KOREAN GOVERNMENT-AU/STR-SAFGRAD

AFRICAN STRIGA PROJECT 2005 REPORT

PILOT SITE: NORTHERN NIGERIA

Institute for Agricultural Research, A.B.U; Zaria, Nigeria.

TITLE OF PROJECT: PROMOTION OF STRIGA-TOLERANT MAIZE VARIETIES AND RELATED CROP AND SOIL MANAGEMENT PRACTICES

COUNTRY: Nigeria (Guinea and Sudan Savannas)

Names, discipline and qualification of collaborator(s)

I. Kureh	Agronomy/Physiology	Ph. D.	IAR
S. O.Alabi	Plant Breeding	Ph. D.	IAR
B.D. Tarfa	Soil Science	Ph. D.	IAR
A. Shenew	Extension	B. Sc.	KADP
A. Danbaba	Extension	HND	SG2000
T. M. Kudi	Socio- Economist	Ph. D.	IAR

Objectives of the project

i. To ameliorate the effect of low N through the use of efficient N fixing legumes in rotation with maize.

ii. To ameliorate yield loss due to *Striga* soil seed bank and seed production through the use of legume trap-crops in rotation with *Striga* resistant maize.

iii. To demonstrate the effect of rotation on *Striga* infestation, soil fertility and maize yield

iv. To evaluate early and extra early *Striga* tolerant maize varieties for *Striga* control in the dry Sudan Savanna.

v. To produce seeds of *Striga* tolerant maize variety and legume trap-crops to facilitate adoption and diffusion.

Monitoring tour

The monitoring tour was carried out from 24-27th November 2005. The team was made up of Dr. M. Ouedraogo, Agronomist, SAFGRAD, and the project scientists at the Institute. At IAR, the team paid a courtesy call on the Director of the institute. The Director welcomed the team members and expressed his appreciation on the collaboration of SAFGRAD and the institute. Dr Ouedraogo explained the purpose of his visit, congratulated the new Director on his appointment and prayed for God's guidance in the leadership of the institute. Furthermore, he informed the Director that AU through SAFGRAD is organizing a meeting on *Striga* and streak research and control in Africa. He explained that Dr Kureh, the project leader will be invited for the meeting to represent the Institute.

Later, the team visited the on station seed multiplication schemes (*Striga* tolerant maize varities-**99TZEE-Y STR and Acr. 97TZL Comp1-W, soybean-TGX1448-2E and cowpea-IT93K 452-1**).

At Likoro (NGS) a new project site, the team visited on-farm soybean, *Striga* tolerant maize and farmers' maize demonstrations intended for rotation.

At tashan dole (SS), the team visited on-farm early and extra early *Striga* tolerant maize variety demonstration trials and cowpea community based seed multiplication scheme. At Buwaya (SGS), the team visited on-farm soybean and cowpea, *Striga* tolerant maize and farmers' maize demonstrations intended for rotation and cowpea and soybean community seed multiplication schemes.

Members of the team interacted with some participating farmers on their

perception of the project and the benefits derived from it. Members of the monitoring team were worried about the level of *Striga* infestation on farmers' fields thus they proposed a holistic approach that will involve community efforts in controlling *Striga*. Dr Ouedraogo was satisfied with the implementation of project activities except at Likoro were the fields were not properly managed largely because fund have not been received. However, the scientists were commended for a good job.

Field days

Three mini field days were organized at the sites in SGS and SS where project activities were carried out. Over 70 farmers/Traditional rulers attended the field days. Discussions were held on farmers' perception acceptability and adoptability of the improved *Striga* control technologies and the establishment of the community seed multiplication schemes. Questions and answers section form part of the discussion. The field days created public awareness and a lot of the farmers were interested in participating in the project.

Trainings

Seed production

A key component identified in the 'best-bet' technologies for *Striga* control is the use of improved *Striga* tolerant maize varieties and rotation with Legume trap crops (soybean and cowpea). The project identified availability of seeds as a major constraint to the adoption of the improved *Striga* control technologies. The small demonstration plots (20*20 m^2) could not satisfy the seed needs of the

communities both in terms of quantity and purity. Trainings were therefore organized at the three ecological zones to train extension agents (EAs) and lead farmers (LFs) on seed production techniques in order to produce high quality pure seeds for their communities. Part of the contract agreement was the provision of inputs (seed and fertilizer) to seed producers on loan, which remained with the groups/communities as a revolving loan.

Specific objectives

The objectives were to enhance the ability of the participants to:

- Set up community seed schemes.
- Explain the production and management practices of maize, soybean and cowpea.
- Supervise the production of pure high quality seeds.

Materials and methods

Activities:

Establishment of Demonstration

Thirty five demonstrations/evaluations were successfully established in the Savannas of Nigeria. Four on station, on 1.3ha and three on-farms, on 1.04ha community seed multiplication schemes were successfully established.

Experiment 1: Variety Demonstration Trials

On-farm demonstration trials were conducted on twenty farmers' fields (10 each of extra early and early maize variety evaluations) in the SS to evaluate the

reaction of maize varieties to *Striga hermonthica* infestation under sole crop. The improved technology consisted of two each of improved *Striga* tolerant extra early and early maturing maize varieties compared with farmers' maize varieties. Two sets of farmers evaluated the extra early (**Syn 2000EE-W and 99TZEE-Y STR**) and early (**EVDT-W99 STR CO and Acr. 94TZE Comp.5-W**) maize varieties. Each farm with the three plots constituted a replicate. The gross and net plot sizes were 400 m^2 and 340 m^2, respectively. Three maize seeds were planted on 75 cm ridges at a spacing of 50 cm apart. At two weeks after sowing (WAS) maize was thinned to two plants per stand. The fields were hoe weeded at 4WAS and earthen up at 6WAS followed by a careful hand pulling of other annual weeds except *Striga*. In order to enhance the tolerance of the improved maize varieties fertilizer was applied at the rate of 120 kg N/ha, 60 kg P/ha and 60 kg K/ha using NPK (15:15:15) and urea. The N fertilizer was split applied at planting and 4WAS.

One cowpea cv. IT93K 452-1 community seed multiplication scheme, on 0.5 ha, was also successful established in SS.

Experiment 2: Legume -Maize Rotation

In NGS, on-farm demonstrations were conducted on eight farmers' fields. The technologies demonstrated in 2005 consisted of improved efficient N fixing legume trap-crop, soybean cv. TGX 1448-2E, *Striga* tolerant maize variety cv. Acr. 97TZL Comp.1-W compared with farmers' maize intended for rotation. Each farm with the three plots constituted a replicate. The gross and net plot sizes were 400 m^2 and 340 m^2, respectively. All field operations on the maize were carried out as

described above except for weeding and time of fertilizer application. The fields were hoe weeded at 2 WAS and earthen up at 6 WAS followed by a careful hand pulling of other annual weeds except *Striga* at 8 WAS. The N fertilizer was split applied at 2 and 6 WAS. Soybean was drilled on 75 cm ridges at a spacing of 5 cm apart and fertilized at 2WAS at the rate of 20 kg N/ha, 40 kg P/ha and 20 kg K/ha using NPK (15:15:15) mixed with single super phosphate (P_2O_5).

Four on station (two *Striga* tolerant maize varieties-Acr. 97TZL Comp.1-W and 99TZEE-Y STR, one soybean cv. TGX1448-2E and one cowpea cv. IT93K 452-1), on 1.3ha seed multiplication schemes were successfully established.

In SGS, on-farm demonstrations were conducted on seven farmers' fields. The technologies demonstrated in 2005 consisted of improved efficient N fixing legume trap-crops, soybean cv. TGX 1448-2E, or cowpea cv. IT93K 452-1, *Striga* tolerant maize variety cv. Acr. 97TZL Comp.1-W compared with farmers' maize intended for rotation. Each farm with the three plots constituted a replicate. The plot size and all field operations on maize and soybean were carried out as described in NGS. The Cowpea was planted on 75cm ridges at a spacing of 25 cm and fertilized as described for soybean above. The cowpea was sprayed with Sherpaplus and Benlate WP50 at the rate of 1 l/ha and 0.4 kg/ha, respectively, at flowering and at podding to control diseases and insect pests.

One each of cowpea and soybean community seed schemes, on 0.54ha was also established in 2005.

Land Preparation and Planting

As soon as the rains were established the demonstration and seed multiplication plots were marked out by researchers, technical and extension staff with full participation of the farmers. A farmer's demonstration plot was set aside as the Farmer's Field School (FFS) where all the operations were first demonstrated to the farmers before implementation on their farms. Farmers were taught to make their ridges across the slope and 75 cm apart. Planting of maize, soybean, and cowpea were demonstrated at the distance of 50 cm, 5 cm and 25cm, respectively using sticks cut at the required lengths.

Thinning, Weeding and Fertilizer Application

At first weeding, the farmers were trained to thin their maize plants to two per stand. Also they were taught to weed their fields at the required times, followed with careful hand pulling of other annual weeds except *Striga*. Graduated rubber covers were used to apply the required quantity of fertilizers to holes made about 5 cm away from the crop stands and covered to prevent washing away by rain or lost due to volatilization.

Analysis

Data collected include number of plants/plot, *Striga* shoot count (infestation), host damage severity, plant and ear heights, yield and yield components of maize and seed yields of legumes. The data were subjected to analysis of variance and treatment means were compared using Duncan Multiple Range Test (Duncan, 1955). The relationships among *Striga* and maize parameters were determined in a correction co-efficient matrix.

RESULTS

Performance of the varieties

The performance of the improved extra early and early *Striga* tolerant maize variety at Tashan-dole (SS) are contained in Tables 1 and 2, respectively. The results of the rotation trials with soybean and/or cowpea at Likoro and Buwaya are contained in Tables 3 and 4, respectively.

The farmers' maize varieties supported significantly more *Striga* plants, were more damaged and produced higher plant and ear heights than the improved *Striga* tolerant extra early maize varieties (Syn 2000EE-W and 99TZEE-Y STR) (Table 1). The improved *Striga* tolerant extra early maize varieties produced significantly more number of plants/plot than the farmers' maize varieties. Extra early maize variety, 99TZEE-Y STR, produced significantly higher cob weight and grain yield than Syn 2000EE-W and farmers' maize varieties. Similarly, Syn 2000EE-W produced significantly higher cob weight and grain yield than farmers' maize varieties. The grain yields of 99TZEE-Y STR and Syn 2000EE-W were 40% and 23%, respectively higher than the farmers' maize varieties.

The improved *Striga* tolerant early maize varieties (EVDT-W99 STR Co and Acr.94 TZE Comp. 5-W) produced significantly higher grain yield, cob weight and plants/plot than the farmers' maize varieties (Table 2). The farmers' maize varieties produced taller plants and ear heights, supported more *Striga* plants and were more damaged than the improved *Striga* tolerant early maize varieties. The *Striga* tolerant early maize variety, Acr. 94TZE Comp.5-W, produced taller plants and was

less damaged than EVDT STR Co. The grain yields of EVDT-W99 STR Co and Acr.94 TZE Comp. 5-W were 17% and 14%, respectively higher than the farmers' maize varieties.

Rotation

At Likoro, (NGS), the improved *Striga* tolerant maize variety, Acr. 97TZL Comp.1-W produced significantly higher grain yield, supported fewer *Striga* plants and was less damaged especially at harvest than farmers' maize varieties (Table 3). The grain yield of Acr. 97TZL Comp.1-W was 118% higher than the farmers' maize varieties. The grain yield of maize at this location was generally low due to poor crop and fertilizer management as a result of delay in access to funds.

At Buwaya, (SGS), the improved *Striga* tolerant maize variety, Acr. 97TZL Comp.1-W produced significantly higher grain yield and cob weight, supported fewer *Striga* plants and was less damaged than farmers' maize varieties (Table 4). The grain yield of Acr. 97TZL Comp.1-W was 34% higher than the farmers' maize varieties.

Correlation

Striga shoot counts and crop damage severities at 9WAS and harvest were all negatively correlated to cob weight and grain yield in the demonstrations at all sites (Table 5). However, only crop damage severity was consistently significant.

Performance of the legumes

At Likoro (NGS) and Buwaya (SGS) the average seed yield of soybeam from the demonstrations were 1564 kg/ha and 2031 kg/ha, respectively. At Buwaya, the

farmers that preferred to grow cowpea produced 1094 kg/ha as the average seed yield.

Seed multiplication

Community seed schemes

Three community seed schemes were set up. Contracts were signed with representatives of the groups. The project provided seeds for planting and other inputs while the lead farmers (LFs) provided land and labor for the various operations. At the end of the season one third of the produce was recovered from the LFs to reach out more farmers in 2006. The LFs were encouraged to sell their seeds to members of the groups and other farmers in order to spread the varieties. The locations, type of crop, land area, quantity of seed produced and recovered are presented in Table 7.

On station seed production

Half-sib family method was used. At about the time of flowering the rows were arbitrarily designed as males and females in a ratio of one male to four female rows. All the plants of the female roles were detasselled. Undesirable and off types plants of the male rows were also detasselled to ensure a better control of the pollen source. About 600 ears were selected before harvest from the female rows and used as the progenitors for the next generation of breeder's seeds. A bulk of equal quantities of seed from the field cobs were sorted out and the remaining ones were threshed, cleaned and graded for use as foundation seed.

The personnel of the National Seed Service inspected our seed production fields and were satisfied with the techniques employed. Time isolation was used to produce both the late and extra early maize varieties. Similarly, cowpea and soybean seeds were produced to compliment the community seed schemes and provide seeds for dissemination. The various crops, land area and quantities of seeds produced are presented in Table 8.

Seed dissemination

About five hundred and thirty five non participating farmers collected seeds of improved *Striga* tolerant maize variety or legume trap crops (soybean and cowpea) to try on their farms.

Table 1: Effect of variety on *Striga* infestation, host damage severity, growth, yield and yield components of extra early maturing maize at Tashan dole, Nigeria during 2005 wet season.

Varieties	Number plants/plot	Plant height (cm)	Ear height (cm)	*Striga* count/ha at 9WAS	Crop damage severity*at 9WAS	*Striga* count/ha at harvest	Crop damage severity* at harvest	Cob weight (kg/ha)	Grain yield (kg/ha)
Syn 2000EE-W	1734a	170b	75b	97b	2.5b	149b	3.4b	122b	1698b
Farmer's variety	1625b	195a	87a	258a	5.2a	418a	7.3a	106c	1377c
99TZEE-Y STR	1716a	169b	71b	68b	2.2b	113b	3.1b	138a	1923a
SE±	20.66	4.35	2.63	20.49	0.18	28.32	0.20	2.66	61.78

WAS = weeks after sowing

* = Crop damage severity using a scale of 1-9 where 1 = healthy plants and 9 = completely dead plants

** = Means followed by the same letter(s) are not significantly different at 5% level of probability (NDMRT).

Table 2: Effect of variety on *Striga* infestation, host damage severity, growth, yield and yield components of early maturing maize at Tashan dole, Nigeria during 2005 wet season.

Varieties	Number plants/plot	Plant height (cm)	Ear height (cm)	*Striga* count/ha at 9WAS	Crop damage severity* at 9WAS	*Striga* count/ha at harvest	Crop damage severity* at harvest	Cob weight (kg/ha)	Grain yield (kg/ha)
EVDT STR Co	1711a	157c	69b	131b	2.8b	48b	3.6b	130a	1814a
Farmer's variety	1627b	197a	107a	346a	5.2a	259a	7.4a	111b	1549b
Acr. 94 TZE Comp.5-W	1700a	169b	69b	125b	2.0c	45b	2.8c	126a	1759a
SE±	12.01	3.45	2.63	4.05	0.13	23.87	0.18	1.45	20.18

WAS = weeks after sowing

* = Crop damage severity using a scale of 1-9 where 1 = healthy plants and 9 = completely dead plants

** = Means followed by the same letter(s) are not significantly different at 5% level of probability (NDMRT).

Table3: Effect of variety on *Striga* infestation, host damage severity, growth, yield and yield components of maize at Likoro, NGS, Nigeria, 2005 wet season.

Varieties	Plant height (cm)	Ear height (cm)	*Striga* count/ha at 9WAS	Crop damage severity* at 9WAS	*Striga* count/ha at harvest	Crop damage severity* at harvest	Grain yield (kg/ha)
Acr. 97 TZE Comp.5-W	207	79	10	1.6b	36b	3.2b	1338a
Farmer's variety	239	109	44	3.6a	155a	6.0a	613b
SE±	16.05	20.40	10.55	0.22	14.83	0.26	29.90

WAS = weeks after sowing

* = Crop damage severity using a scale of 1-9 where 1 = healthy plants and 9 = completely dead plants

** = Means followed by the same letter(s) are not significantly different at 5% level of probability (NDMRT).

Table 4: Effect of variety on *Striga* infestation, host damage severity, growth, yield and yield components of maize at Buwaya, SGS, Nigeria, 2005 wet season.

Varieties	Plant height (cm)	Ear height (cm)	*Striga* count/ha at 9WAS	Crop damage severity* at 9WAS	*Striga* count/ha at harvest	Crop damage severity* at harvest	Cob weight (kg/ha)	Grain yield (kg/ha)
Acr. 97 TZE Comp.5-W	198	83	9b	2.0b	63b	2.4b	314a	4366a
Farmer's variety	200	78	28a	3.8a	135a	5.8a	233b	3248b
SE±	6.18	3.08	3.81	0.14	13.50	0.42	17.08	237.79

WAS = weeks after sowing

* = Crop damage severity using a scale of 1-9 where 1 = healthy plants and 9 = completely dead plants

** = Means followed by the same letter(s) are not significantly different at 5% level of probability (NDMRT).

Table 5: Correlation coefficients between *Striga* and some maize parameters of the various demonstrations/evaluations at Tashan dole, Likoro and Buwaya, Nigeria, 2004 wet season

Extra early maturing at Tashan dole(SS)	Cob weight	Grain yield
Striga shoot count at 9WAS	-0.18	-0.29
Striga shoot count at harvest	-0.24	-0.38
Crop damage severity at 9WAS	-0. 54*	-0.56**
Crop damage severity harvest	-0.45*	-0.58**
Early maturing at Tashan dole (SS)		
Striga shoot count at 9WAS	-0.22	-0.22
Striga shoot count at harvest	-0.29	-0.30
Crop damage severity at 9WAS	-0.45*	-0.45*
Crop damage severity at harvest *= r(0.05) = 0.444 ** = r(0.01) = 0.561	-0.46*	-0.47*
Late maturing at Likoro (NGS)		
Striga shoot count at 9WAS	-	-0.55
Striga shoot count at harvest	-	-0.59
Crop damage severity at 9WAS		-0.85*
Crop damage severity at harvest	-	-0.86*
Late maturing at Buwaya (SGS)		
Striga shoot count at 9WAS	-0.64	-0.64
Striga shoot count at harvest	-0.58	-0.58
Crop damage severity at 9WAS	-0.82*	-0.82*
Crop damage severity at harvest *= r(0.05) = 0.811 ** = r(0.01) = 0.917	0.81*	-0.81*

Table 6: Performance of the legumes in northern and southern Guinea Savannas, Nigeria, 2005 wet season.

Location	Legume crop	Average yield (kg/ha)
Likoro	Soybean cv.TGX1448-2E	1564
Buwaya	Soybean cv.TGX1448-2E	2031
Buwaya	Cowpea cv. IT93K 452-1	1094

Table 7: The locations, type of crop, land area, quantity of seed produced and recovered from communities, Nigeria, 2005 wet season

Location	Type of crop	Land area	Quantity of seed produce in kg	Quantity of seed recovered in kg
Ugwa Yelwa (SS)	Cowpea cv. IT93K 452-1	0.5ha	600	200
Buwaya (SGS)	Cowpea cv. IT93K 452-1	0.5ha	500	250
Buwaya	Soybean cv.TGX1448-2E	0.04	72	27

Table 8: The crop, land area, and quantity of seed produced on station, Nigeria, 2005 wet season

Type of crop	Land area	Quantity of seed produce in kg
99TZEE-Y STR	0.6ha	1000
Acr. 97TZL Comp.1-W	0.3ha	400
Soybean cv.TGX1448-2E	0.15	200
Cowpea cv. IT93K 452-1	0.15	180

Socio – Economic Analysis in Sudan and Adoption Studies of the Improved *Striga* Management Interventions in Northern and Southern Guinea Savanna Zones of Nigeria.

Costs and Returns Analysis of Variety Demonstration.

The costs and returns analysis (Table 1) showed that labor and fertilizer inputs constituted the greater parts of the total variable costs incurred in the evaluation of *Striga* tolerant and farmers' maize varieties. The labor cost for the improved *Striga* tolerant extra early maize varieties, SYN2000 EE-W and 99TZEE –Y STRCO, were 57.66 and 57.47%, respectively while the labor cost of the farmer's maize variety was 61.14%. Similarly, the labor cost of the improved *Striga* tolerant early maturing maize varieties, EVDTSTRCO and ACR.94TZE Comp. 5 – W, were 54. 37 and 54.22%, respectively while the farmer's maize variety was 64:77%. Fertilizers costs were 37.38 and 37.30% for SYN2000 EE-W, 99TZEE–Y STRCO, respectively and 37.76% for the farmer's maize variety; 40.24 and 40.27% for EVDTSTRCO and Acr.94TZE Comp. 5–W, respectively and 40.65% for the farmer's maize variety.

In the Northern Guinea and Southern Guinea Savannas, labor accounted for 43.30 and 35.67%, respectively of the total cost of production for Acr.97 TZL Comp.1–W, while the farmer's variety was represented by 44.13 and 36.24%, respectively. Fertilizer cost accounted for 50.31 and 53.63% of the total cost of production for the *Striga* tolerant maize variety and 51.36 and 55.04% for farmer's variety, respectively in the two ecological zones.

The gross margin analysis as shown in Table 1 indicated that SYN2000 EE-W and farmers variety in Sudan Savannah had negative gross margin, while 99 TZ EE-

Y STRCO, EVDTSTRCO and Acr.94TZE Comp. 5-W had positive gross margin. Thus, there is the need to intensify the production of the *Striga* tolerant maize varieties with positive gross margins.

The gross margin analysis of the ACR.97 TZL Comp.1-W in Northern Guinea and Southern Guinea Savannah zones were positive, with farmers making a gross margin of N1,039.18 and N111,040.40/ha, respectively. The farmers variety in Northern Guinea had a negative gross margin, while in Southern Guinea Savannah the gross margin was positive (N721, 981.20).

Table 1: COSTS AND RETURNS ANALYSIS

COSTS/RETURNS	*STRIGA* TOLERANT MAIZE VARIETIES AND FARMAERS VARIETY											
(1) ITEMS COSTS	Location A: T/Dolle						Sudan Savannah					
	SYN2000EE-W	%	99TZEE-YSTRCO	%	FARMER VARIETY	%	EVDTSTRCO	%	ACR.94TZE Comp. 5-W	%	FARMER VARIETY	%
Seed	2000.00	3.34	2000.00	3.33	1600.00	2.70	2000.00	3.59	2000.00	3.60	1600.00	2.90
Fertilizer	22,400.00	37.38	22,410.00	37.30	22,400.00	37.76	22,410.00	40.24	22,410.00	40.27	22,410.00	40.65
Bag (sacks)	1018.80	1.70	1153.80	1.92	826.20	1.30	1088.40	1.96	1055.40	1.90	929.40	1.69
LABOUR												
Land Preparing/Ridging	7000.00	11.68	7000.00	11.66	7000.00	11.80	9999.90	17.96	9999.90	17.98	9999.90	18.15
Planting	1500	2.50	1500.00	2.50	1500.00	2.53	1050.00	1.87	1050.00	1.89	1050.00	1.91
Fertilizer Application	2166.65	3.62	2166.65	3.61	2166.50	3.65	1750	3.14	1750.00	3.15	1750.00	3.18
Weeding	9333.30	15.58	9333.30	15.54	933.30	1872	6750.00	12.13	6750.00	12.13	6750.00	12.25
Earthing Up	4166.65	6.95	4166.65	6.94	4166.65	7.42	4000.00	7.19	4000.00	7.19	4000.00	7.26
Harvesting	5000.00	8.34	5000.00	8.33	5000.00	8.43	3000.00	5.39	3000.00	5.39	3000.00	15.44
Threshing	2333.35	3.89	2333.35	3.59	2333.35	3.93	1125	2.02	1125.00	2.07	1125.00	2.04
Transportation	3000.00	5.01	3000.00	5.00	3000.00	5.06	2500.00	4.49	2500.00	4.40	2500.00	4.54
Total variable cost (TVC)	₦59918.75		₦60053.75		₦59326.00		₦55663.30		₦55630.30		₦55104.30	
(2) RETURNS												
Average Yield (kg/ha)	1698.00	33.5	1923.00	33.50	1377.00	33.15	1814.00	33.50	1759.00	33.50	1549.00	33.50
Average Price (kg/ha)												
Gross Revenue												
Gross Margin (GR-TVC)	N3035.75		N4366.75		N13197.00		N5105.70		N3296.2		N3212.80	
Gross Margin/N/Ha	-0.05		0.07		-0.22		0.09		0.06		-0.06	

LIKORO	LOCATION B. 1IKORO				LOCATION C. BUWAYA			
Costs/Returns Items	ACR.97TZL Comp.1-W	%	Farmers Variety	%	ACR.97TZE Comp 1-W	%	Farmer's Variety	%
(1) COSTS								
Seed	2000.00	4.50	1600.00	3.67	2000.00	4.9	1600.00	3.93
Fertilizer	22,400.00	50.39	22,400.00	51.36	22,400.00	53.63	22,400.00	55.04
Bag (Sacks)	802.80	1.81	367.80	0.84	2619.60	6.27	1948.80	4.79
Labor								
Land Preparation	3000.00	6.75	3000.00	6.89	2500	5.99	2500.00	6.14
Planting	833.35	1.87	833.35	1.91	1000.00	2.39	1000.00	2.46
Fertilizer Application	1000.00	2.25	1060.00	2.29	1500.00	3.9	1,500	3.69
Weeding	7500.00	16.8	7500.00	17.19	4000.00	9.58	4000.00	9.83
Earthening Up	4166.67	9.37	4166.67	9.55	2000.00	7.50	2000.00	21.91
Harvesting	1000.00	2.25	1000.00	2.29	1000.00	2.39	1000.00	2.46
Threshing	750.00	1.69	750.00	1.72	2000.00	4.79	2000.00	4.91
Transportation	1000.00	2.25	1000.00	2.29	2000.00	4.79	2000.00	4.91
Total Variable Cost (TVC)	N44452.82		N43617.80		N41769.60		N40698.80	
(2) RETURNS								
Average yield (kg/ha)	13338		613		4366		3248	
Average Price (kg/ha)	34.00		34.00		35.00		35.00	
Gross Revenue (N/ha)	454,92.OO		40842		152810		113680	
Gross Margin (GR-TVC)	N1039.18		-N22,775.80		N111,040.40		N72,981.20	
Gross Margin/N/ha	0.02		-0.52		2.66		1.79	

Farmers' perception of the *Striga* tolerant and Farmers'maize varieties.

In the three agro-ecological zones, farmers' perception on *Striga* tolerant maize varieties and farmers' varieties was assessed in terms of crop germination, crop growth, crop maturity, grain/cob filling, grain size, yield, *Striga* emergence and crop damage/symptoms (Table 2). The farmers varieties showed poor germination, slow growth rate, late maturity, poor grain filling moderate grain size, very poor yield (as recorded in Sudan and Northern Guinea Savannah) high *Striga* emergence and crop damage severity. However, the improved *Striga* tolerant varieties (extra early, early and late maize maturing varieties) had better characteristics and performed very well under *Striga* infestation.

Table 2: Farmers Perception on *Striga* Tolerant Maize Varieties and Farmers Variety in Three Agro-Ecological Zones of Nigeria.

Farmers' Perception	***Striga* Tolerant Maize Varieties**				ACR.97TZL Comp. 1-W	**Farmers' Varieties**
	SYN2000EE-W	99TZEEY	EVDTSTRCO	ACR.94TZE Comp. 5-W		
Crop Germination	High	Very high	High	High	High	low
Crop Growth	High	Fast & High	Fast & High	High	Fast & high	Late maturing
Crop Maturity	Early maturing	Very early	Early maturing	Early maturing	Early maturing	Moderate
Crain Filling	High	Very high	High	High	High	Small
Grain Size	Big	Big	Big	Big	Big	Very high
Striga Emergence Crop	N.S.E	N.S.E	N.S.E.	Low	N.S.E.	Very high
Damage/Symptoms	NCD	NCD	NCD	Low	NCD	

Farmers Choice of Variety and improved technology and reasons for the Choices

The results in Table 3 revealed that farmers in the three agro-ecological zones preferred *Striga* tolerant maize varieties to their own varieties. In Sudan Savannah, 80% of the farmers preferred SYN2000EE-W, while 90% each preferred 99TZEE-Y and EVDT99STRCO and 70% ACR.94TZE Comp. 5-W. However in Northern and Southern Guinea Savanna zones all the farmers (100%) preferred ACR.97TZL Comp.1-W to their own variety. The reasons advanced, by the farmers, for the choice of the *Striga* tolerant maize varieties include high yield, tolerance to *Striga*, early maturing, good seed colour, better food taste, compatibility of the technologies to farmers farming system, affordability of the technology, availability of land and marketability especially the varieties with white colour. Most of the farmers in Sudan Savannah zone preferred 99TZEE-Y for consumption. This result revealed that intensification and expansion of *Striga* tolerant maize production in the agro-ecological zones will greatly reduce *Striga* menace.

There is also the need to train farmers in the area of seed multiplication if sustainability of the technologies is to be achieved.

Table 3: Farmers Choice of Varieties

Variety	No. of Farmers	Percentage
SYN2000EE-W	8	80
99TEE-Y	9	90
ACR94TZE Comp.5-W	7	70
EVDT STRCO-W	9	90
ACR. 97TZL Comp 1.-W	10	100

Adoption of Striga control Technologies

In Sourthern Guinea savannah 80% of the farmers (lead farmers) have adopted improved *Striga* tolerant maize variety in rotation with soybean, while 10% have adopted improved *Striga* tolerant maize variety in rotation with cowpea and only 10% adopted sole planting of improved *Striga* tolerant maize variety (Table 4). All the lead farmers reported that *Striga* menace has been greatly reduced in their farms.

In terms of the best *Striga* control technology, the lead farmers were of the opinion that production of improved *Striga* maize tolerant variety in rotation with soybean is the best technology in controlling *Striga* menace. Since the introduction of technologies to the lead farmers in 2002, 127 farmers (Secondary farmers) have requested and collected seeds from the lead farmers and trying the technologies. There is high demand for seed of *Striga* tolerant maize varieties and trap crops both within and outside their communities.

Table 4; Striga Control Technologies Adopted by Lead Farmers since 2002.

Technology	**No. of Farmers**	**Percentage**
Improved *Striga* Tolerant Maize Varity in rotation with Soyabeans	8	80
Improved *Striga* Tolerant Maize variety in rotation with Cowpea	1	10
Improve *Striga* Tolerant Maize variety alone	1	10

2005

PROMOTION OF STRIGA-TOLERANT MAIZE VARIETIES AND RELATED CROP ANDSOIL MANAGEMENT PRACTICES

Institute for Agricultural Research, Nigeria

AU-SAFGRAD