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Semi-Arid Africa Agricultural Research and Development  
Recherche et Développement Agricoles dans les Zones Semi-Arides de l'Afrique

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## ***Striga* Research and Control in Africa**

A collaborative research proposal Submitted to:

**The Korean International Cooperation Agency (KOICA)  
through the Embassy of the Republic of Korea in Abidjan,  
Cote d'Ivoire**

by

**The African Union Semi-Arid Africa Agricultural  
Research and Development (AU/SAFGRAD)**

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## Summary

The *Striga* research and control project in Africa is an initiative involving 12 African countries, the International Agricultural Research Institute (IARI) of the Kyungpook National University of Korea and the African Union specialized office in Ouagadougou (SAFGRAD). The project seeks to bring benefits of prior research and outreach activities developed by IITA, other IARCs, and NARS to reduce staggering cereal and legume food deficits caused by parasitic weed infestations which are aggravated by land and soil degradation in the production systems. The project empowers African men and women farmers to obtain highest return on production inputs and contributes significantly to household and national food security and economies. Community-based feedback mechanisms allow researcher organizations to re-define research agenda in a bottom-up manner to respond to emerging issues from farmers' field experiences and strengthen international collaboration. Activities planned for this year include introduction of new technologies for *Striga* control in line with local demand (verification of technology packages for *Striga* control; demonstration fields for technology packages; creation of partnerships with extension agents to encourage ownership of the project; organization of field days); training of farmers in seed production; capacity building of NARES; advocacy on *Striga* research and control (create awareness); training of scientists on scientific writing; symposium on *Striga* research and control; and impact assessment of project activities to date. The project seeks a total of US \$380,000 to sustain the gain already made in the area of *Striga* research and control.

## 1. Background and Justification

### 1.1 Statement of the Problem

Since the start of 2006, the average world price for rice has risen by 217%, wheat by 136%, maize by 125% and soybeans by 107%. In late April 2008, rice prices hit 24 cents a pound, twice the price that it was seven months earlier. (Wikipedia). Several actors have blamed increased Asian demand for cereals, high population growth, or diversified use of cereals for biofuel, etc. for the food crisis that has been observed. The food security situation in rural and urban households is low today in SSA sparking civil unrest in some countries.

Concerted action is necessary for properly addressing this on-going crisis. This project hypothesizes that investment in maize production can go a long way into resorbing part of the observed crisis. As a matter of fact, maize is a cereal whose production has been on the rise in semi-arid Africa during the past decade and has the potential for reducing the shortage in food supply created by the growing African population. Its ease of cultivation and good response to input such as fertilizers, make it a target crop for the realization of food security and poverty alleviation objectives in semi-arid Africa. Between 41 and 43 millions tons of maize are produced annually on about 27 millions hectare (FAO, 2004).

The popularization of maize production among small-holder farmers with limited resources necessitates the implementing of measures to increase its production and productivity which are hampered by disease, insects, and parasitic weeds. Among these pests, *Striga hermontica* alone is known to cause yield losses on cereals ranging from 40 to 80%. Conservative estimates put the damages caused by this parasite between 5 and 7 million US dollars, affecting the livelihood of more than 100 million people. Complete crop failures have been reported in all regions of Africa and several farms have been abandoned due to severe infestation of *Striga*. *Striga* species also attack other cereals such as sorghum, millet, and rice and also legumes such as cowpea, soybean, etc. It is believed that high population density particularly in rural areas has caused extensive farmland cultivation with little provision of fertilizers to rejuvenate soil fertility. Traditional practices such as intercropping and particularly rotation have been reduced significantly causing soil impoverishment and resulting in heavy *Striga* infestations. A preferred means of combating *Striga* is through breeding and diffusion of *Striga* resistant or tolerant varieties to farmers, along with cultural practices that can curb the effects of the pest.

Several initiatives have been put forth to reinforce and strengthen NARS capacity to effectively control *Striga*. Some of these include the African *Striga* research and control project, which was conceptualized to promote the delivery of *Striga* control technology packages to farmers through farmer managed on-farm demonstration trials, first in West and Central Africa, and afterwards in Eastern and Southern Africa; the Pascon network, which

covered the whole African region with the view to promoting exchange of information on research and control of *Striga* species on crops; and more recently the Sustainable integrated parasitic weed management in cereal-legume production systems in Africa (SIPWEMA) whose aim was to protect cereal-legume production environments in Africa from *Striga* species attacks and thus enhance food security, and improve incomes and livelihoods of resource-poor farmers.

## 1.2 Justification

The Korean AU/SAFGRAD project on *Striga* research and control has been on-going for the past 8 years. Results achieved by the project have been documented in different reports from 1999 to date.

During the last two years the following was accomplished:

- Expansion of project to cover Eastern African countries such as Sudan, southern countries such as Zambia and Botswana based on past results and recommendations. In West Africa, Togo and Niger joined the project.
- The use of integrated control packages in this project seems to be getting more attention since it allows reduction of *Striga* count on cereals and also reduces *Striga* damage to the crop.
- In many countries the identification of adapted varieties capable of giving good yield under *Striga* infestation has been facilitated. In several countries, farmers are already using these varieties in association or rotation with legume trap crops.
- Seed production using community based seed production schemes are underway. However, to insure a successful and sustainable program for *Striga* control, a clear and effective seed production and commercialization system must be put in place in affected countries. Timely availability of these seeds as well as the level of resistance in the varieties used will go a long way toward helping small-holder farmers successfully combat *Striga* infestation.

The following recommendations were also made by participating scientists and partners:

- Adopt a suitable reporting format to facilitate not only timely reporting of the data for inclusion in the various annual and progress reports of the project but also to facilitate the production and publication of scientific papers for improving project outreach.
- Conduct impact assessments first in countries that have been project participants since 1999, (Benin, Burkina, Cameroon, Côte d'Ivoire, Ghana, Mali and Nigeria).
- Adopt guidelines developed by SAFGRAD and validated through the June 2007 consultative workshop as training material for countries proposing training activities. in 2008 and thereafter.

Affirm that dissemination strategies address the technology uptake sustainability of the project by ensuring benefit and profitability to the end-users;

Building on these past successes and learning from recommendations is the way forward in combating *Striga* and ensuring more success in project implementation. As a whole, several varieties that show partial resistance or tolerance to *Striga* have been developed and tested. Cultural practices, intercropping and rotation with legume trap crops have been perfected and are being disseminated to farmers in various countries. While these actions are having an impact, there is no impact assessment study that has been conducted to warrant further action or a redeployment of the activities. Secondly, an important issue already addressed that needs further action is the seed production aspect, particularly the articulation of the *Striga* tolerant variety seed from station to seed production farm and onto farmers' fields.

We are therefore seeking through this new phase to continue to address our initial objectives but also to tackle other aspects of equal or similar importance, notably the enhancement of the scientific writing skills of the participating scientists, the updating of the progress made in *Striga* research and control through the organization of a symposium, and the impact assessment of our activities to date.

## **2. Project Goals and Objectives**

This project has the double purpose of: 1) building more momentum and sustaining the gains made in *Striga* control, from these past and present initiatives; and 2) increasing agricultural productivity by reducing crop losses caused by parasitic weeds, and increasing profitability of production systems by promoting essential input and output market opportunities at community level for both men and women farmers.

The project aims to enhance food security, improve farm income and protect maize based production environments, thus contributing to poverty reduction objectives. By reducing maize yield losses caused by *Striga hermonthica* and increasing profitability of maize production systems, the project will significantly improve rural livelihoods.

### **Specific objectives:**

1. To scale up diffusion of proven *Striga* and maize streak virus control technologies in selected African countries.
2. To increase awareness of *Striga* problem in countries to facilitate policy formulations that are conducive to mitigating the constraints.
3. To strengthen capacity of farmers and NARS for the control of *Striga* in maize based farming systems.
4. To hold a high level symposium on the control of *Striga* in Africa.
5. To study the impact of the project.

### 3. Expected output

- Through this project, farmers will be exposed to technology packages for *Striga* control through on-farm demonstration trials and training using participatory methods.
- Access to technology packages will be facilitated through production of improved cereal and legume trap crops seed.
- Policy makers and opinion leaders will be sensitized about the effect of *Striga* on small farmers' livelihoods and will be informed on ways and means to control *Striga*.
- Impact assessment of the project will be conducted. Farmer adoption and the benefits and impacts of parasitic weed management practices fully quantified and publicized.
- More scientific papers published.

### 4. Target countries and beneficiaries

*Striga* species are found across political borders and are predominant in several agroecologies including the Guinea savanna and Sudan savanna of Africa. For this phase, target countries will be: Benin, Botswana, Burkina Faso, Cameroon, Cote d'Ivoire, Ghana, Mali, Niger, Nigeria, Sudan, Togo and Zambia. In these countries, efforts will be made to reach out to farmers. Hence, the primary beneficiaries are small-holder farmers including women. Through this project, farmers will have access to improved technology packages that they contributed in identifying, and therefore that are easy to implement for improving their farm production. Food security will be enhanced with the production of leguminous crops such as cowpea and soybean which can generate additional income as cash crops. With these technologies the pressure on land will be reduced since *Striga* infested fields can be recuperated and put into cultivation after one to two years of rotation/intercropping with trap crops.

### 5. Activities/Methodology

Activities to undertake include:

- Introduction of new technologies for *Striga* control in line with local demand
  - Verification of technology packages for *Striga* control
  - Demonstration fields for technology packages
  - Creation of partnerships with extension agents to encourage project ownership
  - Organization of field days
- Training of farmers in seed production
- Capacity building of NARES
- Advocacy on *Striga* research and control (create awareness)
- Training of scientists on scientific writing

- Symposium on *Striga* research and control
- Impact assessment of project activities to date

## **5.1 Introduction of new technologies for *Striga* control in line with local demand**

### **Verification of technology packages for *Striga* control**

This activity will be conducted at the country level. It primarily concerns the on-farm identification of new varieties resistant or tolerant to *Striga* in collaboration with farmers. It should concern introduced or newly developed varieties. Several varieties will be compared with known checks in a replicated trial. Scientists will arrange to test these varieties according to agroecological zones in relation with their own country. Trap leguminous crop varieties will also be tested using the same methodology. New countries joining the project need to start with this verification trial. Verification trials are implemented in a way that farmers' preferences for the STR varieties are documented and analyzed to select those that are adequate for demonstration activities. The number of such trials and their locations are determined at the country level according to need.

### **Demonstration fields for technology packages**

When technological packages are identified with farmers' input, demonstration trials will be set up to promote these best options with a scaling up of activities. Communities and local organizations should be strongly involved at all stages of the on-farm demonstration trials to ensure ownership. At least 50 demonstration plots are suggested per country. These plots should be spread across the ecological zones where *Striga* is a problem. It was agreed that plot size should be at least 20 x 20 m. A Field Day should be an integral part of the on-farm demonstration. It will help facilitate further scaling up in subsequent years. Where scientists perceive other improved options for *Striga* control, demonstrations of such techniques should be carried out to broaden the control options available to farmers. The technological package identified (variety in intercropping or rotation with a legume trap crop) should be tested against the farmers' local practice. As much as possible, no more than one technological package should be promoted in the same location against the farmers' local practice.

### **Organization of Field Days**

This activity should be implemented in conjunction with the other activities. The objectives of this activity are to ensure that more stakeholders, particularly farmers, are exposed to project activities and that more awareness of *Striga* control options is generated. It is expected that at the country level, a Field Day can be organized to cover most activities undertaken.

## **5.2 Training of farmers in seed production of STR and trap crop varieties**

A number of community-based seed production activities are undertaken in the sub-region with some good level of success. Community-based seed production of STR maize varieties and trap crops is a sustainable alternative for sourcing seeds. In addition, it ensures that farmers are actively involved in providing solutions to the *Striga* problem. Each participating country will train a least 30 farmers and produce enough seed for the implementation of activities for the following year.

## **5.3 Capacity building of NARES**

Training of technical support groups (extension/NGO agents, technicians, and innovative men and women farmers) from selected NARS and extension systems will be undertaken. To achieve this, training needs will be assessed and a course designed to appropriately address these training needs. It is anticipated that among other subjects, this course could cover the biology of *Striga* and methods of combating it. The objective of this course will be to train the trainers who will in turn train other extension officers. At the end of the day, farmers will be trained, and will acquire the knowledge and skills required for effective *Striga* control. Wherever appropriate, training also could be provided to school teachers, particularly those in agricultural schools and rural areas where *Striga* is endemic.

## **5.4 Creation of partnership with extension agents for ownership**

Whenever possible, activities should be reviewed in collaboration with all stakeholders during a one-day event called "*Striga* Day." During this day, stakeholders will be informed of advances made in *Striga* control and information exchanges can occur to promote further planning and outreach. Indeed, more actors can take part in the dissemination of the proven technologies, particularly extension activities undertaken with NGOs. This in turn will lead to the exit strategy in the concerned locality.

## **5.5 Production of support material for advocacy on *Striga* research and control (create awareness)**

This activity has a two-fold objective. The first objective is to emphasize the need to extend *Striga* control options to and beyond the targeted communities using public media and the second objective is to document the achievements of the program and the approach used in the participating countries using audio-visual types of media (pictures, films etc.).

## **5.6 Workshop on scientific writing**

As stated above, one of the gaps that needs addressing for the visibility of project activities is the output in terms of scientific publications. It is therefore proposed that a course be designed to strengthen the capacity of participating scientists to explain their research and related results to their colleagues and also to development partners and business oriented

managers. At the end of the training, scientists are expected to cut their reports and scientific publication writing time in half. They will also shy away from postponing the translation of their data into scientific peer reviewable scientific publications. Incentives will also be provided for the scientists as an extra motivation for publishing their research findings.

#### **5.7 Symposium on Striga research and control**

In the past, interest and support to Striga control whether governmental, bilateral or multilateral has been scattered. The same is true when the scientific community gets together to examine Striga issues. The driving force behind the new symposium is the shared mission of the organizations to advance progress against parasitic weeds. By combining their respective strengths, the Symposium on parasitic weeds will encompass the full spectrum of parasitic weed research on all crops and facilitate the rapid transition of new knowledge into improved integrated packages for parasitic weed control for the benefit of farmers and producers. This symposium will be composed of technical sessions, plenaries and poster presentations. A synopsis on the state of the knowledge on Striga control is among the deliverables expected out of this symposium.

#### **5.8 Impact assessment of project activities to date**

Following this pilot activity undertaken in several countries, a major step in moving into an all Africa-wide implementation calls for an assessment of impact. The first step consists of creating a group whose intent is to constitute a “peer review” group that could be called upon at the beginning and at the end of the assessment process to comment on the approaches and methodologies being used, the issues identified during the course of implementation, and offer comments and criticism with a view to improving the process and drawing on experiences and best practices that were of relevance to the project. To maximize participation and reduce cost, this group should build on existing (formal or informal) assessment systems (such as monitoring) rather than creating an altogether new one. It will also aim to include all stakeholders (farmers representatives, development partners, etc..).

### **6. Indicators for measuring progress**

#### **6.1 Training of scientists on scientific writing**

Number of scientists trained

Number of scientific publications submitted for review

Number of scientific publications published

#### **6.2 Symposium on Striga research and control**

Number of participants to the symposium

Proceedings of the symposium

### **6.3 Impact assessment of project activities to date**

Report of impact assessment

### **6.4 Training of farmers in seed production**

The following non-exhaustive list of indicators will be used at the country level for measuring annual progress:

Number of farmers and extension agents trained

Number of community-based seed multiplication plots

Number of individual seed multiplication plots

Number of farmers having access to STR seed

Timely availability of STR seed

### **6.5 Creation of partnership**

Number of partnerships established through MOU

Number of stakeholders attending workshops

### **6.6 Organization of Field Days (Facilitate farmer-to-farmer extension and campaigns to share/demonstrate new knowledge, skills and promising practices against parasitic weeds.)**

Number of Field Days organized

Number of farmers participating in Field Days

### **6.7 Production of support material for advocacy on *Striga* research and control**

Number of documents produced

Number of public awareness campaigns conducted

Technical analysis and synthesis of project methodologies, data, and results compiled as annual project reports

Public awareness brochures and bulletins on expected and realized project outputs, benefits, and impacts.

Training support materials such as trainers' handbooks and instruction manuals

Extension and farmer training materials such as posters, charts, pocket books, fact sheet training handouts, extension/field guides.

### **6.8 On-farm demonstration trials**

Number of farmers used for on-farm demonstration trials

Number of farmers having access to the on-farm trial

Number of villages reached

Percentage of infested areas reached in each country

Effectiveness of the *Striga* control package compared to the baseline

## **6.9 Verification of technology packages for *Striga* control**

Number of technology packages tested

Number of farmers participating in on-farm verification trials

Number of farmers giving their perception on the technological packages

## **6.10 Capacity building of NARES**

Course on *Striga* management developed

Number of trainers trained

Number of farmers trained

Number of schools participating in training program

## **7. Project coordination and monitoring**

### **7.1 Coordination**

As in the past, the responsibility for overall coordination of the project shall be vested in AU/SAFGRAD. AU/SAFGRAD shall oversee the implementation of project activities at the country level with the assistance of resource people.

### **7.2 Monitoring**

Taking into account the above indicators, annual field monitoring and project evaluation can be done to assess progress achieved. Monitoring and timing of monitoring activities must be such that trials are at stages when their effectiveness can be objectively evaluated.

Monitoring tours must be strengthened because they hold the key to improving the quality of *Striga* control activities, and they also provide invaluable opportunities for interaction with farmers.

Project monitoring will be conducted each year when field activities are being undertaken. A monitoring team composed of participating scientists, AU/SAFGRAD, the International Agricultural Research Institute of Kyungpook National University, and pertinent and appropriate resource personnel. The team will produce a report that will be available for participating countries. To the extent possible, the scientific monitoring tour will assess the implementation of the project and interact with farmers to ascertain their perceptions of the project in order to make recommendations to address any eventual shortcomings of the project.

### **7.3 Reporting**

National Agricultural Research System (NARS) participating scientists will be in charge of developing the respective country reports which will feed information into the project's various progress reports and annual report. It is anticipated that the proposed training in scientific writing will facilitate the timely production and submission of the various reports.

### **8. Budget**

A detailed budget is indicated in annexes 1 and 2. For the year 2009, a total of USD \$470,000 will be required for the implementation of the activities outlined herein. The African Union is contributing to the sum of US \$90,000. A financial assistance of US \$380,000 is requested from the Korean International Cooperation Agency (KOICA). It is imperative that this funding be secured for 2009 in order to sustain the momentum gained in the last decade of the project's activities.

## ANNEX 1

**STRIGA CONTROL PROJECT  
KOREAN GOVERNMENT &  
SAFGRAD CONTRIBUTIONS**

**STATEMENT OF EXPENSES  
FOR YEAR 2007/2008**

ACTIVITY	KOREA A US \$	SAFGRAD B US \$	TOTAL C=A+B US \$	% D
<b>I. MANAGEMENT &amp; COORDINATION</b>	<b>26 542</b>	<b>34 500</b>	<b>61 042</b>	<b>22,58</b>
1.1 Coordination	11 734	1 000	12 734	4,71
1.2 Communications	357	2 000	2 357	0,87
1.3 Miscellaneous Services	451	1 500	1 951	0,72
1.4 Management Cost AU/SAFGRAD	14 000	30 000	44 000	16,28
<b>II. MANAGEMENT COST KUNGPOOK UNIVERSITY</b>	<b>30 000</b>		<b>30 000</b>	<b>11,10</b>
<b>III. SUPPORT TO SCIENTIFIC ACTIVITIES &amp; ON FARM TRIALS</b>	<b>143 458</b>	<b>35 806</b>	<b>179 264</b>	<b>66,32</b>
3.1 Monitoring Tour / Field supervision	13 901	6 000	19 901	7,36
3.2 Planning Workshop		28 306	28 306	10,47
3.3 Publications & Information dissemination	1 226	1 500	2 726	1,01
3.4 On Farm Trials	128 331		128 331	47,48
<b>TOTAL</b>	<b>200 000</b>	<b>70 306</b>	<b>270 306</b>	<b>100</b>

## ANNEX 2

**BUDGET PROPOSAL  
YEAR 2009**

ACTIVITY	KOREAN GOVERN. A US \$	AU SAFGRAD B US \$	TOTAL BUDGET C=A+B US \$	% D
<b>I. MANAGEMENT &amp; COORDINATION</b>	<b>65 000</b>	<b>34 500</b>	<b>99 500</b>	<b>21,17</b>
1.1 Coordination	15 000		15 000	3,19
1.2 Communications	500	2 000	2 500	0,53
1.3 Miscellaneous Services	500	2 500	3 000	0,64
1.4 Management Cost AU/SAFGRAD	14 000	30 000	44 000	9,36
1.5 Impact Assessment	35 000		35 000	7,45
<b>II. MANAGEMENT COST KUNGPOOK UNIVERSITY</b>	<b>30 000</b>		<b>30 000</b>	<b>6,38</b>
<b>III. SUPPORT TO SCIENTIFIC ACTIVITIES &amp; ON FARM TRIALS</b>	<b>140 000</b>	<b>35 500</b>	<b>175 500</b>	<b>37,34</b>
3.1 Monitoring Tour / Field supervision	30 000	13 000	43 000	9,15
3.2 Publications & Information dissemination	5 000	2 500	7 500	1,60
3.3 On Farm Trials & Capacity Building	100 000	20 000	120 000	25,53
3.4 Inputs - Seeds, Fertilizer...	5 000		5 000	1,06
<b>IV. WORKSHOP</b>	<b>145 000</b>	<b>20 000</b>	<b>165 000</b>	<b>35,11</b>
4.1 Annual Review and Planning Meeting	40 000	15 000	55 000	11,70
4.2 Scientific Writing Workshop	15 000	5 000	20 000	4,26
4.3 Symposium on Parasitic Weed Control	90 000		90 000	19,15
<b>TOTAL</b>	<b>380 000</b>	<b>90 000</b>	<b>470 000</b>	<b>100</b>

DETAILS FOR 2009 BUDGET PROPOSAL

ANNEX 3

US \$

<b>1. Coordination</b>			<b>15 002</b>
- Honorarium for 2 Coordinators/Consultants	5 000 x 2	10 000	
- Mission of 9 days to Ouaga for technical report preparation			
Ticket	800 x 2	1 600	
Per diem	189 x 9 x 2	3 402	
<b>2. Impact Assessment</b>			<b>35 000</b>
The assessment will be conducted by a team of 4 resource persons 2 teams of 2 for 15 days visit each			
Ticket	2 500 x 4	10 000	
Per diem	200 x 15 x 4	12 000	
Honorarium	200 x 15 x 4	12 000	
Miscellaneous		1 000	
<b>3. Monitoring Tour &amp; Field Supervision</b>			<b>30 000</b>
- 18 participants : 12 scientists & 6 farmers 6 teams of 3 for 7 days visit			
Ticket	800 x 18	14 400	
Per diem	120 x 18 x 7	15 120	
Miscellaneous		480	
<b>4. On Farm Trials &amp; Capacity Building</b>			<b>100 000</b>
- 10 countries at 10 000 each	10 000 x 10	100 000	
<b>5. Annual review and planning meeting</b>			<b>40 000</b>
- 24 scientists from participating countries			
Ticket	800 x 24	19 200	
Per diem	120 x 24 x 7	20 160	
Miscellaneous		640	

<b>6. Scientific writing workshop</b>			<b>15 000</b>
The workshop will be conducted during the annual review planning meeting by three facilitators			
Ticket for 2 facilitators	1200 x 3	3 600	
Per diem	200 x 3 x 7	4 200	
Honorarium for 15 days	200 x 15 x 3	6 000	
Miscellaneous		1 200	
<b>7. Symposium on parasitic weed control</b>			<b>90 030</b>
- 60 participants			
Ticket	800 x 60	48 000	
Per diem	120 x 60 x 5	36 000	
Rental of conference hall	450 x 3	1 350	
Coffee/tea break	4 x 2 x 60 x 3	1 440	
Interpreters	480 x 3 x 2	2 880	
Supplies & miscellaneous	6 x 60	360	

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