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Research Application Summary

# Participatory management of *Striga* in cereal-based cropping systems in eastern Uganda

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## Abstract

*Striga hermonthica* is a parasitic weed that infects cereal crops often causing 30-100% crop losses on farmers' fields. Past research has developed several effective *Striga* control strategies, most of which have not been adopted by farmers, partly because each technology was developed without considering farmers' biophysical and socio-economic conditions, which often affect technology adoption. Agricultural development, however, can be accelerated through a process in which farmers participate in the testing and adoption process of new technologies. The overall goal of this project is to identify, validate and promote appropriate and sustainable *Striga* control technological packages that are adaptable to local farming conditions using participatory approaches. This project hypothesizes that active farmer involvement in the identification and on-farm evaluation of technologies will lead to high adoption rates of promising technologies and increase cereal crop production and thus improve farmer livelihoods. A baseline socioeconomic study is currently being conducted to assess farmers' perceptions on *Striga* and its management using structured interviews and focus group discussions. Subsequently, on-farm trials will be conducted to evaluate the effectiveness and profitability of various promising management strategies on *Striga* control and crop productivity. A participatory rapid appraisal (PRA) has been done to establish the prevalence of Striga problem in Iganga in eastern Uganda, a major maize growing area. It was established that 12 out of 19 sub-countries were heavily affected by *Striga*. Maize was chosen to represent cereal crops in this project because its production is highly affected by Striga and it is an important cash/food crop with a high national priority. As part of this project two M.Sc. students are being trained; one student is handling socioeconomic aspects

while the second student handles on-farm technology evaluation aspects of the project.

Key words: Cereal-based cropping systems, eastern Uganda, participatory management, *Striga hermonthica*

**Résumé**

*Striga hermonthica* est une herbe parasite qui infecte les cultures de céréales entraînant souvent des pertes de récoltes de 30-100% dans les champs des agriculteurs. Des recherches antérieures ont mis au point plusieurs stratégies efficaces de lutte contre la *Striga*, dont la plupart n'ont pas été adoptées par les agriculteurs, en partie parce que chaque technologie a été développée sans tenir compte des conditions biophysiques et socio-économiques des agriculteurs, qui affectent souvent l'adoption de technologies. Le développement agricole, cependant, peut être accéléré grâce à un processus dans lequel les agriculteurs participent au processus d'essai et d'adoption des nouvelles technologies. L'objectif global de ce projet est d'identifier, de valider et de promouvoir des ensembles technologiques durables et appropriés de lutte contre la *Striga* qui sont adaptables aux conditions agricoles locales utilisant des approches participatives. Ce projet fait l'hypothèse que la participation active des agriculteurs dans l'identification et l'évaluation de technologies à la ferme conduira à des taux élevés d'adoption de technologies prometteuses et augmentera la production céréalière et ainsi améliorera les moyens de subsistance des agriculteurs. Une étude socio-économique de base est actuellement menée pour évaluer les perceptions des agriculteurs sur la *Striga* et de sa gestion, en utilisant des entrevues structurées et des discussions en groupe. Par la suite, des essais à la ferme seront réalisés pour évaluer l'efficacité et la rentabilité des diverses stratégies de gestion prometteuses sur la lutte contre la *Striga* et sur la productivité des cultures. Une évaluation participative rapide (EPR) a été faite pour établir la prévalence du problème de *Striga* à Iganga dans l'Est de l'Ouganda, une région importante de culture du maïs. Il a été établi que 12 sur 19 sous-districts ont été durement touchés par la *Striga*. Le maïs a été choisi pour représenter les cultures de céréales dans ce projet parce que sa production est fortement touchée par la *Striga* et c'est une importante culture commerciale/vivrière avec une grande priorité nationale. Dans le cadre de ce projet, deux étudiants de maitrise sont formés : l'un s'occupe des aspects socio-économiques tandis que l'autre

s'occupe des aspects d'évaluation de la technologie agricole du projet.

Mots clés: Base de céréales systèmes de culture, est de l'Ouganda, la gestion participative, *Striga hermonthica*

## Background

The parasitic weed, *Striga hermonthica*, infects cereal crops often causing 30-100% crop losses on farmers' fields, *Striga* spp. threaten the lives of over 100 million people in Africa and infest 40% of arable land in the Savannah region causing an annual loss of US$ 7 to 13 million. It is estimated that another 40% of arable land may become infested in the next ten years. In Uganda, it is estimated that 62,000 ha of farmland is infested with *Striga* (Baguma and Bigirwa, 1996; AATF, 2006) causing an economic loss of US $ 8 million a year. Worldwide, Striga causes yield losses that range between 10% and 100% (Kim, 1991).

A national *Striga* survey undertaken in Uganda showed that *Striga* infestation was most severe in the eastern parts of the country (Ebiyau *et al*., 1995) and was spreading to other parts of northern Uganda, virtually affecting all the cereals grown (maize, sorghum, millets, and upland rice). This deteriorating situation calls for concerted efforts to manage this problematic weed.

The frequency and severity of attack by *Striga* is greater in soils that are sandy, low in fertility, and with low to moderate water holding capacity (Weber *et al.*, 1995). Although a variety of effective control technologies have been developed for *Striga* control in SSA, they have not been widely adopted by farmers probably because of the miss-match between technologies, farmers' socio-economic conditions, farming systems set-up, and some technologies may not have been readily available to farmers (Oswald 2005; Woomer *et al*., 2005; Ejeta 2007). Available *Striga* control options include use of herbicides, *Striga*-tolerant crop varieties, and legume-induced suicidal germination of *Striga* seeds. *Striga* control in cereal farming systems is more likely to be achieved by combining a variety of individual component technologies into integrated programs in order to provide more flexible and sustainable control over a wide range of biophysical and socio-economic environments (Chokoye *et al*., 2006). Thus, through a participatory action research and extension approach, involving farmers, scientists and extension personnel at all stages, *Striga* control interventions can be better targeted to respond to the highly diversified environment and to

select the options and combinations best suited to local conditions and needs (Schulz *et al*., 2003; Emechebe *et al*., 2004; Chikoye *et al*., 2006).

**Literature Summary**

The parasitic weed plant of most importance in Africa is the genus *Striga* (of the family Scrophulariaceae). Members of this genus are obligate annual hemiparasites; they are chlorophyllous, but require a host to complete their life cycle (Musselman, 1987). Although 30 or more species of *Striga* have been described, only 5 are presently of economic importance in Africa (Ramaiah, *et al*., 1983). These are, in approximate order of economical importance in Africa, *Striga hermonthica* (Del.) Benth., *Striga asiatica* (L.) Kuntze, *Striga gesnerioides* (Willd.) Vatke, *Striga aspera* (Willd.) Benth., and *Striga forbesii* Benth. All except *S. gesnerioides* are parasites of Africa's cereal crops sorghum, millet, maize, and rice. *S. gesnerioides* is a parasite on cowpea and other wild legumes. It is generally believed that with abundant resource commitment, parasitic weeds can be managed in agriculture. However, the sufficiency of currently available technologies for effective *Striga* management is debatable. Strategies may be directed to *Striga* control, containment, or eradication. New technologies are now proven to control and reduce *Striga*, including imazapyr resistant maize, abortive germination and legume suppression. When these opportunities are combined with traditional practices and rigorous field sanitation, the parasite may be overcome in affected fields. Generally, however, there have been limited studies on the modes of spread and dispersal of *Striga* seeds. Farm practices as well as human and animal movements across geographic areas have been implicated as factors responsible for spreading parasitic weed seeds. Crop seeds are a major vehicle for *Striga* seed dispersal, with 20-40% of seed lots in the market contaminated by foreign *Striga* seeds.

**Study Description**

The study sites have been set up in Iganga District in eastern Uganda because the area is heavily infested by *Striga* (as validated by the findings from PRA study), it is also a major maize growing region in Uganda. A participatory research and extension approach that actively involves farmers and other stakeholders in technology development and dissemination is being employed in the implementation of this project. The project employs participatory approach tools in order to encourage farmers to test improved agricultural technologies. The process of engaging farmers consists of community analysis, problem diagnosis, action planning, experimentation, monitoring and

evaluation. The community analysis approach will allow the assessment of livelihoods strategies, natural resource problems, major crops, household resources and local institutions. The exercise will also facilitate the identification of priority constraints and targeting interventions to different resource groups in the community. After carrying out the detailed socioeconomic studies, on-farm trials will be conducted to evaluate the effectiveness and profitability of various promising management strategies on *Striga* control and crop productivity. Farms and fields will be selected based upon farmers' past experiences with *Striga*, i.e., test fields are to be selected based upon *Striga* infestations observed on farmers' fields during the previous season. Various *Striga* management treatments are to be selected that reflect alternative recommended *Striga* management technologies. Ten on-farm trails examining the selected management options will be installed in Iganga District, each farm serving as a replicate. Information will be collected on the *Striga* seed bank load, the incidence and severity of *Striga* infestation at different stages of crop growth, input costs, yields and existing market process of the chosen commodities. Economic returns will be calculated using a cost and return spreadsheet utility depending on the various inputs (labor, seed, fertilizers).

## Preliminary Findings

Basing on the results of the participatory rural appraisal carried out, 12 out of 19 sub counties in Iganga District were heavily infested by *Striga* weed. Striga attacked cereals including maize, sorghum, rice and that it also attacked sugar cane but a few respondents also indicated legumes like beans and ground nuts. Farmers depended on cultural practices like closed season and planting non-host plants reported because they could not afford the high costs of buying fertilizers.

## Research Application

The outputs of this research are expected to benefit small scale farmers through enhanced cereal productivity and increased incomes and improved livelihoods. Furthermore, capacity to do research will be enhanced through the training of two students at MSc. level. It is anticipated that appropriate striga management strategies suitable for local farming conditions will be developed and adopted by farmers.

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