



Lapai Journal of Science and Technology, Vol. 5, No. 1 (2019)

AGRONOMIC EVALUATION OF MAIZE VARIETIES FOR YIELD AND INCOME GENERATION AMONG FARMERS IN LAPAI, NIGER STATE, NIGERIA

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ABSTRACT

The study was conducted in Lapai, Niger State, North central Nigeria to determine the performance and profitability of Local and improved *Striga* tolerant (SAMMAZ 17) maize varieties in cooperative farmers field. Demonstration plots were cited in 3 cooperative farms where the improved variety and a local variety were planted. All agronomic practices were carried out uniformly and simultaneously on the plots. In addition structured questionnaire were administered on 20 members each of the cooperative societies selected using simple random sampling technique to solicit information on the performance of the maize varieties on their farms. Descriptive statistics was used to analyze the socio-economic characteristics of the farmers. t - test analysis was used to compare the performance of maize varieties in terms of growth parameters, yield and yield components, while Gross margin analysis was used to compare the profitability of maize varieties. The results revealed that maize farmers were male, small-scaled in operations. The local maize variety supported high *Striga* infestation with low yield of 1.7 t/ha, while SAMMAZ 17 yield was 4.4 t/ha under less *Striga* infestation. The Gross margin for the production of SAMMAZ 17 maize variety was ₦ 254,127.40, while Gross margin for the production of farmers maize variety was ₦90, 133.57. Based on these findings, SAMMAZ 16 is profitable and it is therefore recommended for planting in *Striga* farm land in the study area.

Keywords: *Striga* tolerant, maize variety, cooperative farm, action research, farmers 'Local variety, gross margin

INTRODUCTION

Maize (*Zea mays* L.) was identified to be one of the most widely grown cereal crop which was domesticated by people in the prehistoric times (Agbolade *et al.*, 2015). Maize is ranked the third



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commonest crop cultivated in Nigeria and served as a source of food for human consumption, livestock feed and for industrial raw materials (Opaluwa *et al.*, 2015).

One of the huge challenges facing maize growers in sub Sahara Africa is the incidence of *Striga* spp. otherwise known as witch weed or witches weed. It is a parasitic weed which is often referred to as farmers' nightmare due to its negative impacts on cereal crops especially maize. As a result, farmers are compelled to abandon their farm lands to *Striga* or adopt the production of less susceptible crops to *Striga* (Olakojo and Olaoye, 2007).

In view of the challenges faced by maize growers, Breeders have worked tirelessly to develop maize varieties that are tolerant or resistant to *Striga*, *Striga* resistance maize variety performed remarkably more than the Local variety under *Striga* infested field (Garba *et al.*, 2014). Kim *et al.*, 2002) reported that tolerant open pollinated varieties produce 2.0 – 2.5 times the yield of susceptible varieties under *Striga* infested farm land. However, efforts of the agricultural extension agents are needed to educate farmers on new Technologies to reduce the damage caused by *Striga* spp. This study attempted to introduce *Striga* Tolerant Maize variety (SAMMAZ 17) to test its performance over the local variety for yield and income generation among farmers in Lapai.

Objectives of Study

The witch weed scientifically called "*Striga* spp" has been a problem of maize farmers all over the world and a treat to maize farmers over the years in Lapai. Plant breeders have tried many improved varieties that are resistant or tolerant to *Striga* spp and have been widely distributed, but some areas remain untouched with information about the package. The study therefore determined the socio-economic characteristics of maize farmers, to introduced *Striga* tolerant maize variety (SAMMAZ 17) to farmers, determined the level of awareness of maize *Striga* tolerant variety among the farmers, compared the performance of maize varieties in terms of growth, yield and *Striga* infestation and compared the profitability of *Striga* tolerant maize variety with farmers' traditional variety. The farmers traditional maize variety which is



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susceptible to *Striga* spp was planted to serve as a control through plot demonstration. Since *Striga* was the major cause of yield loss, farmers in the study area needed to compare the two varieties. The results obtained will help agricultural policy makers to formulate policy that addresses factors influencing the adoption of improved *Striga* tolerant maize variety in the study area.

METHODOLOGY

Study Area

The study was carried out in Lapai, Niger State. Lapai lies on latitude $09^{\circ} 3' N$ and longitude $06^{\circ} 34' E$ in the Southern Guinea Savanna of Nigeria. It has an area of 3,051 km² and a population of 110,127 at the 2006 census (Tsepav *et al.*, 2012). The dominant tribe is Nupe and they are Muslims. They are characterized by mixed farming system which involve important crops such as maize, guinea corn, millet, ground nut, soybeans, Cashew plantation and livestock production such as rearing of cattle, sheep, goat and some domestic poultry birds.

Sampling procedures

The target population for this research was maize farmers in Lapai. A sample of 60 smallholder maize farmers were purposively selected from three cooperative maize farmers and in each group, twenty maize farmers were randomly selected with the assistance of the community leader since new technology or innovations are better disseminated and accepted in groups rather than individual.

Treatments and Experimental Design

The trial was an action research which involves farmer's participation together with the researcher who facilitates all the agronomic practices. It utilizes the Supervised Enterprise Projects (SEPs) approach which signifies experiential learning (learning by doing) and therefore the farmers were involved in all stages of production starting from land preparation to harvesting so that the farmers act as co-researchers while the researcher facilitates the activities of the project. This gives the farmers an active participation to observe the sequential steps involved in production of *Striga* tolerant maize variety as a means of reducing the menace caused by *Striga*



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spp. (witch weed). Purposive sampling technique was adopted for the selection of three cooperative maize farmers in Cece community. Twenty (20) farmers were randomly selected from each cooperative group for the study with the assistance of the local leader. The farmers' cooperative groups include Manbe, Yandalu and Tswana cooperative societies. For the purpose of introducing a new maize variety (*Striga* tolerant) to maize farmers, 3 Demonstration farms were established and two maize varieties (traditional maize variety and improved *Striga* tolerant SAMMAZ 17) each were planted on the established plots. The size of each field laid out was 20 m by 15 m (300 m²). 25 cm intra-row spacing was used for the improved maize *Striga* tolerant variety. 2 seeds of the improved variety was uniformly sown per hole and later thinned to one stand at 2 weeks after sowing (WAS), while farmers practice was adopted for the Local (Kabako) variety in which two seeds were planted per hole at an inconsistent intra- row spacing (60 – 100 cm). After harvest, the maize varieties were dried, shelled, winnowed, weighed and extrapolated to kg/ha.

Data Collection

Primary data collected through the use of structured questionnaire was used for the study. The primary data observations on some crop parameters such as crop growth, yield and *Striga* parameters (plant stand count, plant height, days to 50% anthesis and silking, dry cob weight, grain yield and 100 grain weight and Shelling percentage and harvest index) while the *Striga* parameters include days to first *Striga* emergence and *Striga* shoot count were carried out. Twenty (20) maize plants were randomly sampled in each net plot of the maize varieties on which all the parameters were measured and records were taken.

Data Analysis

Data generated from the survey were analyzed using the following analytical tools:

(i). Descriptive Statistics: - The method employs arithmetic- mean, frequency –distribution and percentage. The technique was used to describe the socioeconomic and farm characteristics of maize farmers sampled.



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(ii). t –test analysis: - Paired comparison t-test was used to achieve the performance of maize varieties in terms of growth, yield and *Striga* parameters and the formula used is described by Hassan *et al.* (2012).

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Where:

\bar{X}_1 and \bar{X}_2 = the mean group of 1 and 2 respectively.

S_1^2 and S_2^2 = the sample variance for n_1 and n_2

N = number of the subject in each group

(iii). Gross Margin Analysis: - This was used to assess the profitability of the two varieties of maize in the study area. The gross margin is the difference between the gross income (profit) and total variable cost (TVC). The formula that was used in the calculation is shown below as described by Kudi and Abdulsalam (2008).

GM = GI – TVC, where

GM = Gross Margin

GI = Gross profit

TVC = Total Variable Cost.

RESULTS AND DISCUSSION

Socio-economic Characteristics of maize farmers

The results shown in Table 1, revealed that 33.3% of the farmers involved in maize farming fall within the ages of 36-45 years with a mean age of 41 years. This implies that maize farmers were in their active stage in life and they are still energetic to perform farm activities. Among the ageing population having lowest participation in maize farming were those from 56 years and above accounting for 6.7%. Ibrahim *et al.* (2012) reported in respect to ageing that age is an important determinant of individual's stamina to do manual labour especially farming. The larger



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population of the respondents (86.7%) that participated in maize farming in the area shows that they are married and therefore they are more faced with numerous challenges of life which may easily make them to accept and adopt any new technology that will enhanced their livelihood. This report is similar to the findings of Sambo *et al.* (2012) who reported that marital status of an individual signifies the states of being responsible especially to one's family. With respect to household size, the result shows that about 87% of the married farmers has a household size of 6 – 10 persons accounting for 40% of the sampled population. Among the house hold size 13.3% are recognized as part of the household size that is not married. Larger household size observed in this study could be a contributor to availability of family labour which enhances higher productivity and income generation among farmers. This result corroborates the findings of Bunu *et al.* (2014) who reported that household size determined the family labour that can be used to produce food and vice – versa.

Acquisition of formal education is a tool that enhances productivity. It was also revealed in this study that, majority of maize farmers (66.7%) acquired Islamic education. This signifies that there is higher rate of illiteracy in terms of western education in the area and that could lead to lack of information of new technology by farmers. Tiri *et al.* (2014) reported that education enables the individual to appreciate and adopt innovations as well as make informed decisions which is likely to impact positively on performance. The size of farmer's farm land is between 0 - 5 ha (40%) and this implies small scale farming. This result is in line with the report of Ojuekaiye (2001) who reported that 0.1 - 5.9 hectares are classified as small farms (Table 1).

Information source and farm input usage

Farmers' awareness of existing or newly released resistance, tolerance or hybrid varieties strongly depends on their access to agricultural information. The result in Table 2 shows that prior to the introduction of the new technology (SAMMAZ 17 *Striga* tolerant maize variety), 73.3% of the farmers were not aware or had no information on any type of maize that is either resistant or tolerant to *Striga*, but 26.7% of the population had received prior information about some *Striga* resistant/tolerant maize variety which they have not seen nor planted in their



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community other than the SAMMAZ 17 that was newly introduced to them. Though, the farmers admitted that some hybrid maize varieties were introduced to them more than 15 years ago by the ADPs, but they were not *Striga* resistant/tolerant maize variety. Lack of Information of innovation is a setback to farmers especially to the rural farmers. In this research work, 73.3% of the population had no prior information or knowledge about the existence of any *Striga* resistant/tolerant maize variety. Farmers in the rural areas hardly receive new innovation if information or awareness is not passed to the farmers.

The lack of information by majority of farmers may be due to their high level of illiteracy coupled with lack of committed agricultural extension agents in the area whose responsibility is to impact new technology to them. This result is similar to the finding of Daneji *et al.* (2006) who explained that there was ineffectiveness of extension agents in information dissemination. Information obtained from farmers shows that 36.7% of the respondents made an harvest of 1 - 10 bags (100 – 1000 kg/ha) of maize in the previous cropping season (Table 2)

However, *Striga* tolerant maize variety (SAMMAZ 17) was introduced to the farmers in which field demonstration method was used. From the result obtained in this study, farmer's opinion about the improved *Striga* tolerant variety was excellent for the fact that 76.7% of the farmers showed that field performance of the new variety was fast in terms of growth and good vigor, tolerance to *Striga* and better yield. It was also revealed that all farmers have no doubt about the tolerance maize variety. About 73.3% of the population strongly agreed to adopt SAMMAZ 17 and promised to continue with the practice in the subsequent years for the fact that 4.4 t/ha was realized. This is in agreement with the report of Benjamin (2010) that farmers adopt agricultural innovation because of high yield advantage. `



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Table 1: Socio-economic characteristics of sampled maize farmers

Variables	Frequency	Percentage (%)
Age		
15-25	12	20.0
26-35	14	23.3
36-45	20	33.3
46-55	10	16.7
>55	4	6.7
Total	60	100
Marital status		
Single	8	13.3
Married	52	86.7
Divorced	-	-
Widowed	-	-
Total	60	100
Household size (HHS)		
1-5	12	23.1
6-10	24	40.0
11-15	8	13.3
>15	8	13.3
Member of Household size	8	13.3
Total	60	100
Educational status		
Islamic education	40	66.7
Adult education	2	3.30
Primary education	10	16.7
Secondary education	6	10.0
Tertiary education	2	3.30
Total	60	100
Farm Size of farmers(ha)		
0-1	24	40.0
2-3	24	40.0
4-5	12	20.0
6-7	-	-
>7	-	-
Total	60	100

Source: Field Data,2014



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Table 2: Awareness and farm input usage of maize farmers

Variables	Frequency	Percentage (%)
Awareness of new maize variety		
Yes	16	26.7
No	44	73.3
Total	60	100
Source of information		
ADP extension agent	4	6.7
Radio/Television	4	6.7
Cooperate society	2	3.3
Friends/Relations	6	10.0
None of the above	44	73.3
Total	60	100
Farmer's opinion on the new maize variety		
Fast growth and good vigor	-	-
Striga Tolerant	-	-
Better yield	14	23.3
All of the above	46	76.7
Total	60	100
Yield of maize in the previous year (kg/ha)		
1-5	22	36.7
6-10	22	36.7
11-15	14	23.3
16-20	-	-
>20	2	3.3
Total	60	100
Adoption level of SAMMAZ 17 maize variety		
Strongly agreed	44	73.3
Agreed	16	26.7
Undecided	-	-
Disagreed	-	-
Total	60	100

Source: Field survey, 2014

Soil Analysis

The physical and chemical analysis of the soil in the study areas at Cece in the 2014 cropping season is presented in Table 3. The soil textural class of Cece in the three experimental sites were sandy loamy. The soil reactions (pH) in all the three sites revealed slightly acidic, with very low total nitrogen content, very low organic matter with moderate phosphorus concentration. The exchangeable bases (Ca, Mg, and Na) and Cation Exchange Capacity (CEC) were also very low (Table 3). Mbah and Njoku (2010) reported that soils of the tropics are inherently infertile due to



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intensification of agricultural production in the region which exposed the soil to the harsh forces of degradation, erosion and rapid deterioration resulting to reduction in soil quality.

Table 3: Physical and Chemical characteristics of soil at the experimental sites of Cece Community in Lapai. Niger state during 2014 rainy Season

	Cece A.	Cece B.	Cece C.
Physical properties (%)			
Sand (g kg^{-1})	780	710	720
Silt (g kg^{-1})	120	110	100
Clay (g kg^{-1})	100	180	180
Textural class	Sand Loamy	Sand Loamy	Sand Loamy
Chemical properties			
pH in water	6.80	6.50	6.40
pH in CaCl_2 5.33	5.48	5.52	
Organic Carbon (%)	0.48	0.43	0.41
Total N%	0.32	0.31	0.30
Available P (mg kg^{-1})	10.50	10.60	10.00
Exchangeable base			
Na^+	0.19	0.22	0.26
K^+	0.12	0.16	0.18
Mg^{2+}	1.60	1.12	1.20
Ca^{2+}	4.60	3.04	3.00
Exchangeable acid (C mol kg^{-1})	0.06	0.03	0.05
CEC (C mol kg^{-1})	10.00	10.94	10.00

Source: Soil Science Laboratory, Federal University of Technology (FUT) Minna.

Agronomic Performance of Maize Varieties

Growth Parameters of Maize Varieties

Evaluation of growth parameters of SAMMAZ 17 and Farmer's maize varieties at Cece in Lapai during the 2014 rainy season is presented in Table 2. The result of the t- test analysis shows that maize plant stand count differed significantly at $p < 0.05$ level of probability such that the improved tolerant variety had more number of surviving maize plants than the local variety at both 10 and 12 Weeks after sowing (WAS). This result might be that the *Striga* tolerant maize variety (SAMMAZ 17) was able to withstand *Striga* damage than the farmer's variety which was found to be susceptible to *Striga* infestation. This finding support the findings of Garba *et al.* (2014) who reported a significant difference between a *Striga* improved maize variety and a



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Local variety such that the improved *Striga* maize variety recorded the highest percentage of maize stands. Plant height at 10 and 12 WAS and days to 50% anthesis and silking were not significantly different from each other (Table 4).

Table 4: Evaluation of Growth Parameters of Improved and local Maize Variety

Variables	SAMMAZ 17	t- value	Farmer's variety	t- value	level of significance
Stand count					
10 WAS	99.17	0.0001	33.42	0.0001	0.0001
12 WAS	98.12	0.0001	29.66	0.0003	0.0001
Plant height					
10 WAS	142.40	0.0189	146.57	0.0160	0.0696
12 WAS	187.37	0.0034	208.07	0.0021	0.0562
50% anthesis	48.67	0.0002	56.67	0.0042	0.1165
50% silking	53.67	0.0002	62.33	0.0050	0.1419

Source: Field Data, 2014 **Significant at $P < 0.05$

Yield and yield components of maize Varieties

Table 5 shows the evaluation of yield and yield parameters of SAMMAZ 17 and Farmer's maize varieties. From the result of the analysis in this study, it was discovered that dry cob weight, 100 grain weight and grain yield differed significantly such that the improved tolerant maize variety (SAMMAZ 17) produced the highest yield parameters compared to the Farmers' maize variety. The ability of the tolerant maize variety (SAMMAZ 17) to produce the highest result (4444.44 kg/ha) in terms of the yield and yield components could be due to the variety's genetic superiority and ability to withstand *Striga* infestation more than the farmers' variety which yielded 1666.67 kg/ha (Table 5). This result is in line with the findings of Epinal *et al.* (2000) who reported that the genetic potential of maize is determined by hybridization, agro ecological and climatic condition including the technology of growing.



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Table 5: Evaluation of Yield and Yield Parameters of Maize Varieties Combined

Variables	SAMMAZ17	t- value	Farmer's variety	t- value	level of significance
Dry cob weight (kg/ha)	5044.44	0.0058	2777.78	0.0020	0.0138
100 grain weight (g)	29.91	< 0.0001	18.17	0.0143	0.0267
Grain yield (kg/ha)	4444.44	0.0035	1666.67	0.0084	0.0020

Source: Field Data, 2014 **Significant at $P < 0.05$

Yield Performance of the maize varieties at group Farmers demonstration plot in Cece, Lapai, Niger State

Performance of the two maize varieties in terms of yield for the three farmers group at Cece in the 2014 rainy season is shown on Table 6. The performance of the improved maize variety in terms of Dry cob weight, 100 grain weight and grain yield recorded the highest result with Tswanya farmers group, followed by Yandalu and Manbe respectively (Table 6). The local variety at all the sites was very low in the yield and yield components. Tswanya farmers group recorded the highest yield for the local variety followed by Yandalu and Manbe respectively. The low yield obtained from this plots may be due to infertility of the soil and impact of *Striga* infestation in the plots planted with the local variety. However, the higher revenue derived from the improved tolerant maize variety is attributed to two factors. First, the improved tolerant maize variety has higher yields per hectare compared with local varieties. Secondly, the improved tolerant maize variety attracts a higher market price.



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Table 6: Yield performance of the maize varieties at the group farmers demonstration plot in Cece in the 2014 rainy season

Varieties	NAMES OF ASSOCIATION								
	Manbe			Yandabu			Tswayan		
GY (kg)	DCW(kg)	100 gwt	GY (kg)	DCW (kg)	100 gwt	GY (kg)	DCW (kg)	100 gwt	GY (kg)
SAMMAZ 17	4333.33	29.4	3933.33	5133.33	29.99	4600	5666.67	30.33	4800
Local(Kabako)	2533.33	15.25	1400	2866.67	16.8	1666.67	2933.33	22.47	1933.33

Source: Field Data, 2014

Shelling percentage of Maize varieties

The ratio of grain weight after shelling to the weight of the cob was obtained and expressed in percentage (Table 7). The result shows that the improved *Striga* tolerant variety (SAMMAZ 17) recorded the highest shelling percentage (88.11%), while the farmers' variety was lowest with 60%. The ability of the *Striga* tolerant maize variety to produce the highest shelling percentage might be due to the agronomic practices employed during the research work and also its superiority over the farmers' variety at 25 cm intra-row spacing. This is in conformity with the findings of Babalola *et al.* (2011), Fasina (2002 and 2004) that the superior performance of maize under the improved management practices could be due to adequate fertilizer, effective weed control and adoption of optimum plant population among others. Jehan *et al.* (2006) also reported that an increasing application of N reduces barrenness and increased the shelling percentage (Table 7)

Table 7: Mean Performance of Maize Varieties Evaluated for shelling Percentage (Kg/ha)

Varieties	Total mean grain weight (kg/ha)	Total mean cob weight (kg/ha)	Percentage (%)
Tolerant	4444.44	5044.44	88.11
Farmer	1666.67	2777.78	60.00

Source: Field Data, 2014



Effect of *Striga* infestation on maize varieties

Evaluation of *Striga* parameters such as days to first *Striga* emergence, *Striga* shoot count and *Striga* incidence is presented in Table 8. The result of the analysis revealed that there was no significant difference between the *Striga* tolerant maize variety and the farmer's variety in terms of days to first *Striga* emergence. *Striga* shoot count at 10 and 12 WAS for the two maize varieties were significant at $P < 0.05$. In this regard the farmers' variety recorded the highest number of *Striga* in each farmer's field than the number of *Striga* shoot count recorded under the plots planted with the tolerant maize variety. This is an evidence of the importance of fertilizer (NPK 15- 15- 15) which is believed to have suppressed the emergence of *Striga* in the plots planted with the tolerant maize variety and coupled with the genetic superiority of the improved maize variety over the farmers' variety. This result supports the finding of Kureh *et al.* (2003) who noted that higher rates of nitrogen fertilizer are needed to reduce *Striga* damage and increase crop yields. *Striga* incidence was not significant with both varieties at 10 WAS, but it differed significantly at 12 WAS such that the farmers' variety supported the highest *Striga* infestation while the tolerant maize variety recorded the lowest incidence in this study. The result could be attributed to low soil fertility as a result of very low total nitrogen and organic matter content at the experimental sites as indicated in Table 1 which must have contributed to the high level of *Striga* abundance as recorded in the farmers' maize field. This finding is in line with the result of Franke *et al.* (2006) who reported that *Striga* abundance is clearly favoured by low soil fertility and high level of nitrogen fertilizer (above 180 kg N ha^{-1}) would be required to achieve a significant reduction of *Striga* emergence.



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Table 8: Evaluation of Striga Parameters of Maize varieties

Variables	SAMMAZ 17	t- value	Farmer's variety	t- value	level of significance
Days to first <i>Striga</i> emergence	61.33	0.0015	59.67	0.0008	0.6621
<i>Striga</i> shoot count					
10 WAS	10.33	0.0972	22.33	0.0234	0.0310
12 WAS	23.00	0.0154	47.33	0.0225	0.0429
<i>Striga</i> incidence					
10 WAS	4.67	0.0051	12.33	0.0260	0.0491
12 WAS	11.00	0.0187	22.00	0.0187	0.0533

Source: Field Data, 2014 **Significant at $P < 0.05$

Profitability of maize varieties

Table 9 presented the Cost and benefit analysis of maize varieties. The Gross Revenue realised from the sales of SAMMAZ 17 was ₦ 311,110.40, while farmers' variety was ₦ 116,666.90 against the variable Cost of ₦ 56,983.40 and ₦ 26,533.33 respectively. Therefore the gross margin for SAMMAZ 17 was ₦ 254,127.40 which was greater than the farmers' variety that recorded gross margin of ₦ 90, 133.57. This reveals that SAMMAZ 17 maize variety is profitable in the study area which is an indication that improved variety perform better than the local variety.



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Table 9: Estimates of Costs and Returns/ha of maize varieties at Lapai during 2014 rainy season

ITEMS	AMOUNT(N/ha)	
	SAMMAZ 17	Farmer maize variety
Gross Revenue	311,110.80	116,666.90
Variable Cost		
Seed	5999.40	3333.33
Fertilizer	30000.00	11000
Insecticide	1500	1500
Bag	1650	1200
Labour	17834.00	9500.00
Total variable Cost	56,983.40	26,533.33
Gross margin	254,127.40	90,133.57

Source: Field Data, 2014

CONCLUSION

Findings from the study reveals that age, marital status, education, household size, source of information, maize varieties and yield played a greater role in the adoption of the newly introduced technology (*Striga* tolerant maize variety SAMMAZ 17) to maize farmers in the study area. However, SAMMAZ 17 was superior and performed excellently over the Local maize variety which is susceptible to *Striga* with an increase in yield and total gross margin. The constrain to this study was lack of awareness of new technologies, source of information and non-contact of agricultural extension agents to the area. In conclusion, the newly introduced *Striga* tolerant maize variety has been successful in improving farmers' income and livelihood. Therefore, the study recommend that the production of *Striga* tolerant maize varieties should be encouraged among maize farmers, effort should be made to strengthened them for easy access to credit, farm input and market of their maize products.



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ISSN: 2346-7371 (PRINT)
2682-4965(ONLINE)

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