maize production in the studied area. This study was in line with the findings of Damisa and Ogonoh (2007), where he found that years of education, number of extension contact and access to credit significantly influenced extra early maize production technologies. Also, Ogungbile et al. (2002) found that age, years of education and improved seed significantly influenced adoption of new technology.

CONCLUSION AND RECOMMENDATIONS

The study revealed that years of education, access to credit, number of extension contact and access to improved planting materials were the significant variables influencing participation of farmers in improved *Striga* resistant variety maize production in the study area. This implies that these explanatory variables are very important in the adoption of new technology in the study area.

Based on these findings, the following recommendations were made: As number of extension contact was one of the significant variables influencing participation in the study area, the extension workers in the area should therefore improve on their number of visits, train and enlighten the farmers so as to get more participation in improved *Striga* resistant maize production. Also, the farmers should be encouraged to form cooperatives and organise small credit schemes among themselves and make it a revolving loan to aid them in purchasing inputs for improved *Striga* resistant maize production in the area. The low determination coefficient of considered variables (46%) indicates absence in equation of other influential variables.

Table 1. Socio-economic characteristics of the respondents.

Variable	Frequency	Percentage
Age		
15 - 25	18	12
26 - 35	54	36
36 - 45	45	30
46 - 55	24	16
> 55	9	6
Total	150	100
Years of education		
No formal education	15	10
1-6	72	48
7-12	45	30
13- 18	18	12
Total	150	100
Household size		
1-5	45	30
6-10	75	50
11-15	24	16
> 15	6	4
Total	150	100
Credit received		
5,000-10,000	42	28
11,000-20,000	72	48
21,000-30,000	27	18
31,000-40,000	9	6
Total	150	100
No. of extension contact		
1-2	87	58
3-4	39	26
No contact	24	16
Total	150	100
Access to improved planting material		
No access	**75**	**50**
Having access	**75**	**50**
Total	150	100
Years of farming experience		
1-5	72	48
6-10	42	28
11-15	15	10
16-20	21	14
Total	150	100

Table 2. Maximum likelihood estimate of the factors influencing participation in improved *striga* resistant maize variety production in Ushongo LGA of Benue State, Nigeria.

Adoption variables		Coefficients	Standard error	Exponential β
Constant	α	0.548	2.14	0.578
Age	X_1	-0.065^{NS}	0.044	0.938
Years of education	X_2	5.031***	10.94	0.007
Household size	X_3	0.303^{NS}	0.085	0.971
Access to credit	X_4	2.025**	-920	7.580
Extension contact	X_5	0.342**	0.177	1.408
Access to improved Planting materials	X_6	0.637**	0.245	1.891
Years of experience	X_7	0.014 ^{NS}	0.046	1.014
Membership of Cooperative(s)	X_8	1.418 ^{NS}	0.937	4.131
Percentage prediction = 87.2				
Goodness of fit df (7) = 82.7				
_2 log likelihood = 46				

** = (P≤ 0.05) *** = (P≤ 0.01). NS = Not significant.

Therefore, further research is recommended to learn about other influential factors.

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