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Ensuring Improved Livelihood Opportunities for Resource-Poor Maize Farmers through the Dissemination of Striga Control Methods in Kwara State, Nigeria

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Abstract

This paper examines the sources used by resource poor maize farmers in search of agricultural information on Striga control methods in Kwara State, Nigeria. A well structured interview schedule was used to elicit information using random sampling technique from one hundred and sixty (160) maize farmers in Edu and Patigi Local Government Areas which are highly endemic to Striga infestation in the State. Four sources of information were found effective in disseminating and diffusing Striga control methods in the area which include neighbours and friends, government agencies (ADP), agricultural extension agents and farmers groups. Logistic regression model of determinants of poverty revealed that characteristics of households that were more likely to be impoverished include small household size; low farm income, few years of farming experience and those whom Striga have been on their farms for long thereby having high yield loss to Striga. The study recommends an urgent need for extension agencies to intensify the use of the effective sources of information for disseminating Striga control methods to the farmers and it highlighted policies to improve the livelihoods of the resource-poor maize farmers in the Striga affected areas of Kwara State, Nigeria.

Keywords: agricultural information, information sources, maize, poverty, striga control methods, yield loss.

1. Introduction

Almost one billion people in the world have little to eat or are malnourished due to a number of factors which include population growth, wars, struggling economy and reduced global investment in food and agricultural development [2]. Recent estimates put the number of hungry people in Nigeria at about 30 percent of the country's total population of roughly 160 million; and 69 percent live under the poverty line and may as well increase [7]. Nigeria is still a food-deficit nation that depends on imported grains, livestock products, and fish making her one of the largest food importers in the world. The food import bill of the nation between 2007 and 2010 was $628 billion [1]. The agricultural sector is essential in the economic development and poverty alleviation drive of many countries. Agriculture is viewed presently as the pillar of Nigeria's economy as it contributes 40 percent to the GDP [1] and employs about 70 percent of the labour force [2]. According to Food and Agricultural Organisation of the United Nations, [3] food security exists when people at all times have access to sufficient, safe and nutritious food to meet their dietary needs to attain an active and healthy life. The problem associated with food insecurity could be linked to low agricultural productivity and poverty. With this in view, it is important to address the capacity and production needs of small holder farmers, and to pay particular attention to those obstacles impeding their abilities to maximize their capacities in food production. Increasing crop production is an important challenge in addressing economic growth, alleviating poverty and arresting environmental degradation over most of Sub-saharan Africa [10]. All over the world, cereals have become the foundation of world food security. Not only do they constitute the basic food of mankind, they have become a tool of international politics and control and a very vital factor of economic growth. Cereals constitute the primary component of major local food preparation and raw materials in the production of livestock feeds and breakfast cereals. They have also found industrial uses in beverage, baby food, pharmaceutical and soft drink industries in Nigeria. Cereal crops, especially maize are the most important

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food crops cultivated in Nigeria with a high yield potential in the savannas and is consumed by more than 70 percent of the population [5]. Maize has been said to be the third most important cereal crop after sorghum and millet. It is a staple food crop of great socio-economic importance with a per capita consumption of 40kg/year [4]. Nigeria in general and Kwara State in particular have put in place several mechanisms to boost maize production in the small holder agricultural sector but such efforts have not yielded the desired result as a wide gap still exist between research results and farmers yields. Several biotic and abiotic production constraints have been identified to cause losses to maize crop thereby resulting in reduction in yield. Among the most important biotic constraints to maize production in Kwara State are the parasitic weeds belonging to the genus Striga which rob the maize plant of water and nutrients leading to a drastic reduction in yield. Estimated crop losses in the Northern Guinea Savanna of Nigeria is up to 5-6 million USD annually with attendant negative impact on the livelihood of about 60 percent of the farming population [6]. Yield losses caused by Stiga infestation has contributed greatly to the shortage in maize supply. The research community have on their own part developed various Striga control technologies aimed at reducing the losses and increasing farmers' income, however, there seems to be a low level of awareness among the small scale maize farmers who are yet to make use of such technology and they still respond to Striga infestation by hand weeding, manuring and less often, burning affected fields, but the efficacy of these practices remain questionable because it is not yielding the maximum yield per hectare of land. A prominent factor identified as being responsible for this unacceptable situation is the unavailability of timely and appropriate information to users of agricultural information especially the resource- poor farmers. A great gap still exists between the advances made in terms of Striga control technologies and the transfer of such technologies to the pest-constrained farmers. Subsistence farmers are yet to adopt seemingly beneficial control practices to any appreciable degree. This in turn affects their output and thus their income. Researches documenting the advances made in terms of Striga control technologies and the transfer of such technologies to pest-constrained maize-based farmers for adoption which will in turn affect their livelihood is very few. This is why this study in a bid to bridge the gap and provide useful information for research programmes, extension agencies and policy makers on how to enhance effective diffusion and adoption of Striga control technologies in order to improve the livelihood and food security status of the farmers in the Striga affected areas intend to focus on the following objectives.

The general objective of this study is to determine the information sources used by resource-poor maize-based farmers in search of agricultural information on Striga control technologies in Kwara State, Nigeria while the specific objectives are to:

- describe the socio-economic characteristics of maize farmers in Striga affected areas of Kwara State, Nigeria.
- examine the farmer's sources of information used in acquiring Striga control methods.
- determine the farmer's perception of the effectiveness of sources of information on Striga control methods.

Investigate the poverty profiles of the maize-based farmers in the striga affected areas of Kwara State, Nigeria.

2. Material and Methods

The study was carried out in Kwara State, Nigeria. The state is geographically located between latitude $7^0 20^I$ and $11^0 05^I$ north of the equator longitude $2^0 5^I$ and $6^0 45^I$ east of the prime meridian [8]. It is located in the North Western Nigeria and because of this unique geographical location; the state is referred to as the "gateway" between the north and south of the country. Kwara State is divided into four (4) zones by the Kwara State Agricultural Development Programme (KWADP) in consonance with ecological characteristics, cultural practices and project administrative convenience. The zones are as follows:

Zone A: Baruteen and Kaima, Local Government Areas.

Zone B: Edu and Patigi, Local Government Areas.

Zone C: Asa, Ilorin East, Ilorin South, Ilorin West and Moro Local, Government Areas.

Zone D: Ekiti, Ifelodun, Irepodun, Offa, Oyun, Isin and Oke-Ero, Local Government Areas.

Zone B (i.e. Edu and Patigi Local Government Areas) are the Striga infested areas in the State.

The population for this study was the total number of maize-based farmers in Edu and Patigi Local Government Areas (Zone B) which is highly endemic to Striga infestation in Kwara State, Nigeria. A well structured interview schedule was used to elicit information from one hundred and sixty (160) maize farmers in Edu and Patigi Local Government Area which is about eight percent of the 2000 maize farmers found in the area. Four major villages i.e. Tsaragi, Lafiagi, Lade and Patigi were purposively selected (2 in each local government) based on the prominence of Striga infestation and 40 maize-based farmers were randomly sampled in each of these locations.

Data were collected on the socio-economic characteristics of the maize farmers, their assess to sources of agricultural information, sources of information used in acquiring Striga control methods, their perception of the effectiveness of the sources of information used while the dependent variable was the poverty profile of the maize-based farmers. These variables were measured as follows:

Poverty analysis was carried out by first classifying the sample households into poor and non-poor based on whether they are below or above a revised international poverty line of $1.25 per day [11]. This was done by computing the total household income as the sum of the farm income and off-farm income. Therefore by using the total household income, those above the poverty line was categorized as non-poor while those below were categorized as poor.

Logistic regression model of determinants of poverty was estimated to examine factors determining the maize farmers' likelihood to being impoverished. The logistic regression model of poverty in the form of the ratio of natural logarithm of the probability of being poor to the probability of being non-poor (i.e. log odds ratio), can thus be given as:

$$Ln\left[\frac{\Phi}{1-\Phi}\right] = \beta_1 X + \varepsilon$$

Where Φ is the conditional probability of being poor, X is a vector of hypothesized explanatory variables, β is a vector of unknown parameters to be estimated and ϵ is independently and normally distributed random error term.

Access to information

The respondents were subjected to 13 sources of information. Data was obtained on the farmers access to these 13 information sources (which was coded 1 if they have access, 0 if not accessed); whether the sources provided information on Striga control methods for the farmers (code 1 if provide information, 0 if does not provide information). Further, the farmers' judgment of the effectiveness of such information sources in disseminating Striga control methods was obtained using a 5-point likert type scale of effectiveness coded as 5 if highly effective, 4 if effective, 3 undecided, 2 ineffective and 1 if highly ineffective.

Descriptive statistics such as frequency counts, percentages, means and ranks was used to analyze the data obtained while logistic regression was used to generate some inferences from the study.

3. Results and Discussion

The obtained results are presented in the following tables.

Table1: Socio-economic Characteristics of Maize Farmers

Characteristics	Frequency	Percentage	Mean	Mode
Age				
Young ≤ 40	65	40.6	43	40
Middle age 41- 60	94	58.8		
Old age 60+	1	0.6		
Gender				
Male	146	91.3		
Female	14	8.8		
Marital status				
Single	13	8.1		
Married	143	89.4		
Divorced	1	0.6		
Widowed	3	1.9		
Level of Education				

No formal educ.	84	52.5		
Primary educ.	32	20.0		
Secondary educ.	29	18.1		
Post-sec. edu.	15	9.4		
Farming experience				
≤ 10 years	65	40.6	13	10
11-20 years	79	49.4		
21 and above	16	10.0		
Household size				
1-3				
4-6	18	11.3	6	
7-9	52	32.5		
10 and above	89	55.6		
Farm size	1	0.6		
0.5 ha				
1.0 ha	17	10.6	1.4	
1.5 ha	89	55.6		
2.0 ha	19	11.9		
3.0 ha	16	10.0		
Access to Credit Have no access	19	11.9		
Have access	110	68.8		
Years of Striga	50	31.3		
≤ 5 years				
6-10 years	93	58.1	6	5
11-15 years	64	40.0		
	3	1.9		

Source: Analysis of Field Survey Data

Table 2: Access to Sources of Information

Sources of Information	Frequency	Percentage	Rank
Farmer group	136	85.0	5
Community Leaders	15	9.4	11
Cooperative Societies	65	40.6	9
On farm demonstration	99	61.9	7
Town criers	15	9.4	11
Radio	139	86.9	3
Television	34	21.3	10
Agricultural Extension Agents	139	86.9	3
Posters/ Pamphlets	67	41.9	8
Local meetings	102	63.8	6
Government Agencies (ADP)	142	88.8	2
Computer	4	2.5	13
Neighbours and friends	153	95.6	1

Multiple Response
Source: Analysis of Field Survey Data.

Table 3: Sources of Information Used for Striga Control Techniques by the Farmers

Sources of Information	Frequency	Percentage	Rank
Farmer group	135	84.4	4
Community Leaders	2	1.3	13
Cooperative Societies	56	35.0	9
On farm Demonstration	98	61.3	5
Town Criers	10	6.3	10
Radio	59	36.9	8
Television	3	1.9	12
Agricultural Extension Agent	139	86.9	3
Posters/Pamphlets	63	39.4	7
Local meetings	72	45.0	6
Neighbours and Friends	153	95.6	1
Government Agencies (ADP)	142	88.8	2
Computer / Internet	4	2.5	11

Multiple Response
Source: Analysis of Field Survey Data.

Table 4: Effectiveness of Information Sources in Disseminating Striga Control Methods

Sources of information	Highly Effective	Effective	Undecided	Ineffective	Highly Ineffective	Mean Score	Rank
Farmers Group	34(21.3)	95(59.4)	4(2.5)	1(0.6)	1(0.6)	3.53	4
Community Leader	0(0.0)	0(0.0)	0(0.0)	2(1.2)	0(0.0)	0.0375	12
Cooperative Society	4(2.5)	27(16.9)	15(9.4)	10(6.3)	0(0.0)	1.19	8
On-farm demo.	29(18.1)	62(38.8)	3(1.9)	1(0.6)	3(1.9)	2.54	5
Town criers	0(0.0)	4(2.5)	3(1.9)	3(1.9)	0(0.0)	0.19	10
Radio	0(0.0)	17(10.6)	24(15.0)	14(8.8)	4(2.5)	1.08	9
Television	0(0.0)	0(0.0)	1(0.6)	1(0.6)	1(0.6)	0.0375	12
Agric Ext. Agent	90(56.3)	48(30.0)	0(0.0)	0(0.0)	1(0.6)	3.97	3
Posters/ Pamphlets	8(5.0)	39(24.4)	10(6.3)	5(3.1)	1(0.6)	1.48	7
Local meetings	8(5.0)	55(34.4)	7(4.4)	1(0.6)	1(0.6)	1.78	6
Neighbour& Friends	71(44.4)	62(38.8)	9(5.6)	10(6.3)	1(0.6)	4.07	1
Govt. Agencies	80(50.0)	61(38.1)	0(0.0)	0(0.0)	1(0.6)	4.03	2
Computer/ Internet	0(0.0)	4(2.5)	0(0.0)	0(0.0)	0(0.0)	0.10	11

Mean Score was obtained from: Highly effective = 5; Effective = 4; Undecided = 3; Ineffective = 2; Highly Ineffective = 1; Multiple Response

Source: Analysis of Field Survey Data.

Note: The values in parenthesis represent the percentage, while the value outside represent the frequency.

Table 5: Logistic Regression Results indicating factors determining Respondents likelihood to being impoverished (Poor)

Factor	Regression co-efficient	Standard Error	T – value
Household Size X_1	-0.605*	0.305	-1.984*
Farm Size X_2	3.247	3.542	0.917
Farm Asset X_3	-0.001	0.001	-1.000
Income X_4	0.001*	0.001	1.000*
Years of Striga Infestation X_5	0.133	0.338	0.393
Yield loss through Striga X_6	0.001*	0.001	1.000*
Age X_7	0.174	0.122	1.426
Educational level X_8	0.767	0.855	0.897
Farming Experience X_9	-0.002*	0.011	-0.182*
Model Chi-square	189.257		
-2 log likelihood for the model	26.107		
Overall case corrected predicted	96.3%		

*co-efficient significant at 5 per cent

Source: Analysis of Field Survey Data.

Socio-economic characteristics of Respondents

Table 1 presents the socio-economic characteristics of the respondents in which the modal age for the maize-based farmers in the study area was 40 years. A mean age of 43 years was however recorded from the analysis. The youngest farmer was 25 years old and the oldest 61years. Majority (58.8%) of the farmers were middle age. This shows that most of the young adults are not involved in maize farming. This could be attributed to the fact that young people always seek for "so called" more lucrative job in the cities rather than farming in the rural areas. The results obtained indicated that the contribution of the female gender to maize production was very low in the area as just a hand full (8.8%) of them were involve in maize farming when compared to their

male counterpart (91.3%). This suggest that maize farming activities were mostly practiced by the male respondents which might be a positive boost to the level of agricultural productivity in the state because the men generally are known to have more stamina and capable of doing more tedious work than the women.

Table 1 further reveals that most of the maize farmers (89.4%) were married. This suggests that the married farmers in the sampled area might have a reasonable family size providing more family labour compared to the unmarried ones. More than half of the farmers (52.5%) had no formal education. This may limit the sources from which farmer seek information. The implication of this may be on the low rate of adoption of new technology. A good educational background may help to facilitate farmers understanding and use of improved crop production practices. On the average, the respondents had been into maize production for 13 years. This indicates that the farmers are highly experienced in the cultivation of maize. The long time experience might have facilitated their acquisition of good skills in the production of maize crop. Majority (56.2%) of the farmers had household size that consists of 7-10 members, while a few (11.3%) had household size that consist of 1-3 members. The mean household size for the maize-based farmers was 6 persons. The finding on household size implies that the maize-based farm household could draw some level of family labour from their households considering their mean household size. This implies a likely reduction in the cost of hired labour which increases the net gain of the farmers. More than half (66.2%) of the farmers cultivated small plots that were less than or equal to 1 hectares, few (22.9%) had a farm size of between 1.5 to 2 hectares while the remaining farmers (11.9%) cultivated farmlands as large as 3 hectares. This implies that the farm units were generally small sized. This finding agrees with Okunola and Adekunle [9] who reported that majority of the Nigerian farmers are small-scaled. The small-scale maize cultivation may constrain the quantity of farmers output. The result in table 1 further shows that less than one-third of the farmers (31.3%) indicated that they had access to credit facilities. This implies that most of the farmers depend on their personal capital to finance their farms. They will thus have less money to carry out their farming activities thereby reducing their level of productivity. The average number of years of Striga infestation among the maize farmers is 6 years. The lowest or minimum number of years of infestation is 2 years while the maximum is 15 years. About two-third of the farmers (58.1%) have experienced Striga infestation on their farms for five years and below average (40%) have experienced it for between 6 – 10 years while just a handful of farmers (1.9%) have experienced it for between 11 - 15 years. This implies that Striga infestation is already prominent in the area and quick and effective measures should be taken to control it.

Farmers Access to Information Sources

There were 13 sources of information to which the farmers were asked for access. As shown in table 2, more than half of the farmers had access to seven sources in the following order; neighbours and friends (95.6%), government agencies (ADP) (88.8%), agricultural extension agent (86.9%), radio (86.9%), farmer group (85%), local meetings (63.8%) and on-farm demonstrations (61.9%).

Neighbours and friends which ranked first as an information source in the study area implies that in the area, there is cooperation and proper information flows among the farmers. The farmers easily share new ideas and ways of doing things with one another meaning that there will be effective diffusion of adopted technology in the area.

Also the effect of government agencies like the Agricultural Development Programme and extension agents who work hand-in-hand with the government agencies was felt in the study area and that was why they both ranked 2nd and 3rd among the sources of information that the farmers had access to meaning that extension work is still going on in the area. Access to radio as an information source was also prominent in the area. Majority (86.9%) of the farmers had access to radio information meaning that radio signals was received in the area and most of the could afford a radio set. Farmer group as an information source was also prominent in the area as it ranked 5th among the sources. This was probably due to the fact that majority of the farmers had to constitute themselves into groups in order to benefit from government programmes such as provision of farm inputs credit facilities and other special programmes which has given them the opportunity group discussion and interaction. Local meetings ranked 6th among the sources of information that the farmers had access to. This was likely so because in the study area periodic community meetings usually take place and farmers also receive certain

information from such meetings. The farmers also had access to on farm demonstration and it ranked 7th among the information sources. This is probably due to the fact that on farm demonstration was one of the extension methods used by the extension agents in the area to train the farmers and allow them to see practically ways of applying new technologies and carrying out farm management practices. Access to other information sources was low which shows that these sources were not prominent in the area. Computer/ Internet ranked 13th among all the sources because it is a new technology and the facilities needed for it are less available in the study area.

Information Sources that provide Information on Striga Control Methods

Result from table 3 revealed that of the 13 sources of information; only five of these sources were prominent in the provision of information on Striga control methods to the farmers in the study area. Neighbours and friends was a very prominent source of information providing information to the farmers on Striga control. Majority (95.6%) of the maize farmers indicated that they use it to acquire information on Striga control methods and it still ranked first in terms of information provision on Striga control. It was followed closely by information from government agencies such as the Agricultural Development Programme (ADP) (88.8%), Agricultural Extension Agents (86.9%) of which some of them are also staff of government agencies, farmer group (84.4%) which is an association of farmers and On farm demonstration (61.3%). The implication of this is that farmers in the study area were able to receive tangible information on Striga control methods from the above sources which means effective extension of information and diffusion of technologies on Striga control methods was prominent through government agencies (ADP), Agricultural Extension Agents, farmer groups, neighbours and friends and On-farm demonstration. Other sources were not prominent because their provisions of information on Striga control was below average meaning that they provided minute or no information on Striga control techniques.

However, it is worthy of note that radio as a source of information which majority (86.9%) of the access to did not provide much information to the farmers on Striga control methods (36.9%). This implies that most of the agricultural programs on radio do not contain information on how Striga can be controlled. This ought not to be so, considering the importance of radio as a source of mass information dissemination coupled with the fact that majority of the farmers had access to it because it is affordable and portable, it should be properly utilized in disseminating Striga control technologies to the farmers. This will allow the information to reach more farmers at the same time and it will speed up the rate of Striga control in the State.

Effectiveness of Sources of Information in Disseminating Striga Control Methods

Table 4 shows that four sources of information were effective. Using mean ranking to rank the information sources according to their order of effectiveness in disseminating and diffusing Striga control methods as indicated by the farmers, neighbours and friends ranked 1st with $\ddot{x} = 4.07$, Government agencies (ADP) was 2nd with $\ddot{x} = 4.03$, Agricultural Extension Agent was 3rd with $\ddot{x} = 3.97$ and Farmers group was ranked 4th with $\ddot{x} = 3.53$. This shows that these four information sources were effective sources through which the farmers were able to receive some information on Striga control methods and technique in the area. The other sources of information whose mean score were below 3.5 were not effective sources in disseminating and diffusing Striga control technologies in the area. This implies that government and extension agencies should focus attention on the usage of these four sources of information in the extension and diffusion of information among the farmers in the study area.

Poverty profile of the Respondents

Nine factors were hypothesized as factors affecting maize farmers' likelihood to be impoverished. These factors were household size (X1), farm size in hectares (X2), farm asset (X3), total income (X4), years of Striga infestation (X5), yield loss due to Striga infestation (X6), age of farmers (X7), educational level of the farmers (X8), and farming experience (X9). The result of the logistic regression is as presented in table 5;

From the table, the coefficient of household size (X1), income (X4), yield loss due to Striga (X6), and farming experience (X9) were significant at 5 per cent level of significance, implying that these factors significantly determine farmers' likelihood to be impoverished. The remaining variable coefficients including that of farm size (X2), farm asset (X3),

years of Striga infestation (X5), age of farmer (X7), and the educational level of the farmers (X8), are not significant even at 10 per cent level of significance implying that these factors do not significantly affect farmers' likelihood to be impoverished. There is a positive relationship between the farmers' poverty status and the coefficient of income and yield loss through Striga implying that they both increase farmers' likelihood to be impoverished. On the other hand there is a negative and significant relationship between farmers' poverty status and the coefficient of household size and farming experience. This implies that they both decrease farmers' likelihood to be impoverished. The coefficients of all the variables included in the model conform to apriori expectation (have the expected signs).

Increase in household size tends to limit the farmers' likelihood to be impoverished because most of the farmers in the area have fairly large household size considering their mean household size of 6 members which might likely allow them to increase the area of land cultivated thus increasing their output. Also increase in family labour might likely reduce the cost of hired labour which increases the net gain of the farmers. A decrease in income of the farmers increases the likelihood of the farmers' being poor. The farm income of the farmers is very small and not sufficient enough to meet their basic needs. Farm income is directly related to farm output which is probably affected by the small farm size that is cultivated. However, some of the farmers that engage in off-farm jobs like tailoring, bricklaying, carpentry, mechanics, traders, barbers, drivers and so on earn additional income from these jobs which make them better-of than those who just engage in farming alone. Striga infestation has a positive and significant influence on household poverty implying that the more the number of years Striga stays on the maize farm, the more the likelihood of the farmers being impoverished. Production losses incurred due to Striga infestation will automatically cause a decrease in net farm income accrued to the farmers and as a result of this increases the likelihood of the farmers being poor because income is directly related to farmers' poverty.

The farming experience coefficient has a significant and negative relationship with farmers' poverty. An increase in the number of years of farming experience limits the farmers' likelihood to be poor. Majority of the farmers in the study area are experienced in maize farming business. This long time experience help them to have acquired good skills in the production of maize crop which ought to affect their output positively thereby decreasing their likelihood to be impoverished.

In summary, results from the logistic model revealed characteristics of households that are more likely to be poor: those with small household size, those with low farm and off-farm income, those with few years of farming experience and those whom Striga have been on their farms for long, and as a result having high yield loss to Striga.

4. Conclusions

Based on the findings of this study, maize farmers in the study area source information on Striga control methods from four (4) out of 13 sources. Also the farmers were resource-poor and Striga infestation contributed to the likelihood of the farmers being impoverished. Efforts should be geared by extension agencies to provide a robust capacity building for maize farmers by intensifying the use of the effective sources of information in the area including radio to disseminate effective and adoptable Striga control methods to the farmers so as to stop the menace and improve maize production. The maize farmers should be availed the opportunity by governments and other stakeholders to have access to credit facilities in form of loans and subsidies on control methods in order to encourage the farmers to cultivate maize more on a large scale thereby increasing maize output so that supply can meet demand on the crop. In addition, rural community developers and other relevant agencies should help in designing poverty reduction strategic programmes that will foster diversification of income sources for the farmers and focus attention on farmers who have experienced Striga infestation for a long time on their farms. All these will help ameliorate the poverty of the farmers, control Striga weeds and boost maize production in the State and in Nigeria as a whole thus enhancing sustainable food and nutrition security.

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