KARI/CIMMYT/CARE SMALL GRANTS PROJECT

Of

CGIAR Program on Participatory Research and Gender Analysis for Technology Development and Institutional Innovation

Project title: Development and diffusion of integrated *Striga* control practices for small-scale farmers in western Kenya.

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Collaborating institutions:

KARI
CIMMYT
CARE
MoARD
Local institutions and organizations

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Abstract

The parasitic weed *Striga hermonthica* has become one of the most significant constraints to cereal production in western Kenya. In 1995 a collaborative project among CIMMYT, the University of Hohenheim (UH) and the Kenyan Agricultural Research Institute (KARI) was initiated in order to develop agronomic *Striga* control technologies for Kenyan farmers. In collaboration with the NGO CARE-Kenya the most promising methods were tested on farmers' fields. Crop performance, trial evaluation and feedback from farmers were key factors for the modification and selection of best techniques. Furthermore, based on this on-farm research training materials were developed to train extension agents and farmers.

The objectives of the Small Grant Project was to evaluate if the *Striga* control technologies and the participatory technology dissemination strategies developed during the previous project phase (1995-1998) would have an impact on adoption and knowledge creation among subsistence farmers. For this purpose CARE with its participatory approach to technology dissemination and the MoARD with its conventional extension approach backed-up by the *Striga* working group started to train farmers on *Striga* control in 1999. Additionally, the project wanted to test whether the CARE or MoARD approach would be more efficient and result in higher adoption rates.

A baseline study was conducted in June 1999 using questionnaires and farmers group discussions (using appropriate PRA tools) to document farmers perception of the *Striga* problem, current control practices and other factors affecting their crops productivity and to give a socio-economic background of farming and non-farming activities interfering and/or competing with good farm management. After the baseline survey, *Striga* control options were disseminated to farmers using two different dissemination methods by CARE and government extension services. The dissemination methods involved training and demonstrations on *Striga* biology and control options.

CARE used a community entry process to approach farmers' groups. They trained farmers as trainers for other farmers and formed local committees to sustain this learning and dissemination process in time. Farmers groups elected adaptive research farmers who carried out the on-farm research and reported to their group and the local management committees.
The MoARD used its routine approach in training farmers, i.e. contact farmers set-up on-farm trials and demonstrations under their guidance, who called farmers' meetings during the season and trained them on-site. Additionally the front line staff used picture series on *Striga* control developed and provided by the *Striga* Working to improve training efficiency and adoption among farmers.

During the 3-year period, several thousand farmers and trainers were trained on *Striga* biology and control options. CARE trained 204 Group Resource Persons who trained fellow farmers using picture series compared to 6 contact farmers in the MoARD approach. The use of picture series coupled with demonstration plots facilitated training and increased adoption of accepted technologies with women preferring labor saving

with higher income options. The CARE approach built the capacity of the community to manage their own affairs thus sustain themselves compared to MoARD where such capacity was not built but remained with the extension staff. In the CARE approach, women were able to take leadership positions and thus influence decisions within the groups. The CARE approach with both research and capacity-building components was therefore effective in reaching farmers and allowed participation of both men and women in *Striga* technology generation and dissemination.

1. INTRODUCTION

Problem Statement

Striga (*Striga spp.*) or witchweed is increasing as a problem to small-scale subsistence farmers in sub-Saharan Africa and represents today the largest single biological barrier to food production in that region (Sauerborn, 1991). Infestation can become so severe that farmers abandon their fields. In a large zone in Western Kenya farmers identified *Striga* as their most important constraint to maize production (Hassan et al., 1995). There are various reasons why *Striga* has built up to such damaging levels:

- the complex biology of *Striga* and its interactions with the host-crop and the environment;
- farmers lack awareness and knowledge of *Striga* biology and control or preventive methods;
- increasing population pressure which results in shorter fallow periods of farmers´ fields to restore soil fertility;
- continuous mono-cropping of cereals such as maize or sorghum without balancing losses in soil organic matter and nutrients.

Striga is a parasitic plant, which attaches to the roots of specific host plants (such as maize, sorghum, finger millet, rice) extracting water, nutrients and carbohydrates. Already during their underground development the growing *Striga* plants exert a potent phytotoxic effect on their host (Ransom et al., 1996), so that even before their emergence considerable damage is inflicted on the crop. The parasitized plant often suffers from moisture stress. Yield reductions depend on the level of infection and other stresses affecting the crop simultaneously. *Striga* is most prolific and devastating on a crop where soil fertility is low.
Without a basic knowledge of the life cycle of *Striga* and its mode of infection and multiplication, control methods cannot be fully appreciated by farmers. Therefore adoption of *Striga* control methods is low, because they are either too expensive, labor intensive or not adapted to the local agro-ecological and socio-economic conditions (Oswald et al., 1999).

Between 1995 and 1998 adapted *Striga* control technologies were developed on-station and in farmer managed on-farm trials in Siaya district, Nyanza Province. Therefore farmers were trained in adaptive on-farm research by CARE. The scientists of the *Striga* Working Group (CIMMYT and KARI) acted as resource persons and principal evaluators of the research activities. As a result of these activities a basket of choices of *Striga* control methods for small-scale subsistence farmers in western Kenya was

developed. Also a training concept and training materials were developed to disseminate *Striga* control methods.
In 1999 CARE-Kenya started a new project to improve the livelihood of farming communities in Homabay, Suba and Ranchuonyo districts of Nyanza Province. Hence, the *Striga* working group in cooperation with CARE implemented *Striga* research and technology dissemination in this region and the Small Grant Project became part of this approach. This project phase envisaged:-

- to train farmers' groups using training concepts and materials, which were developed with farmers in Siaya district;
- to measure the adoption rate and change in farming practices in the area;
- to involve farmers in adaptive on-farm research to enable them to conduct their own trials;
- to train farmers to be trainers themselves;
- to further develop and modify training methods to create a greater impact and better acceptance of novel farming concepts;
- to improve and foster the co-operation among stakeholders in the area.

The Setting
Kenya is administratively sub-divided into eight provinces, which are further divided into districts. The districts are made up of divisions, which are made up of locations. Locations are subdivided into sub-locations, the smallest administrative unit. Each sub-location has several villages.
The project area covers Suba, Homabay and Rachuonyo districts in Nyanza province of the western Kenya Region. These three districts bordering Lake Victoria are characterised with a diversity of climatic and edaphic conditions. Parts of the districts are classified as high potential zones although the larger portions neighbouring the lake are low potential zones. Average farm size is 1-3 ha^{-1} with yield of 500 to 1,000 kg ha^{-1}. The ethnic community is predominantly Luo, the third largest tribe in Kenya who speak the Luo language. Their culture is mainly subsistence mixed farming (grow crops for subsistence and keep livestock extensively). However, being near Lake Victoria, they also derive their livelihood from fishing. Most of the household property including land is owned by men. Women only own their houses thus have little control of most resources in the household. There is a clear division of labour and gender roles within a household. Men mostly engage in off farm activities such as livestock trade, fishing and politics. The only major farming activity men get involved in is land preparation and any farming activity which generate a lot of income to the household such as horticulture, cotton, dairy livestock etc. Hence, after ploughing, all other farm work is left to the women who have to supply the family with food.
Over 70% of the community belongs to social groups or associations with women forming the bulk of the groups. Most of the groups have links with their church denominations. Local institutions within the project area include schools, churches, NGOs, groups and committees.
The districts experience high infant mortality, poor nutrition, low agricultural productivity and low economic security among other household livelihood related problems. Some of the reasons for low agricultural production have been attributed to *Striga* locally known as *Kayongo*, which is widespread in western Kenya.

2. METHODOLOGY

Research design

The objectives of this project were to evaluate if the *Striga* control technologies and the participatory technology dissemination strategies developed during the previous project phase (1995-1998) would have an impact on adoption and knowledge creation among subsistence farmers. For this purpose CARE with its participatory approach to technology dissemination and the MoARD with its conventional extension approach backed-up by the *Striga* working group started in 1999 to train farmers on *Striga* control. Additionally, the project wanted to test whether the CARE or MoARD approach would be more efficient and result in higher adoption rates.

To this end a baseline study provided information of farm conditions prior to the commencement of interventions by the project. It was conducted using questionnaires, farm profiles and farmers group discussions (appropriate PRA tools):-

- to document farmers' perception of the *Striga* problem, current control practices and other factors affecting farm productivity;
- to give a socio-economic background of farming and non-farming activities interfering and/or competing with good farm management.

Results of this baseline showed that:

- *Striga* infestation was increasing in 68% of the farms;
- 50% of the farmers had *Striga* not longer than 5 years in their fields;
- 50% of the farmers had very limited knowledge on *Striga* control;
- 40% of the farmers had no training on *Striga* at all, while 30% had received some training by extension agents;

The *Striga* working group provided training on *Striga* biology and control and prevention methods to the extension staff of CARE and the MoARD. Additionally the group helped in planning and implementing the on-farm experiments and demonstrations, gave training materials (picture series) to both organizations and provided scientific back up in case the extension agents were confronted with specific problems.

The project worked with CARE-Kenya and the MoARD in distinct administration divisions of the same districts, i.e. if CARE had activities in one division we would choose an adjacent division for the technology dissemination activities of the MoARD in order to compare the different approaches of both organizations.

MoARD Approach

The MoARD used its routine approach in training farmers, i.e. contact farmers did set-up on-farm trials and demonstrations under guidance of the Front Line Staff (FLS), who called farmers' meetings during the season and trained them on-site. Additionally the FLS used a picture series on *Striga* control developed and provided by the *Striga* Working to improve training efficiency and adoption among farmers.
Generally the training sessions conducted by the extension staff could be visited by everybody without restrictions. The training was advertised by the MoARD among farmers in the location / division.

Table 1. Participating groups/persons in the MoARD approach and criteria for their selection

Selected participants	Criteria	Selection methods
MoARD	Expertise in farmers training; covers all farming communities; using a different dissemination approach (T&V) than CARE	Purposive selection
Contact-Farmers	Have interacted with the extension staff before; good accessibility; can activate other farmers; innovative;	Selected by the extension staff
Farmers	Iinterest in *Striga* biology and control	None

CARE Approach

CARE used a Community Entry Process to approach decision-makers and management committees within the communities. Their involvement was desirable as they are important opinion leaders and could greatly influence the sustainability of the project. In village meetings farmers' groups were asked to participate in project activities. These groups consisted of women and mixed groups.

Table 2. Participating groups/persons in the CARE approach and criteria for their selection

Selected participants	criteria	selection methods
CARE	high degree of expertise in participatory extension and adaptive research methods; motivated staff and resource rich organization; highly interested in *Striga* research and control	purposive selection
Locational Management Committees (LMC)	oversees the activities of farmer groups in the location; is responsible to call meetings and advise the community on improved farming methods etc.	chosen by the community; members are local opinion leaders and members of the administration
Farmers groups	must be existing and functioning farmers' groups; not more than 20 to 30 members;	CARE and self selection
Adaptive Research Farmers (ARF)	adequate land for research and food production; easily accessible and accepted by other farmers; ability and willingness to conduct research; literacy; innovative	selected from among the GRP by the LMC with CARE as facilitator
Group Resource Persons (GRP)	belong to a farmers group; be willing to get trained and train other farmers; innovative; good social standing in the community	selected by the farmers' group with CARE as facilitator
Opinion Leaders	high social standing in the community; special education (teacher), tasks (village chief) or achievements (best farmer etc.)	selected by their social standing in the community

The 108 ARFs were chosen by the 450 farmer groups actively involved in project activities to conduct adaptive research on behalf of a cluster of groups. Hence each ARF represented a cluster of 2 to 5 groups. Approximately 40 % of the selected ARFs were women farmers. No quota was established but women were encouraged to be members of LMCs, ARFs and GRPs.

The CARE-Kenya Agro-forestry Extension Project developed and adopted a community based extension methodology known as 'Training Resource Persons in Agro-forestry for Community Extension (TRACE). TRACE was implemented through community-based institutions such as organized groups, primary schools and locational agro-forestry committees. It had three major components namely extension, capacity building and adaptive research.
Key steps in the implementation of TRACE were:

- participatory needs assessment – defining research and training topics;
- formation of LMC which in turn selects ARF among the GRP selected by the farmers' groups;
- selection and training of farmers groups who in turn select GRP;
- training of GRP who were supposed to train other group members and farmers;
- data collection analysis and extension message development;
- monitoring of adoption and impact evaluation.

The GRPs were trained by CARE in:-

- on-farm research (set-up of on-farm trials and demonstrations);
- *Striga* control methods and innovative farm management practices;
- documentation and evaluation.

Farmers were trained by GRPs. The feedback of these activities was used to modify training and on-farm trials and demonstrations accordingly. Training materials and methods were developed on a participatory approach with farmers, extension workers and scientists. The material was tested with farmers' groups (men and women groups) involved in *Striga* research and others not involved in the project. After 2 years farmers' groups were encouraged to suggest and conduct their own trials, technology evaluation and training sessions. Resource persons still visited farmers and gave guidance if necessary.

Methodological innovation

- farmers' participation in extension message development and dissemination;
- diffusion of *Striga* control methods using a participatory approach;
- GRPs were monitored during training session by CARE staff;
- farmers' feed-back was used to modify and/or change training and research topics;
- phase out strategy well defined and implemented through LMCs.
- community mobilization and activity co-ordination by the committees.

The differences between the CARE and the MoARD approach were:

- how farmers and farmers groups were selected;
- how these farmers were integrated in the village community (social standing and commitment);
- how the on-farm demonstrations were evaluated, analysed, technology sharing process among farmers.
- how CARE's use of GRPs for technology sharing among farmers was expected to sustain the community based extension process.
- how farmers were mobilized for training during the field days by the LMCs.
- how the trainers focus on adoption and sustainability of the control technologies.

Types of participation

The project used different types of participation of its stakeholders depending on the objectives of the specific activities it wished to accomplish as shown below:

Table 3. Types of participation used in the Small Grant Project

Types of participation	**used for**
Conventional participation	• Baseline study *Striga* technology selection for testing/demonstration • interviews with farmers and extension staff
Consultative & collaborative participation	• Organizing of farmers groups (gender desegregated) • Training of farmers groups - on-farm research - new technologies - documentation and monitoring evaluation methods - priority setting and preference selection - training of farmers • Development of training material and training methods (gender disaggregated)
Collaborative participation & partnership	• capacity building with institutions (KARI; NGOs; Ministry of Agriculture etc.) • capacity building on village level (village committees, administration, etc.)

3. Expected Outcomes.

Table 4a. Research results (process impacts)

Impact category	Expected Outcomes
Stronger organisation/better co-ordination	Increased state of knowledge of the resource persons about control options More trained trainers (extension workers and farmers) Better linkages among institutions Willingness to co-operate among stakeholders Better exchange of information and resources
Healthier local innovation systems	Process of participatory development used in more areas Better information flow among farmers Innovative dissemination models developed Sustainable project goals after PRGA activities have ceased

Table 4b. Development Impacts

Impact category	Expected outcomes
Improved knowledge & skills enhancement	Increased level of awareness created; Farmers knowledge of *Striga* biology and control methods enhanced; Higher adoption rate of new technologies; Independent technology evaluation and diffusion to untrained farmers;
Improved farm productivity & better/more technology options	Higher yields Improved soil fertility Diversity of crops Declining *Striga* infestation Cereal crops are less affected No spread to non-infested areas Improved overall farm management

4. Research Process

Point in time	Activity or Significant Event	Outcome/Impact/Change
Jan-June 1999	A baseline study was conducted in the three districts project areas.	Farmers' perception of the *Striga* problem, current control practices and other factors affecting farm productivity; socio-economic background of farming and non-farming activities interfering and/or competing with farm management.
	In several locations on-farm demonstrations were established during the long rainy season period 1999. The demonstrations were jointly set-up by CARE, the MoARD and a CIMMYT/KARI technician.	Farmers tested control methods adapted to their cropping system; researchers and extension agents received their feed-back in order to modify or confirm specific control methods.
	Workshops/training for the staff of the MoARD, CARE on *Striga* biology, control and training methods. In addition four special training sessions were conducted on the use of a picture series for selected staff of the MoARD;	CARE and MoARD field staff understanding of *Striga* biology and control options enhanced; both organisations were now able to train farmers (MoARD) and GRPs (CARE) using picture series;
	Several training sessions conducted for farmers by extension officers (MoARD) under the supervision of a CIMMYT/KARI technician. Since no elaborate community entry process was necessary in MoARD areas, farmer training started earlier than in CARE areas.	MoARD trained a total of 181 farmers, 83 men and 71 women. The *Striga* training courses were well received among farmers, and had to be repeated in some areas because of high demand.
July-Dec. 1999	A guide on *Striga* control and biology was published and distributed to FLS of the MoARD in Nyanza and among ARWs and extension workers of CARE.	A very high level of awareness to address the *Striga* problem was reached in a large area of western Kenya through the guide.
	Further workshop/training for FLS of the MoARD on *Striga* biology, control and training methods. Workshops also conducted by CARE for ARFs.	Improved knowledge for stakeholder trainers (CARE and MoARD staff) and farmers
	60 training sessions of farmers by MoARD under the supervision of a CIMMYT/KARI technician were conducted;	1,200 farmers were trained with the proportion of women being 45% of those trained.
	Selection process of LMCs and ARFs completed in the CARE project area, hence completing their preparatory stage (community entry process) and beginning with the fieldwork.	The LMCs were responsible for the selection of farmers' groups and ARFs, i.e. they facilitated and participated in the selection process.
	Striga on-farm trials were evaluated and analysed and new trials planted (for the following season).	Farmers become more interested in control techniques, as farm productivity is improved,

July 1999 – Dec. 2001	The FLS of MoARD continued to train farmers and implemented and supervised on-farm demonstrations; they also conduct field days with contact farmers and train them in the use of the picture series;	Several thousand farmers were trained on *Striga*, field days were conducted and on-farm demonstrations implemented
September 1999	ARFs were trained by CARE in various workshops on the following topics: -adaptive research concepts; -trial layout and establishment; -trial management, trial monitoring and participatory evaluation techniques; -data collection, farm records, data presentation. In each location a participatory research needs assessment (PRNA) was conducted with farmers' groups. *Striga* on-farm trials demonstrations established in some selected ARF farms in the short rainy season 1999.	Trained ARFs lead group members in PRNA. Trained ARFs facilitate identification of researchable issues. Trained ARFs conduct adaptive research activities and present results to group members thus improved ARFs knowledge on experimentation. Research agenda identified and prioritised. Soil fertility improvement; *Striga* weed control; IPM; Cop variety screening.
Oct. 1999 – Dec. 2000	Extension staff of CARE trains GRPs in *Striga* biology, control and prevention	Framers' trainer trained
Nov. 1999 - Sept. 2001	GRPs start training group members using picture series. Extension personnel on the other hand continue training farmers directly	Most group members and farmers could understand *Striga* biology and were able to create awareness on the weed to non-participating farmers.
Jan. 2000- Dec. 2000	Field days and agricultural shows organized by LMCs who were also actively involved in organizing World Food Day celebrations in Lambwe and Riana CARE areas	LMCs now able to take charge of their members and events in their locations. During the shows, prizes were awarded which motivated farmers to increase productivity. ARFs and GRPs used these chances to conduct and train group members using demonstration/trial sites in ARFs farm. *Striga* campaign weeks organized by LMCs
March – April 2000	*Striga* on-farm trials in CARE and MoARD areas planted	More ARFs involved, number of contact farmers remains unchanged
July – August 2000	Harvest an evaluation of *Striga* trials	Farmer see first results, select certain techniques or principles and apply them on the rest of their farm,
July- Dec 2000	Adaptive research symposium for stakeholders conducted to present results of trials/demonstrations in CARE project area.	Stakeholders were able to share results and experiences. Intercrops: maize/soybean association were best intercrop for economic and nutritive values, high yield and most important ability to provide better ground cover to impede *Striga* development. Variety screening: Farmers evaluated and ranked varieties with preference to early maturing ones, which escape *Striga*. Research results used by ARFs and GRPs to develop extension messages to be used when they are training group members.

January-June 2001	GRPs and ARFs in the CARE areas are now all effectively trained.	They could then start training fellow group members using picture series during cluster training and field days and in the demonstration/trial plots during regular farm visits.
May 2001	More ARFs establish demonstration/trial sites.	Gender was well represented resulting in 11 women and 13 men ARFs in the CARE areas. Although men were interested in variety screening, women were more interested in *Striga* issues and soil fertility.
June 2001	Field days conducted to evaluate long rain season crop in the demonstration/trial ARF sites. Provincial administration sensitized on *Striga*	Farmers were trained during the field days. LMCs were able to successfully organize the field days. Active involvement;
August/September 2001	CARE started moving to new locations. Phase out strategy meetings conducted with LMCs to hand over complete management to them.	Outstanding LMC members and ARFs awarded certificates as a motivation. LMCs, ARFs and GRPs develop strategies to sustain already initiated activities (way forward drawn). Out of 26 LMCs, 8 still need assistance to manage their affairs. CARE/CIMMYT/KARI to continue to provide back up for 2 years to the weak LMCs. The other can operate on their own.
September 2001	Quantitative and qualitative survey conducted for end of project phase evaluation.	Quantitative survey data not analysed due to time and financial constrains. Qualitative data mainly used to write this report.

Monitoring and Evaluation

- Baseline study, which became the benchmark for monitoring and evaluation, was conducted in May 1999.
- Development of participatory monitoring and evaluation framework (intermediate indicators).
- All on-farm activities were evaluated and analyzed with the major stakeholders involved, i.e. the farmers or farmers groups, CARE or MoARD and CIMMYT and KARI. Members of the LMCs were involved in some of the activities as well as the local administration.
- The farmers' training sessions of the FLS of the MoARD or of CARE with the GRPs were monitored by the *Striga* working group. In monthly meetings the trainings were analyzed and improvements or changes suggested.
- Progress reports written and submitted.
- End of project evaluation strategy to monitor changes and impacts of the project compared to the baseline results of 1999 using questionnaires.

Impact Assessment methodology:

The project designed and conducted a baseline survey in May 1999. This was a first step towards establishing a basis for activity identification, monitoring and evaluation framework. 198 farming households were interviewed using a developed questionnaire. The trained enumerators randomly selected farmers in areas where CARE and MoARD were to work (including non-project areas) in order to provide a ground for comparison.

Using the results and the project proposal (hypothesis) a monitoring and evaluation framework was developed with the following intermediate indicators/outcomes (table 1a and 1b).
As the project implemented the set activities, CARE and MoARD staff, LMCs and farmers anticipatorily monitored and evaluated the activities which helped modify activities and plans, with various innovations being included in the implementation process. All these were captivated in the 5 half yearly semester reports.
In on-farm research the crop yield was measured and the crops performance during the year evaluated. Additionally *Striga* infestation levels were measured and their change over time. Results were compared with the local practice, i.e. with maize performance in other parts of the farm.
In training the number of farmers attending the sessions on a gender basis were taken. Some farmers were asked to give their addresses for later visits by the *Striga* group to monitor the success of the training with these farmers (knowledge acquired through training, prospective change in farming methods in the future).
Towards the end of the project in July, August and September, an impact assessment was conducted for the two approaches using both quantitative and qualitative surveys. In the quantitative survey, a total of 112 farmers were interviewed using trained enumerators. 60 farmers were randomly selected in each category (CARE and MoARD).
Two groups (68 women and 52 men) each in the CARE/MoARD areas participated in the quantitative survey. In the focus group discussion, 38 men and 45 women participated. This survey was designed to corroborate the results obtained from the quantitative survey.
The *Striga* working group suggests that a second impact assessment should be conducted in 3 years time to be able to assess the adoption of new techniques and the sustainability of the approaches without the intervention and presence of the *Striga* group.

5. Results and Impacts

The project could create awareness about the *Striga* problem in western Kenya among the major stakeholders such as the MoARD, the local and provincial administration, NGOs, farmers and farming communities. As a result of these activities, stakeholders became active to improve the situation; task forces and working groups were established of partners, which had not collaborated before (for example NGO and MoARD). Results according to institution and / or approach are found in table 5.

General results:
The results of the Small Grant Project show that the strategy developed by the *Striga* Control Project could make a difference in the adoption of *Striga* control methods by farmers. The strategy was based on:

- the development of adapted low input *Striga* control methods;
- improved farming methods to increase soil fertility and farm productivity;
- intense farmers' training in *Striga* biology, control and prevention in order for them to understand the principles of these new methods;
- long term (4seasons) on-farm trials and demonstrations to show the effectiveness of the control methods under actual farm conditions;

- involving major stakeholders in extension activities (MoARD and NGOs) and providing them with scientific back-up and M&E when needed.

The MoARD approach was effective in farmers' training but to a lesser extent in on-farm experimentation. The MoARD did not aim to build any sustainable structures for technology dissemination among farmers. However, based on our results, it can be assumed that with an active (functioning) extension service *Striga* control can be promoted effectively and inexpensively in affected areas.

CARE took more time to approach communities, identify their most urgent needs and set-up structures for farmers' training and for farmer-led adaptive on-farm research. Once these structures had been in place and farmers' groups and GRPs were involved in adaptive research and training, the number of trained farmers increased rapidly. Compared to the MoARD approach CARE worked with farmers more closely and intensively giving them more support and guidance then a FLS could have done considering the many farmers he has to attend. This could make a marked difference in adoption of the new techniques but results on adoption rate might not be available in the near future because of the long-term nature of *Striga* control methods.
CARE also tried to build sustainable structures within the communities (LMC). This might help to sustain the *Striga* control effort in a community if the LMCs remain operational.

Both extension approaches showed success in creating awareness and training of farmers. The *Striga* working group was initially the driving force in motivating both partners in this process. However, while CARE would adopt *Striga* control in its agenda and further develop this process based on the experiences gathered with farmers and the *Striga* working group, MoARD would heavily rely on the working group throughout and not develop strategies on their own. Reasons for this difference might be in staff motivation and institutional structure. We concluded that the organisational structure and institutional objectives of CARE and MoARD were quite diverse as well as they relied on a highly different resource base (which in turn affected motivation and working options of the personnel). Hence, what was supposed to be a comparison between different methods became a comparison of organisations which was not the aim of this study.

Institutional Results
CIMMYT/KARI/CARE were able to:-

-Provide back up to all technical issues related to the implementation
-Develop picture series and *Striga* extension bulletin.
-Facilitate training of trainers.
-Provide inputs for demonstrations and trials.

Impacts
Increase in adoption of inter-cropping legumes with maize reduced *Striga* infestation, increased their income and enhanced food security among participating farmers.
Trained trainers were confident while training. It boosted their morale and hence social standing in the community.

Through LMCs, the communities were able to collectively discuss their farming problems, opportunities and possible solutions and action plans drawn.
Farmers changed their attitude towards *Striga* control.

Outcomes

- Farmers were able to gain knowledge on *Striga* biology and control options.
- Awareness created to farmers on causes, effect and *Striga* control options to the participating farmers, CARE and MoARD staff and their change of attitude towards *Striga* control.
- Development of training and reference materials on *Striga* for use by trainers (5 sets of pictures left with the community).

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Table 5. Results of project activities by organisation involved.

Activity	MoARD	CARE	General remarks
Training of trainers	> 200 MoARD staff were trained on *Striga* control and biology, not only FLS who would train farmers but also other hierarchical layers of the MoARD. Training of trainers would be conducted in one day training session and was rather cost-effective if sufficient staff participated. Selected FLS were trained in separate sessions in the use of training materials (picture series). 6 contact farmers were trained by the FLS to use the *Striga* picture series and train other farmers.	All CARE extension and adaptive research staff was trained in *Striga* control and biology and in the use of the picture series. 204 GRP were trained by CARE extension staff in *Striga* control and biology and in the use of the picture series.	Generally all extension agents were interested in the training as they are permanently confronted with the *Striga* problem. Based on brief assessments before the training sessions, it became evident that extension agents had a very limited knowledge on *Striga* control and no knowledge on *Striga* biology.
Farmers' training	The FLS trained farmers with the picture series. These training were started directly after the FLS themselves had been trained. During the three year period several thousand farmers could be trained. MoARD conducted 6 field days mobilizing about 200 farmers.	CARE did not start training of GRP before September 1999. The GRPs trained their farmers groups and also used the picture series to train farmers during field days and other social gatherings on their on initiative. CARE will use some of these GRPs to train GRPS of new farmers' groups in other project areas (hence substituting the work of their own extension staff).	CARE decided to use farmers as trainer of other farmers in order to provide them with more skills and promote farmer led training and extension.
Capacity building	Contact farmers developed new skills in on-farm research and training	CARE formed and trained 26 LMCs who coordinated and managed agricultural information and services in the location. These LMCs conducted field days and agricultural shows in their locations. More than 4,800 farmers participated in the shows and about 1,700 in the field days. The high turn out of farmers was attributed to LMCs mobilisation process. The LMCs are supposed to be further active in agricultural issues concerning the community after CARE has terminated its project activities in their locations.	Capacity building is an integral part of CAREs program in community development. MoARD has no such agenda.
Gender impacts	No specific activities undertaken to address women	CARE facilitated selection and election processes in farmers' groups and community level and managed to increase the level of women participation in LMCs and as GRPs and ARFs. However, equity was not achieved	

6. Lessons learned and Conclusions

Adoption and training

- Use of farmer managed demonstrations and PM&E provided hands on experience thus enhanced adoption of *Striga* weed control options.
- Use of the picture series (training materials) was an effective method of training trainers and farmers. It shortened the training period and was cost effective. It provided the required knowledge for farmers to understand the principles of *Striga* control methods and show them the specifics of *Striga* biology, which affect its spread and persistence in the field.
- Training trainers and farmers on *Striga* biology and control options provided the MoARD, CARE staff and farmers with new knowledge and understanding of *Striga* weed. This generated enthusiasm and contributed immensely to effective training and adoption.

Gender

- Women farmers learned more willingly from men resource persons while men were reluctant to learn from women GRPs. It seems that men are more recognized as trainers than women, also they might have more available time for follow ups and consultations than women. 69% active men GRPs and 43% active women GRPs supports this argument.
  - Women farmers registered higher adoption rates (70%) compared to 30% in men (CARE annual report, 2001). This was attributed to needs considering that women suffer most in a food insecure situation brought about by *Striga* infestation.
  - About 71% women ARFs in CARE areas were found to be actively conducting adaptive research technology demonstrations compared to 39% men. Women might be more suited for technology demonstrations on their own farms since they have time to spend in the farms while men might be more suited for technology dissemination.
- Given that *Striga* control is a long-term undertaking, training the youth might bridge the generation technology gap and seriousness in *Striga* control. This was observed by farmers during the FGDs CARE approach, which involved training the youth, and school going children and addressed this concern.
- In the FGDs, farmers observed that most women farmers are poor with very little farm investment opportunities. This hinders diversification and thus increases *Striga* infestation through monoculture. Provision of credit to women farmers is therefore recommended.

Capacity building

The CARE approach which emphasized the formation of LMCs created opportunities for women to elevate themselves to leadership positions thus participating in the decision making process. This approach is therefore recommended as a long-term strategy for empowering rural women.

Formation and training of LMCs in the CARE approach doubles up as mobilization and coordination strategy. It has in it sustainability strategies and contributed immensely to the high number of field days organised in the CARE areas.
The two approaches were not effective in involving the majority of the population in the *Striga* control activities and this remains a challenge as it requires a community effort.

Technology

- Farmers adoption trend confirmed that labor is a major constraint in general agricultural production. Farmers are more willing to use labor saving technologies. Inter-cropping and crop rotation was most adopted by farmers citing their relevance in existing farming systems and less labor requirement as reasons for adoption. Future research should focus on labor saving technologies and use of ITK, which takes care of existing farming system. Labor constraints and expected benefits should be the driving force behind technology testing and recommendations..
- Integration of control options and enterprises at farm level during the testing period is the key to meaningful adoption, as subsistence farmers cannot wait for long-term benefits of most *Striga* control options.

What difference does involving end users make:-
In Technology Development
In both approaches, the involvement of end users helped to modify the treatments in the demonstration process hence appropriate technology options for dissemination. An example is where interow planting of legumes with cereals as opposed to intra-row planting. Farmers sited labour requirements during weeding as the basis for their choice.

Such modifications helped farmers', researchers and extension staff arrive at the appropriate and acceptable technology options with ease, confidence and in a timely manner.

Modifications suggested by farmers according to their needs and capacity to adopt helped to enhance adoption potential of such options by others.

In Technology Dissemination
It was an important tool for reaching more farmers with *Striga* on biology and control messages.
It enhanced farmer to farmer technology sharing thus boosted the morale and confidence of the trainers.

In Mobilization
In CARE sites, where LMCs were involved in the mobilization, co-ordination monitoring and evaluation, more farmers were reached. Trainers (GRPs) felt obliged to train others and ownership of the process by farmers and institutions was enlisted. These are pointers to sustainability of farmer to farmer knowledge sharing process.

How research was Improved by the Involvement of end users
Working together between researchers, farmers and extension staff provided a fertile ground for experience and knowledge sharing.
The design stage was time consuming due to its consultative nature. It incorporated farmers' knowledge and untested experience e.g rotating with cassava.
The management stage which was basically farmer managed responded to reality on the ground. I.e. difficulty in uprooting *Striga* at the right stage.
While the evaluation stage was a major learning session for researchers and extension staff as farmers reasoned up for their preferences which were not necessarily the best options for reducing *Striga* seed bank in the soil i.e intercropping for farmers

How will follow up be conducted in the next two years
KARI/CIMMYT/CARE
Plan to conduct periodic/seasonal visits to LMCs in CARE set up and groups in the MoARD set up to establish:-

-How demonstrations and trainings are conducted by participating farmers.
-Evaluate the impact of technology demonstrations and trainings on *Striga*.
-The use of picture series by trainers.
-Food security status of farmers who participated in the project activities.

Towards Institutionalization.
Use of PRGA tools (picture series) for training enhanced staff communication skills in technology dissemination and provided an opportunity for better interaction between trainers and trainees thus incorporating ITK development and extension messages.
Training of stakeholders and project staff on the use of PRGA approach and its benefits may be a good option for institutionalization.

Conclusion
Given the success registered within the project period, replication of PRGA approach to neighboring locations will ensure wider adoption and hence sustainability of *Striga* control in the area since this is a community effort without which it cannot succeed as re-infestation is always possible.

7. Project documentation

Oswald, A., Agunda, J and Ransom, J. 1999. On-Farm Research and Training of Farmers' Groups on *Striga* Control Using a Participative Approach. Poster presented at the XIVth International Crop Protection Congress, Jerusalem, Israel, July 25-30, Abstracts p. 74.

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LEFGENDS :

CIMMYT : CENTRO INTERNATIONAL de MAJOREMEINTO de MAIZE Y TRIGO
KARI : KENYA AGRICULTURAL RESEARCH INSTITUTE
PRGA : PARTICIPATORY RESEARCH AND GENDER ANALYSIS
CARE : CARERING
MoARD : MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT
LMCs : LOCATONAL MANAGEMENT COMMITTEE
ARFs : ADAPTIVE RESEARCH FARMERS
GRPs : GROUP RESOURCE PERSONS
FLS : FRONTLINE EXTENSION STAFF
ARWs : ADAPTIVE RESEARCH WORKERS
CEWs : COMMUNITY EXTENSION WORKERS
FGDs : FOCUS GROUP DISCUSSION
PM&E : PARTICIPATORY MONITORING AND EVALUATION
T&V : TRAINING AND VISIT
NGO : NON-GOVERNMENTAL ORGANISATIONS
TRACE : TRAINING RESOURCE PERSONS ON AGRICULTURE COMMUNITY EXTENSION
ITK : INDIGNEOUS TECHNICAL KNOWLEDGE
M&E : MONITORING AND EVALUATION