Development and promotion of Alectra resistant cowpea cultivars for smallholder farmers in Malawi and Tanzania

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Summary:
The parasitic weed *Alectra vogelii* is a wide spread constraint to cowpea production in semi-arid areas of East and Southern Africa, where the crop is an important source of protein for resource poor farmers. A project aiming to develop and promote *Alectra* resistant cowpea cultivars was initiated in Malawi and Tanzania. Farmer research groups have been established in cowpea growing areas of both countries and will be the focus of research for four years. Initial studies of farmers and market trader's preferences in Tanzania indicate that large white -cream seed types are most favored. Growers also need plant types that produce copious foliage for spinach and for preservation for consumption in the dry season. Cowpea germplasm was collected from local institutions, farmers and the breeding programme at the International Institute of Agriculture (IITA) Nigeria. Thirteen lines were identified in pot and field screening that show resistance to the parasite – four were resistant in trials to accessions of the parasite collected in both countries. Selected lines will now be used as source of resistance for crossing with locally adapted released high yielding disease resistant varieties starting 2007/08 season. Parallel to this work some of these materials are to be planted on farmers fields for farmers to evaluate for *Alectra* resistance, yield and other criteria. Post-graduate student projects on production, utilization and marketing of cowpea will be undertaken at Sokoine University of Agriculture Morogoro in Tanzania and Bunda College in Malawi.

Introduction

Cowpea (*Vigna unguiculata*) is a crop of major importance to the nutrition of poor rural households in the drier and sub-humid regions of Eastern and Southern Africa, where diets tend to be overly reliant on starchy foods such as millet, sorghum, maize and cassava. The addition of even a small amount of cowpea ensures the nutritional balance of the diet and enhances the protein quality by the synergistic effect of high protein and high lysine from cowpea and high methionine and high energy from cereals. Hence cowpea grain is an inexpensive, high quality source of protein and its vitamin-rich leaves are eaten as spinach. Women particularly value cowpeas, which help them to bridge the "hunger months" prior to the main cereal harvest also it adds cash to the household after selling the grain and dried leaves. It has to be noted that cowpea is mainly a women crop On-farm cowpea yields are extremely low, averaging 319 kg/ha in Tanzania and 388 kg/ha in Malawi. Use of late maturing cultivars, low plant density and insect damage are widely recognized as important constraints to improved cowpea production under on-farm conditions. Less well appreciated is the importance of the parasitic weed *Alectra vogelii*, which attaches itself to the roots of cowpea plants and interferes with the plants' ability to obtain water and nutrients. Recently-released improved cowpea cultivars that are earlier maturing and more tolerant to key insect pests and diseases are especially susceptible to *Alectra* attack, experiencing up to 50% yield reductions. *A. vogelii* is widespread from the Northern Province of South Africa, through Central Africa to Kenya and across West Africa to Mali. In Tanzania, *A. vogelii* is common in Mwanza, Shinyanga, Dodoma, Iringa and Ruvuma regions, while in Malawi, it is common in Lilongwe, Dowa and districts in central Malawi, the lower lying, drier areas of the southern region and the Blantyre/Shire Highlands

Project objectives

The general objective of the project is to improve cowpea productivity on *A. vogelii*-infested land in Malawi and Tanzania by introducing *Alectra* resistance into cowpea cultivars that are also early-maturing, pest and disease tolerant and high-yielding. The specific objectives are to develop high yielding *A. vogelii* resistant cowpea cultivars and then to promote them in both countries Malawi and Tanzania.

Summary of research activities

Following the project inception workshop in December 2006 field work was initiated in Malawi and Tanzania and a glasshouse study was undertaken under quarantine in United Kingdom. Details of field activities, methods used and the results obtained up to August 2007 are provided in the country/partner reports attached as Annex 1 to 4 of this report. Highlights of progress on each of the outputs included in the annual work plan is as follows.

Objective 1:. Development of high yielding *Alectra vogelii* resistant cowpea varieties

Output 1.1: Producer and consumer preferences in cowpea identified

In Tanzania group discussions with cowpea producers were undertaken in 2 villages in Singida region, two in Dodoma region and two in Iringa region (Annex 2). Because the crop is largely produced and used by women, female farmers comprised the majority in the focus groups. In addition researchers visited markets in Singida, Dodoma, and Morogoro to verify urban consumer preferences through discussion with traders. Although yields are generally low, farmers in the study areas perceive cowpea as a valuable food and cash crop and also recognize its importance as a fodder, for maintaining soil fertility and for weed suppression in inter-cropping systems. The important traits that farmers need of cowpea cultivars are:

- White-cream grain
- Produce large and more leaves
- Early maturity
- Resistance to pest and disease
- Easy to cook
- High yielding

Discussions with traders revealed that dry cowpea grain is sold throughout the year while green leaves and pods are dominant during rain season. In all three markets, white grain was dominant and more preferred by traders and final consumers than brownish grain. Equally important is large grain size. However the majority of farmers still plant local cultivars so marketed grain is not of uniform size or colour.

A more in-depth study of cowpea trade in Tanzania will now be undertaken by a MSc. Student from Sokoine University. This will focus on rural and urban markets of Dodoma, Singida, Iringa, and urban markets for Handeni, Morogoro and Dar es Salaam.

A study has been designed to assess cowpea preferences among stakeholders in Malawi, to be undertaken as a MSc. student project at Bunda College. A reconnaissance survey to target areas has revealed that the farmers mostly grow the cowpeas for subsistence. Hence, the farmers can also ably tackle issues on consumer preferences. Apart from the farmers, other respondents will include cowpea traders in markets surrounding the two study areas, institutions that buy cowpeas (e.g. refugees, schools, hospitals, etc.), companies buying cowpeas (e.g. Muli Brothers, TransGlobe, Patson Produce, ADMARC) and cowpea processors (e.g. Rab Processors Limited).

Output 1.2: Capacity of cowpea farmers, especially women, enhanced

Participatory methods are central to the philosophy of this project so a number of activities will be implemented through farmer research groups.

In **Tanzania** work will be implemented in collaboration with district council extension staff with six existing groups, with currently a total membership of 167 farmers (45% female) in six villages of Dodoma Municipal, Iringa and Singida Rural Districts. Capacity building with the groups will be an on-going activity aimed at building organizational capacity to ensure effective participation in project activities. A series of action-training sessions for joint learning were initiated on principles of group organization and management, group strengthening and improved production of cowpea (see Annex 1). Initial meeting covered training on the biology and management of *Alectra*, a situation analysis of cowpea production and development of a joint strategy for research on the problem. A SWOT analysis revealed an appreciation of cowpea as a potential crop for improved household and community economy, especially for women. However farmers need improved production practices and reliable markets to fulfill this potential. They agreed the challenge that Cowpea production be increased from current < 1 bag/acre to 6 bags/acre by participating in research and training activities to combat *Alectra* through improved cowpea production practices. Group members also agreed to work with the research team to identify market opportunities.

In **Malawi** field work is being implemented in Chikwawa, Mbewe Extension Planning Area (EPA) of Chikwawa District and Mpokwa EPA in Zomba District. Two farmer research groups were formed in each EPA with the assistance of both Agricultural District Division (ADD) and District Agricultural Office (DAO) management teams (Annex 3). Each group has 25 - 30 members with women comprising 70 % or more. All groups have elected leadership comprising a chairperson and vice, secretary and vice, treasurer and four committee members. The next step is to organise training on group dynamics and on farming as a business. Farmers identify *Alectra* as just one of a number of problems leading to low cowpea yields. The project team will therefore need to liaise with other researchers, to address these issues, particularly insect peat management. As in Tanzania, farmers identified a lack of markets for cowpea as an important issue for further research.

Output1.3: Cowpea lines resistant to A. vogelii identified

A major effort was made by project partners during the year to evaluate the *A. vogelii* susceptibility of cowpea germplasm in order to identify lines that can be tested on-farm by farmer research groups and to find parasite resistant lines to use as parents for breeding *A. vogelii* resistant cultivars.

For work in **Tanzania** 130 cowpea accessions were assembled from different institutions. These included 33 accessions from Ilonga Agricultural Research Institute (IARI), 30 from the National Plant Genetic Resource Center (NPGRC), 17 from Bihawana Substation (BIHA) and 50 accessions from the International Institute of Tropical Agriculture (IITA). Material from IITA included advanced lines from the breeding programme with genes conferring resistance to the related parasitic weed *S. gesnerioides* and which also provide resistance to *A. vogelii* in West Africa. A further 106 seed accessions were collected from farmers in project areas during the season.

In **Malawi** germplasm evaluation concentrated on the 50 lines provided by IITA with two locally grown cultivars included in pot and field trials as checks. A collection of cowpea lines currently grown by farmers (landraces and previously released cultivars) was made during the crop season..

Pot trials were used in Malawi, Tanzania and UK to screen germplasm collections for resistance. These involved growing test plants in soil artificially infested with *A. vogelii* seed. Observations were made on the number of parasite stems emerging per host plant. Trials were maintained for 78, 84 or 98 days from sowing in Tanzania, UK and Malawi respectively. One accession of the parasite was used in Malawi, two in Tanzania while the trial in UK compared cowpea reaction to four accessions of *A. vogelii* collected from different areas of Tanzania and one from Malawi. Full details of the method and results are provided in the country reports (Annex 1 and 3).

In pot trials of the 132 cowpea lines tested 10 remained free of emerged parasite stems when challenged by *A. vogelii* collected from Ilonga and Ismani and four were found to be completely resistant in the initial trial in Malawi. Overall these included 13 breeding lines from IITA, the landrace accession B301 and land race TZA 263 collected from Tanzania.

Table1: Resistance identified in pot and field screening trials. R indicates resistance (no parasite emergence)

	Source of *Alectra* seed			
	Tanzania			**Malawi**
Line	**Ilonga**	**Bihawana**	**Ismani**	
IT99K-573-1	R	R	R	
IT97K-499-8	R	R	R	
IT97K-818-35	R	R	R	
IT97K-819-118	R	R	R	
IT97K-499-38	R		R	
IT99K-7-21-2-2	R		R	R
IT89KD-288	R		R	
IT00K-1207	R		R	
IT96D-733	R		R	
B301	R	R	R	R
TZA263	R		R	
IT99K-494-6				R
IT99K-1060				R
IT97K-820-18				R
IT03K-378-4				R
IT97K-499-38	R	R	R	R
IT81D-994	R	R	No test	R

Further screening of 99 of the lines tested in pots was undertaken on infested field sites at Bihawana (Dodoma District) and Ismani (Iringa District) in Tanzania. Ten lines remained *Alectra* free.

The pot trial in UK was undertaken to check if there is any geographic variation in the virulence of *A. vogelii* on different cowpea genotypes (Annex 4). Of 14 cowpea lines tested. Three cowpeas, IT81D-994, B301 and IT97K-499-38 did not support the emergence of any of the five parasite accessions from Tanzania or Malawi under the conditions of the trial.

Further confirmation will be needed to confirm that the promising lines identified in trials to date are resistant across a range of conditions. However the results to date suggest that land race B301 and line IT81D-994 may provide resistance to all the sites where project trials have been undertaken or from where *Alectra* seed used in trials was collected. Only one sample of Alectra seed was used from Malawi. Previous results with seed from another location (Mainjeni, 1999) indicated that B301 and two lines derived from it were susceptible. IT81D-994 has not been tested in the field in either Malawi or Tanzania. A number of lines appear to offer resistance in either Malawi or Tanzania.

Output 1.4:. Collaboration in cowpea research increased in E. and S. Africa.

Preparations of the project proposal and the inception meeting have already provided opportunities for researchers from Malawi and Tanzania to increase collaboration on cowpea improvement. Teams in both countries have already recruited graduate and post-graduate students to work with the project. Since the project inception meeting held in Mbeya, one student enrolled for MSc (Agricultural Economics) was approached and has developed a proposal titled: "*Assessment of production, marketing and consumption of cowpea in Tanzania: A case study of selected regions in Tanzania*". Dr Joseph Hella from the Department of Agricultural Economics and Agribusiness at SUA will supervise the student. A masters student will also work on producer and consumer preferences in the Centre for Agricultural Research and Development at Bunda College.. In addition, in Malawi, a BSc project student is studying the biomass production of cowpea lines. Mr E. Mazuma from Chitedze Research Station supplied these lines. The idea is to find lines that can be used as green manures as well as produce high grain yields. In addition, some correlation and regression of leaf mass and canopy width will be undertaken to establish an easier way of estimating biomass. It is hoped in August/September 2007 another student will begin a study on the rotational effects of these lines on maize production and another will assist with screening cowpea germplasm for resistance to *Alectra*.

Objective 2. Promotion of high yielding *A. vogelii* resistant cowpea cultivars

Activities to be implemented during the project period under this objective will build extension and farmer knowledge of the *Alectra* problem and available management approaches, demonstrate control measures, investigate opportunities for cowpea seed multiplication and seed supply and will work to develop market opportunities for cowpea grain and products. This work will begin in year two of the project. During the past 12 months work was initiated to understand farmer awareness of the *A. vogelii* problem.

Output 2.1. Farmer and extension awareness of A. vogelii and use of resistant cultivars enhanced.

Sharing knowledge of the *Alectra* problem and management practices with extension providers and farmers will involve a number of activities as the project progresses. These will include training of trainers in extension and production of supporting training materials. This work will get underway in the second year of the project. In year one discussions with the farmer research groups were used to learn the extent of farmer knowledge of the problem. In Tanzania farmers have been aware that *Alectra* occurs in fields where cowpeas grow and yield poorly but they know little of the life cycle of this pest. The only control measure tried has been pulling up *Alectra* plants but this has not had an impact on the problem. In Malawi, sessions for farmer groups will take place in October 2007. This training will cover all aspects of cowpea production, including cowpea production, disease and pest management (including *Alectra*), and will share with farmers the results of the preferences study. The training will also equip farmers with skills to undertake participatory variety evaluation on plots that they will be managing during the season.

Implications of the research findings

During the first 12 months of project activities, the partners have established the research programme with communities whose cowpea crops are adversely affected by *A. vogelii* infestation and have screened germplasm to allow an initial selection of parasite resistant lines. These achievements will allow the project to move forward with the next stage of the agreed work plan to undertake activities in the following ways.

1. The capacity building of farmer groups will continue in the next season. The farmer research groups that the project is working with have been sensitized to the aims and objectives of the project. Training will be given on group leadership and management with an emphasis on helping group members and project staff to learn together.
2. A start will be made on the development of training materials that can be used by extension providers working with farmers to improve cowpea production.
3. Work in the past 12 months has provided an insight into the traits farmers require in cowpea cultivars. Student projects will now bold on this to further understand market demands and consumer preferences.
4. It has been established that there are both local (inter-household) and area sales of cowpea grain and leaves. Market studies will now be undertaken in both Malawi and Tanzania to understand more fully how cowpea markets work and to identify new opportunities for growers to sell their crop.
5. Screening trials completed in the first year of the project have provides evidence of at two sources of resistance in cowpea to *A. vogelii* from Malawi and Tanzania. These have previously been widely studied in West Africa for resistance to both *A. vogelii* and *S. gesneoides*. These are B301 and lines derived from this by the breeding programme at IITA, including IT97K-499-35, IT97K-499-38 and IT98K-205-8 (Singh et al., 2006); and IT81D-994 (Singh, 2002), and IT81D-994 (Singh, 2002). Of particular importance is that these two sources provide

different resistance genes. The single dominant gene conditioning resistance to *Alectra* in IT81D-994 is different to the two duplicate dominant genes in B301 (Atokple et al., 1995). (Mainjeni (1999). Data from the current trial also show emergence of the parasite from Malawi on B310 derived lines (e.g. on IT97K-499-35). IT81D-994 may therefore provide a better source of resistance for Malawi. A number of lines derived from crosses using B301 as a parent at IITA offer useful sources of resistance for Tanzania. However previous work has demonstrated that B301 along with two lines derived from B301 supported the emergence of *A. vogelii* from the Blantyre/Shire Highlands of Malawi in pot trials. IT81D-994 may therefore provide a better source of resistance for Malawi. As well as providing a good source of resistance for *A. vogelii* in Tanzania. Further trials are need to confirm the resistance of IT81D-994 in the field.

6. Full details of the pedigrees of lines that showed resistance in trials to date are needed so that choices can be made of parents to use in breeding work to introduce resistance genes into cultivars that are adapted to conditions in Malawi and Tanzania.
7. Further collection of *A. vogelii* is needed from geographically dispersed locations in Malawi in order to learn more about possible variability in the virulence of the parasite on different cowpea genotypes. Data from the trials completed to date will be used to select cowpea lines for use in a further trial to examine this issue.
8. Multiplication of seed will be undertaken of lines that have shown resistance so that farmers may participate in evaluation of new cowpea lines in on-farm trials. PVS techniques will be used to allow farmers to select the plant types they need.
9. Cross site Monitoring and Evaluation will be undertaken during the growing season with agreed M&E criteria used as the basis for identifying recommendations for improving the research process.

Annex 1. Tanzania Country Report

1.1: Sensitization and farmer group formation

Objective: This activity aimed at introducing the project idea, raising farmers' awareness, identifying and assessing the status of participating farmer groups and building their interest in improving cowpea production.

Methodology: This involved joint reflection and exchange of information involving the project teams, district staff, village leadership and group members.
The identified farmer groups and their respective villages are as presented in Table 1:

Table 1: Farmer groups involved in the project and their composition

District	Village	Farmer Group Name	Year Started	Members		
				Male	Female	Total
Singida District Council	Msungua	Mshikamano	2004	20	10	30
	Ikhanoda	Mwofenji	2006	10	10	20
Dodoma Municipal	Mbalawala	Maksai	2006	15	5	20
	Kikombo	Uzalishaji Mbegu	2004	12	8	20
Iringa District Council	Mangalali	Muungano	2007	21	21	42
	Mkungugu	Ari Mpya	2007	14	21	35
Total				**92**	**75**	**167**

Findings from the interaction with the groups, it was found out that all the groups were relatively new, having been established between 2004 and 2006. The groups were started from different motives. For example Mshikamano group was established after sensitization by a project to grow improved sorghum varieties – Wahi and Hakika, Mwofenji Group started at the initiative of one Farmer Motivator. The Maksai group was established by a group of farmers interested in using animal draught power after attending training. The group members seem to be motivated and share common interest related to improving their economic status. In terms of composition, the number of women was less than or equal to that of men however, all the groups confirmed that they are open to more members as stipulated in their constitutions. All the groups visited were interested in participating in project activities. This is mainly because of the opportunities offered through the project and the potential for improving cowpea production in their communities. There was good awareness of the Alectra problem in cowpea production – some members even asked the project to help them solving the problem. All the groups have their own constitutions and leadership and seem to be well managed. There is internal cohesion and enthusiasm to grow as a group. Two of the groups have started mobilizing savings from internal sources
Main challenges facing the groups are: lack of knowledge and skills for initiating viable economic activities, lack of internal dynamism to face their challenges.

1.2. Capacity building of farmer groups

After identifying the farmer groups then the next activity was capacity building. It has to be noted that this is an on-going activity aimed at building organizational capacity of farmer groups for participating effectively in project activities. It involves a series of action-training sessions for learning together with farmers on principles of group organization and management, group strengthening and improved production of cowpea. Successful promotion and development of Alectra resistant varieties for increased cowpea production among smallholder farmers depends on the human element – the way communities perceive the problem and get organized to address the issue. This is important for project ownership and success.

The first intervention undertaken had the following main objectives:

a) Training on aspects of *Alectra* biology and how it affects cowpea plant growth and development and yield.

b) Conducting a situational analysis of the groups to allow farmers appreciate their situation, problems and challenges with regard to cowpea production and group development.

c) Developing a strategy for participatory research and technology development process involving farmers, researchers and other stakeholders.

The training workshop method was used, involving plenary discussions, probing questions in an action-learning manner. Analysis of group situation used a SWOT technique (Strengths, Weaknesses, Opportunities, and Threats) in the following manner;

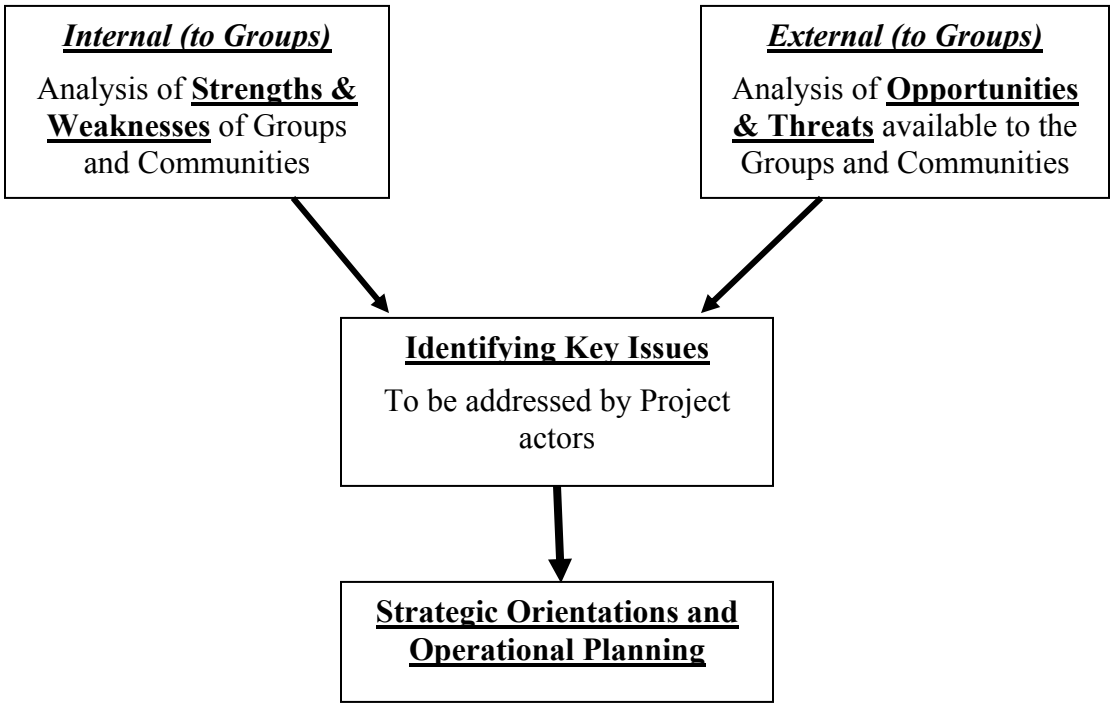

Fig 1: SWOT analysis

1.3: Farmer's knowledge on aspects of *Alectra* biology

From training workshops conducted for each farmer group, it was learnt that aged farmers (at age of sixty) have known the problem of *Alectra* for a long time as they can remember to be infesting cowpea, but they have been confusing it with a similar parasitic weed *Striga*. As most of the groups mentioned that the weed infests also cereals especially maize and sorghum. This may be because farmers intercrop/mixed crop cowpea with cereals and could not differentiate between *Alectra* and *Striga*, that *Alectra* attacks only cowpea.

Cowpea plants infested by Alectra show stunted growth, produce few or no pods and sometimes the plants die. The problem of *Alectra* is said to be increasing on infested fields and also spreading to more new fields year after year.

There were a lot of speculations on the way Alectra attacks the crop and how it propagates and means of spread from one field to another. The majority of farmers said *Alectra* produces toxic substances which kill the cowpea plant and some said it competes with the cowpea plant for food.

The control measures practiced by farmers is by hand pulling and leaving the plants on the surface to dry or leaving the field fallow for up to 3 years. But they have not been able to get rid off the problem. It is a problem which they have to live with it and the extension staffs do not provide any reliable advices to them.

1.4: Situation analysis

Main results and findings from SWOT analysis of project groups are presented in Table 2.below. From the analysis, the following issues were identified as important to be addressed by the project actors for increased cowpea production:

1. In general, the current levels of cowpea production among smallholder farmers are too low to make any significant contribution to the household economy.
2. There is renewed recognition ad appreciation of cowpea as a potential crop for improved household and community economy, especially for women.
3. There is a knowledge gap on research and farmers on recommended package for cowpea production and improvement.
4. Most groups participating in the project are still young and therefore need training and capacity building support to be sustainable and play active role in participatory research and technology development activities..
5. Across project sites, there is lack of knowledge and improved practice for improving cowpea production.
6. There is a potential for increasing cowpea yields and contributing to household income.
7. There are opportunities for improving cowpea production which, if well exploited, could lead to improved production.

Table 2: Main Findings from SWOT analysis

	POSITIVE Strengths	NEGATIVE Weaknesses
NALINTER	1. Human resource for supplying farm labour. 2. Voluntary self-help groups and members' commitment to participate in the project. 3. Balanced gender representation with significant women participation. 4. Available farm lands for cowpea production. 5. There is collection of local and improved cowpea varieties. 6. There are animal drought power used by some groups and animal manure for use in farms. 7. Have farm implements including oxen plough and hand hoe. 8. Have substantial indigenous knowledge on cowpea production. 9. Group members are motivated and share common interests for improving their economic status. 10. Awareness of *Alectra* problem in cowpea production – project requested to help solve the problem.	1. Lack of stability in group development and fluctuating membership. 2. Most groups still in their infancy, and established from external initiatives. 3. Groups lack economic activities which poses a threat to the sustainability. 4. Group sustainability threatened by several challenges including lack of knowledge and skills for initiating viable economic activities, lack of internal dynamism to face their challenges. 5. Over-dependence on external support. 6. Low awareness on *Alectra* problem and effect on cowpea production. 7. Poor allocation and misuse of household resources. 8. Negative community perception of cowpea as a women's crop. 9. Low recognition of the role of extension advice in improving cowpea production.
	Opportunities	**Threats**
EXTERNAL	1. Extension service from village to district levels, and from NGOs. 2. Available market for cowpeas. 3. Available cowpea varieties with diverse attributes. 4. Adequate research capacity on cowpea in Tanzania. 5. Nutritive value, consumer preference (taste) and medicinal value of cowpea products. 6. Drought resistance of cowpea crop. 7. Potential of cowpea in inter-cropping systems. 8. Potential for increasing cowpea yields to reach 5-6 bags/acre (under optimum conditions). 9. Potential for increasing household income to as high as Tsh. 150,000/=.(US$ 115) 10. Potential for using project groups to up-scale best practices to village communities.	1. Weather fluctuation and drought. 2. Lack of reliable market for cowpea. 3. Cheating and supply of low-quality seeds by seed suppliers/stockists. 4. Increasing susceptibility of cowpea to diseases, insect pests and parasitic weed – *Alectra.* 5. Lack of resistant cowpea varieties to *Alectra.* 6. Most groups have received little or no training support prior to project intervention.

1.4.1: Future strategies for improving cowpea production by the farmer groups

The following are the main strategies agreed to be pursued by project actors and participating farmer groups in order to achieve the stated aims and objectives of the project:

No.	What is to be achieved	How it is to be done	Who should do	When
1.	Strengthening participating farmer groups	1. Draft group constitutions.	1.1 Group members supported by	August 2007
		2. Develop action plans	Extensionist	Monthly from July
		3. Hold group meetings	2.1 Group Members	2007
			3.1 Group members	
		Training on group dynamics.	INADES/Extension	From October 2007
2.	Cowpea production promoted among village communities.	Sensitize communities via: Farmer-to-farmer learning.	Group members.	From July 2007
		Formal and informal meetings/forums.	Village leadership	
3.	Cowpea production increased from current < 1 bag/acre to 6 bags/acre	1.Impart knowledge on improved cowpea production & *Alectra* control	Researchers	From July 2007
		2. Training workshops.	Researchers	From July 2007
		3. Farmer field schools	Group members	From July 2007
		4. Dissemination of knowledge via formal/informal means.	Group members/ Extension	From July 2007
4.	Cowpea markets promoted and available	Workshops to identify potentials, constraints and opportunities for cowpea marketing.	Researchers. Group members.	From October 2007
		Conduct market research and share the findings	Researchers.	October 2007

3. Cowpea germplasm collection

In the first phase, cowpea germplasm was collected from institutions namely IITA, ARI Ilonga, Bihawana Agricultural Centre and National Plant Gernetic Resource Centre (NPGRC) - Arusha, where a total of 130 accessions were assembled and screened for Alectra resistance both in the field and screenhouse.

In the second phase, germplasm was collected late in the season from farmers in the project target villages namely Mbalawala and Kikombo in Dodoma urban, Msungua and Inkhanoda in Singida rural district in Central Tanzania. Also collections were conducted in two project villages (Mkungugu and Mangalali) of Iringa rural district in the Southern Highlands of Tanzania. In addition also collections were made in villages surrounding the above mentiond project target villages to capture variability.

A total of 106 cowpea landraces were collected and were found almost all of them to have mixed seed colours ranging from white to black, with cream colour dominating. Also they were of different seed sizes from small to large, but large was dominating. These collections are being sorted according to seed colour ready for screening against Alectra in screenhouse.

From farmers views mixed seed colour was not a problem for those who process the cowpea seed for making bans (*Bagia in Kiswahili*), but traders prefer uniform seed colour (ie..white to cream). For seed size, farmers have a bigger market for large seeded types. These are some of the criterion to be used in the breeding programme to select what the farmers and market like.

Ban (bagia) →

4. 0. Screening cowpea germplasm for *Alectra* resistance in screen house

4.1: Introduction

Screening cowpea accessions for *Alectra vogelii* resistance was conducted at Ilonga Agricultural Research Institute screen house in Kilosa Tanzania to identify accessions that were resistant to *Alectra vogelii* parasitic weed. The objective was to identify accessions resistant to the parasitic weed for use in breeding appropriate resistant varieties.

4.2: Methodology

One hundred and thirty cowpea accessions were assembled from different institutions. These included 33 accessions from Ilonga Agricultural Research Institute (IARI), 30 from the National Plant Genetic Resource Center (NPGRC), 17 from Bihawana Substation (BIHA) and 50 accessions from the International Institute of Tropical Agriculture (IITA). Two sets were planted in pots in soil mixed with sand (2:1 v:v) infested with Alectra inoculums from two sites, namely Ismani (Iringa Rural district) and Ilonga (Kilosa district). Each pot received the same amount of inoculum on average Although both sources of inoculum germinated in susceptible accessions, Ilonga inoculum had more parasitic plants emerged per pot than that from Ismani indicating possibly more viable seeds from Ilonga inoculum .Four seeds were planted in each pot and thinned to three plants. The trial was planted on 1st February 2007 and final results were collected 78 days after planting when no further emergence was observed. The accessions were rated as resistant where there were no *Alectra* plant/s emerging and susceptible when an accession supported the emergence of *Alectra* plant/s.

4.3: Results

All the cowpea varieties released in Tanzania, namely Vuli-1, Vuli-2, Tumaini and Fahari, were observed to be highly susceptible to the parasitic weed (*A. vogelii*) for both Ilonga and Ismani inoculums (Table 3). These varieties are known to be susceptible to *A. vogelii* thus the environment for screening for Alectra resistance was favorable. It was also observed that the accessions reacted differently to the two sources of inoculums (Table 3). This suggests that we have at list more than one strain of *A. vogelii* in the country. There were accessions that were resistant to *A. vogelii* from Ilonga inoculum and susceptible to that from Ismani inoculum and vice versa. This could complicate breeding for resistance. This could necessitate breeding varieties specific to certain areas which could lead to an array of varieties which may bring problems in handling.

In the present study it was also observed that there were ten accessions that were resistant to both sources of inoculums (Table 4). Among them includes B301 a known accession resistant to the *A. vogelii.* Together with this is accession TZA263 from the NPGRC, the only local landrace to be observed resistant to the parasitic weed. The rest of the resistant accessions are from IITA. These are among the accessions that were requested from IITA because of their resistance to *A. vogelii.* From this study we have managed to get at list ten sources of resistance to *A. vogelii* that can be used for breeding appropriate cowpea varieties. Almost all the lines from IITA are white seeded with either black or brown eye with medium to large seed size. These are not common seed colors found in farmers fields in Tanzania. The other source of resistance B301 has whitish seed but very small. The landrace TZA263 has reddish round and very large seeds.

The crossing program using these sources of resistance will be done concurrently with evaluation of these sources of resistance to the parasitic weed in farmers' fields to get a feed back from them in terms of resistance observed, plant type, seed color and seed yield and taste. We will need also to obtain pedigree of the resistant accessions- the breeding lines. It is my hope that our partner IITA will be willing to provide us with information regarding the pedigree of the breeding lines supplied from IITA as they had agreed in the project contract.

Table 3: Cowpea accessions reaction to *A. vogelii* for inoculums from Ilonga and Ismani in screen house, ARI-Ilonga, Tanzania 2007.

Acc. No.	Accession name	Origin	Type(Released variety-RV, Breeding line – BL, Landrace – LR)	Ilonga inoculum	Ismani inoculum
1	Vuli-1	Tanzania	RV	42.0	9.0
2	Tumaini	Tanzania	RV	40.0	15.0
3	Fahari	Tanzania	RV	40.0	9.0
4	Vuli-2	Tanzania	RV	11.0	4.0
34	IT97K-499-8	IITA	BL	0.0	0.0
39	IT97K-818-35	IITA	BL	0.0	0.0
43	IT99K-491-7	IITA	BL	52.0	0.0
52	IT99K-1122	IITA	BL	0.0	2.0
57	IT99K-573-2-1	IITA	BL	1.0	0.0
59	IT00K-835-45	IITA	BL	0.0	2.0

Table 4: Cowpea accessions resistant to both from Ilonga and Ismani *A. vogelii* inoculums, ARI-Ilonga, Tanzania 2007.

Acc. No.	Accession name	Origin	Type	Inoculum Ilonga	Ismani
33	IT99K-573-1	IITA	BL	0.0	0.0
34	IT97K-499-8	IITA	BL	0.0	0.0
39	IT97K-818-35	IITA	BL	0.0	0.0
44	IT97K-819-118	IITA	BL	0.0	0.0
49	IT97K-499-38	IITA	BL	0.0	0.0
50	IT99K-7-21-2-2	IITA	BL	0.0	0.0
58	IT89KD-288	IITA	BL	0.0	0.0
67	IT00K-1207	IITA	BL	0.0	0.0
77	IT96D-733	IITA	BL	0.0	0.0
99	B301	IITA	LR	0.0	0.0
124	TZA263	NPGRC	LR	0.0	0.0

NPGRC = National Plant Genetic Resource Centre.

4.4: Cowpea field screening for Alectra resistance Ismani and Bihawana .

Introduction

The trial sites selected for screening cowpeas against *Alectra* differ by altitude, which may create *Alectra* biotypes. Ismani is at an altitude of 1700masl while Bihawana lies at 1200masl. The two locations are known to be highly infested with *Alectra*.

4.4.1: Method:

Since the project was just starting, there was shortage of cowpea seed and it was then possible to plant those accessions, which there was enough seed for both pot and field trials. From 130 accessions, assembled 99 accessions were planted on single rows of 5 m long 2-3 seeds per hill and thinned to one plant per hill. The number of emerged Alectra plants was used as criteria for selecting resistant cowpea accessions. The counting of emerged Alectra plants was done at 9 and 12 weeks after planting by visual observation; those underground were not checked. At maturity, the cowpea grain yield was measured per plot.

4. 4.2: Results:

From 99 accessions planted, ten were found free of Alectra emergence at both sites Ismani and Bihawana.. At Ismani 17 accession showed no above ground emergence of Alectra, while at Bihawana were 12 free of emerged Alectra, but there were those that showed Alectra emergence at Ismani but were free at Bihawana and vice versa (Table 5) . This may suggest existence of two strains of Alectra. This will be confirmed in replicated trials during the 2007/08t season. Those accessions showing resistance at both locations are to be planted in a replicated trial during the 2007/08 season and will be taken on-farm for farmers to evaluate while the pot experiments at Ilonga to continue with some of these accessions on crossing programme.

A result of no spraying against insect pest, at Bihawana no grain yield was obtained but at Ismani this was done and yield performance of the cowpea accessions per plot are as presented in Table 5. Entries IT99K-573-1-1 and IT99K-494-6 gave the highest yield per plot (> 1kg/plot). These showed also good resistance to *Alectra vogelii*.

Table 5: Cowpea accessions with little or no Alectra emergence at field sites Ismani and Bihawana, Tanzania 2007 season.

Location		**Bihawana**			**Ismani**			**Ismani**
Entry No	**Entry Name**	**Plant count at harvest**	**Alectra Count 9WAP**	**Alectra count 12WAP**	**Plant count at harves**	**Alectra Count 9WAP**	**Alectra count 12WAP**	**Yield(g)/ plot**
1	**IT99K-573-1-1**	**27**	**0**	**0**	**36**	**0**	**0**	**1135**
2	IT97K-499-8	42	0	0	34	0	0	658
7	IT97K-818-35	32	0	0	26	0	0	590
8	IT97K-499-35	38	0	0	43	0	0	857
9	IT98K-205-8	41	0	0	39	0	3	531
11	IT99K-491-7	24	0	0	34	0	0	445
12	IT97K-819-118	46	0	0	50	0	0	824
18	IT99K-7-21-2-2	36	0	2	35	0	1	625
19	IT98K-628	28	0	0	37	2	3	558
21	IT99K-1060	20	1	4	12	0	0	337
22	IT99K-316-2	32	0	0	29	0	0	850
25	IT99K-573-2-1	34	0	0	16	3	3	573
30	IT98K-692	30	0	0	36	0	0	589
33	**IT99K-494-6**	**37**	**0**	**1**	**51**	**0**	**0**	**1176**
34	IT99K-429-2	34	0	0	18	1	10	397
36	IT94K-437-1	42	0	0	43	0	0	645
37	IT96KD-757	31	0	0	42	4	6	866
46	IT93K-693-2	34	0	0	49	0	1	681
49	IT98K-1092-1	48	0	0	58	1	2	673
99	B301	31	0	0	64	0	0	847

ANNEX 2

Consumer Preference on different cowpea varieties in Tanzania

Joseph P. Hella[1]

1. Introduction

Cowpea (*Vigna unguiculata*) is a crop of major importance to the nutrition of poor rural households in the drier and sub-humid regions of Eastern and Southern Africa, where diets tend to be overly reliant on starchy foods such as millet, sorghum, maize and cassava. In Tanzania particularly in semi-arid areas, all households grow cowpeas as a source of an inexpensive, high quality source of protein and its vitamin-rich leaves are eaten as spinach. Women particularly value cowpeas, which help them to bridge the "hunger months" prior to the main cereal harvest. Recent studies in Tanzania indicates that on-farm cowpea yields are extremely low, averaging 319 kg/ha in Tanzania and 388 kg/ha in Malawi. Use of late maturing cultivars, low plant density and insect damage are widely recognized as important constraints to improved cowpea production under on-farm conditions.

Recently a less well appreciated parasitic weed *Alectra vogelii*, which attaches itself to the roots of cowpea plants and interferes with the plants' ability to obtain water and nutrients is the growing its importance. Unfortunately the recently-released improved cowpea cultivars that are earlier maturing and more tolerant to key insect pests and disease are especially susceptible to *Alectra* attack, experiencing up to 50% yield reductions.

A. vogelii is widespread in Tanzania. Is a very common weed in Mwanza, Shinyanga, Dodoma, Ismani and Ruvuma region. Thus this project is timely. The overall goal of the project is to improve cowpea productivity on *A. vogelii*-infested land in and Tanzania by introducing *Alectra* resistance into cowpea cultivars that are also early-maturing, pest and disease tolerant and high-yielding under on-farm conditions. Specifically and inline to this report, the project intends to develop and promote *Alectra*-resistant cowpea lines that are acceptable to farmers and consumer markets in Tanzania. This report presents preliminary findings of the study to investigate the consumer preference for cowpea cultivars grown in Tanzania. The study intended to guide cultivars screening process by focusing both the resistance to *A. vogelii* but also acceptability to consumers.

2. Methodology

The study was done in 5 of the six villages involved in *A. vogelli* project. These are Msungua and Ikhanoda (Singida region), Mbalawala and Kikombo (Dodoma region), and Mangalali (Iringa region). Group discussion was the main method of collecting necessary information. Because the crop is feminist in most of the households in the study area,

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female farmers comprised the majority in the focus discussion group in all study villages mentioned above. In addition researcher visited Singida, Dodoma, and Morogoro for verification purposes especially for urban consumers.

Because of the importance of crop both for food and cash, reference criteria touching base on both use values as advanced by FGD in each study village was recorded. In this respect, the following criteria were recorded;

- Length/time to maturity
- Cookability
- Growth habit (erect & spreading type)
- Palatability
- Drought resistance
- Seed size
- Seed colour
- Leave characteristics
- Yielding ability
- Multiple use
- Resistant to pest & disease attack

3. Results

3.1 About the location of the study

As mentioned above, information gathered for this report was collected in five study villages' mention above and summarized in Table 1 below.

Table 1: Focus Group Discussion (FGD) in study villages

Region	Villages	FGD size		Date of visit
		Male	Female	
Singida	Msungua	20	10	16th April
	Ikhanoda	10	10	17th April
Dodoma	Mbalawala	15	5	19th April
	Kikombo	12	8	20th April
Iringa	Mangalali	21	21	27th April
	Mkungugu	14	21	Not visited
Total		**92**	**75**	

3.2 Use value of the cowpea crop

During FGD primary intention was to record the use value of the crop in the local farming system. Unfortunately despite its use, the ultimate importance of the crop to most villages was not apparent except in Kikombo village in Dodoma region. However after the discussion, the participants agreed that of all crops cultivated in the villages, cowpeas had a very wide and diverse use value than all crops grown in the village. Table 2 summarizes the use value.

Table 2: FGD results on uses of cowpea in their households

Use	Description	Location
Food crop	• Grain • Green leaves • Dry leaves • Green pods	All villages
Cash crop	• Grain • Green leaves • *Bagia* • Soup at *pombe* shops	All villages *bagia* is more common in Iringa region
Fodder crop	For livestock feeds for grazing livestock soon after harvesting or are cut and feed under zero grazing	Dodoma & Singida regions
Soil fertility	• Green manure • Crop rotation • Soil & water conservation	All villages
Medicine	Cure some diseases	Iringa region
Husbandry	Control weed when planted with cereals such as maize & sorghum	All regions

3.3 Preference for food and cash by the study villages

Analysis of the results from FGD revealed that cow-peas is the most important crop in all study villages. It was learned that although the value of the crop is not documented but all households have cowpeas albeit in a very small scale. Women reported that it is not possible to stay without cowpeas around the homestead because it provides a quick and reliable source of vegetable (spinach) for the household.

Recorded cowpeas preference across the study villages is presented in Table 3. Based on criteria recorded in section 2 above, the subsequent results have been presented. Noted from the subsequent discussion, preference on cultivar to grow is mostly influences by grain colour, grain size, ability to produce leaves, resistance to pests and disease attack and growth habit (Table 3).

Table 3: Preferences for different cowpea varieties in study villages

Mainuse	Region	Village	Main criteria	Preference
Cash & food crop	Singida	Msungua & Nkhanoda	Seed colour	White & somehow brownish seeds
			Seed size	Medium sized, large size for the market
			Leaves	Soft & produce many leaves
			Length to maturity	Early maturity
			Growth habit	Erect growth
			Yield	High grain yield
			Cookability	Ease cooking
			Resistance to pest	High
Cash & food crop	Dodoma	Mbalawala & Kikombo	Seed colour	White or
			Seed size	Large size
			Leaves	Large leaves
			Length to maturity	Early maturity,
			Growth habit	Erect type
			Yield	High yielding
			Cookability	Easily cooked and produce thick soup
			Pest & disease	High resistance
Cash & food crop	Iringa	Mangalali	Seed colour	Brownish
			Seed size	Large size
			Leaves	Produce many leaves over extended period
			Length to maturity	Early
			Growth habit	Spreading type
			Yield	High grain and leave volume
			Cookability	Quick and produce thick soup

White grain colour was recorded to be preferred in all villages followed by brownish colour. This was the case for all villages in Singida and Dodoma regions. Farmers in Iringa indicated high preference for light-brown followed by white colour. Grain size was also reported in all FGDs however with different opinions. Generally farmers prefer large sized grains especially if production is targeting urban markets.

Another characteristic of high importance to farmer's cowpea is leaves. Due to importance of leaves for food and for sale both as green or dried for off season use, cultivars producing more leaves (large) are more preferred than otherwise. This

situation was more pronounced in Iringa region where farmers indicated high preference in trailing cultivars which continue to produce green leaves over extended time period. Limited opportunity to process dry leaves could be the main factor for preferring trailing varieties. Other preference indices are as indicated in Table 3 above.

3.4 Market place visits

In order to verify results recorded during FGDs in study villages, researchers visited Dodoma, Singida and Morogoro markets to establish cowpea market opportunities. Dry grains are sold throughout the year while green leaves and pods are dominant during rain season. Dried leaves in dry season. In all three markets, white grain was dominant and more preferred by traders and final consumers than brownish. Equally important is large grain size most preferred than small grains. Since most farmers still plant their local cultivars, marketed grain size and colour was not uniform. Sale of dried leaves is not common in Morogoro market probably due to the fact that it is possible to produce green leaves throughout the year in Morogoro where as it is not possible in Dodoma or Singida.

4. Conclusion and recommendation

This report had provided a snap short prior more intensive and extensive research is done. Important highlights include

- White grain
- Produce large and more leaves
- Early maturity
- Resistance to pest and disease
- Easy to cook
- High yielding

Based on these findings, our research to reach the overall goal of the project of improving cowpea productivity on *A. vogelii*-infested land in Malawi and Tanzania by introducing *Alectra* resistance into cowpea cultivars is reached, inherent characteristics such as grain colour, grain size, early-maturing, pest and disease tolerant, high-yielding under on-farm conditions, good cookability should be taken into consideration. This will be an added advantage not only to the farmers but also will suit market needs thus stimulate production.

ANNEX 3 Malawi Country Report

1.0: Producer and farmer preferences for cowpea traits

1.1 Introduction

Cowpea is a crop grown mainly by smallholder farmers, who tend to have several reasons for growing the crop. These would include home consumption and for sale. The home consumptions, several aspects of variety characteristics could be important including taste, colour, cooking quality among others. There could also be preferences for crop growth habit. A running type growth habit may be important in pure stands, while a bunch type could be important in intercropping. If farmers grow cowpeas for cash and home use, the question becomes which traits dictate the choice of variety. Rainfall pattern, diseases and pests may also dictate variety choice. In this background, it is important to interface with farmers and obtain information of cowpea preferences of cowpea traits. In particular, to note how the farmers weigh these. The objective of the activities in this model was to identify preferences traits of cowpea by various actors in the value chain (farmers, consumers, buyers or trade).

The group formation visits provided a lot of background information for the preparation of these studies. Clearer pictures of stakeholders and issues for training were obtained. The research team held a meeting and to plan the stakeholder consultations, meetings, and training and market studies in view of the knowledge gained. Although screening for *Alectra* resistance in the entry point for this project, it is important to consider stakeholder preferences as a means of taking care of as many concerns as possible in the cowpea value chain. The main objective of the preferences study was to determine preferences of growers, consumers and traders in cowpea varieties. The information would be useful to the research team in the variety evaluation and breeding process. Our project farmers would also benefit directly by growing varieties preferred by traders (if already available).

1.2 Narrative summary

A concept paper was prepared and circulated to the entire team so as to enrich the methodology and scope.

2.0 Germplsm assembly, screeining for alectra and entry characterisation

2.1 Introduction

Cowpea yields are low, averaging 319 kg ha^{-1} in Tanzania and 388 kg ha^{-1} in Malawi (FAOSTAT, 2006; MOAIFS, 2005). There is often a considerable yield gap between production in research station trials and those observed under farmer management (e.g. for Malawi see Kabambe *et al*. 2004). Most of the focus in cowpea improvement has been on insect pests and diseases. However, an approach that considers all important pests is important, as it avoids clogging the process of adoption at some point. Therefore screening and breeding for resistance to *A. vogelii* is considered a good entry point into the value chain be by this project.

2.2 Narrative summary.

Fifty cowpea lines with resistance to *Striga* gesnoiroides were received from IITA in January 2007, courtesy of Dr Chikoye. The lines were planted at Chitedze Research Station and Bunda College in un-replicated plots for seed increase and characterisation. A replicated screen house study was planted in mid-February at Bunda College under artificial infestation to screen for *Alectra vogelii*. Two local checks, ITD86-1 and Sudan were included in these studies. Data recorded were *Alectra* emergence time and numbers (days to first emergence) and cowpea plant weight. In the characterisation study, variables recorded wee grain yield, seed size (g/1000 seeds), seed colour, and plant type. We plan to use this characterisation information, in combination with the farmer preference results, to narrow down the entries for farmer participatory evaluation next rainy season.
Locally available farmer lines with preferred traits will be collected during the interactions with farmers

2.2.1 Screening for Alectra resistance.

In the *Alectra* screening study, *Alectra* emergence was observed at 45 days after planting. Some entries have shown complete resistance. Table 1 shows the performance of top ten entries, ranked according to *Alectra* emergence at 82 days after emergence, which was peak emergence. Entry number 52, one of the two local checks was in the top ten, while the other local check (entry 51, Sudan) was the least. Compared from the bottom two and the two checks, it was interesting to note that the top four entries (IT99K-7-21-2-2, IT99K-494-6, IT99K-1060, IT97K-820-18, IT03K-378-4) had zero emergence *Alectra* recorded throughout the 98 days of evaluation, hence suggested a possible absolute resistance. These will be evaluated in summer both in the screen house and with farmers.

Table 1 shows the performance of top ten entries, compared to bottom two and the two checks in terms of Alectra emergence, ranked based on emergence at 82 days, which was peak (least susceptibility).

Entry No.	entry name	DFE	Alectra 53dys	Alectra 82 Days	Alectra 98dys	alectra Fwg/pot	Cowpea dwtg/pot
9	IT99K-7-21-2-2	79.0	0.00	0.00	0.00	0.00	7.4
21	IT99K-494-6	95.5	0.00	0.00	1.00	0.00	52.4
24	IT99K-1060	70.5	0.00	0.00	0.00	0.00	4.6
49	IT97K-820-18	87.0	0.00	0.00	0.00	0.00	26.7
14	IT03K-378-4	54.0	2.00	0.50	0.00	0.00	14.2
33	IT98K-205-8	64.0	0.00	1.00	0.50	0.27	23.1
2	IT93K-452-1	57.5	0.00	1.50	0.50	0.12	16.4
30	IT89KD-288	55.5	2.00	1.50	3.00	0.68	10.6
52	IT82-16	45.5	11.00	1.50	3.50	0.57	12.1
29	IT97K-878-35	69.0	0.00	2.00	2.00	0.93	30.8
34	IT98K-205-10	48.5	2.50	14.50	15.00	6.59	19.3
10	IT97K-390-2	46.5	8.50	18.00	13.00	3.17	4.0
51	SUDAN	49.0	5.00	19.00	13.50	4.47	2.9
	Mean	**56.3**	**1.89**	**6.16**	**5.11**	**2.22**	**16.9**
	F	**<0.001**	**0.01**	**0.092**	**0.212**	**<0.001**	**<0.001**
	MSE	**84.48**	**5.86**	**31.39**	**5.02**	**4.13**	**72.0**
	SED	**9.20**	**2.40**	**5.61**	**5.02**	**2.03**	**8.5**
	LSD 5%	**18.40**	**4.86**	**11.25**	**10.08**	**4.08**	**17.0**
	Cv%	**16.30**	**127.00**	**90.90**	**98**	**91.50**	**50.4**

2.2.2 Characterisation of the lines

The cowpea characterisation results for Bunda College and Chitedze Research Station are shown in Table 2 and 3. The results show that three cowpea lines (IT99K-1122, IT98K-1092-1, IT98K-1092-1) out yielded the controls (Sudan1 and IT83E-16). Other lines yielded extremely low. In general, the yields were low because the materials were planted very late and there was heavy infection by scab fungal disease (*Elsinoe phaseolii*) that attacked the bearing buds and caused the flowers to abort. However, this performance is quite good bearing in mind that these materials were planted late and in the presence of high incidence of scab and cowpea aphid borne mosaic virus (CABMVD). Those materials highlighted in green are the ones that performed best, out yielding the controls. Those materials highlighted in red are the ones that performed poorly in terms of yielding ability (Table 2). However, these results are just preliminary and we intend to repeat the evaluation this coming rainy season.
Ascochyta blight and *Cercospora* leaf spots were not a problem at this time of the year since these diseases are favoured by humid weather.

Of the 52 entries two entries appear at top 20 for yield (at Chitedze and Bunda) and top 10 for Alectra resistance in all evaluations. These are entry 10 (IT97K-3090-2 and entry 2 (IT93K-4521-1). In terms of yield only, 9 entries were in top 22 both at sites.

Therefore, there is some consistency in the results and it apparent that entries with good yield potential and alectra resistance can be identified for on-farm verification next October.

Table 3. Yield and disease scores (scale 1-9) of top 23 lines evaluated at Chitedze Research Station. (where 1 = no visible symptoms, 9 = severe infected)

Entry no	Cowpea Entry	Unshelled	Shelled	Scab	Aschochyta	Cercospora leaf spot	ABMV
39	**IT98K-1092-1**	**1117.4**	**1001.9**	6.5	3.0	1	1
25	**IT99K-1122**	**1020.9**	**895.7**	6.0	2.0	1	1
46	**IT97K-819-14**	**1000.6**	**886.5**	7.0	4.0	1	1
51	**SUDAN1**	**835.4**	**729.3**	6.5	3.5	1	1
50	IT97K-1068-7	816.9	705.6	6.5	2.5	1	1
52	**IT82E-16**	**826.1**	**702.6**	6.0	3.0	1	1
5	IT98K-503-1	579.3	525.2	6.0	3.5	1	1
2	IT93K-452-1	588.9	513.2	6.0	2.5	1	1
28	IT97K-494-3	576.3	507.4	6.0	2.5	1	1
37	IT97K-825-14	561.1	457.4	6.5	2.5	1	1
26	IT99K-429-2	539.8	448.5	6.5	1.0	1	1
15	IT00K-835-45	542	443.7	7.0	3.0	1	1
4	IT97K-497-2	398.3	358.9	6.0	2.5	1	1
10	IT97K-390-2	414.3	336.3	7.0	4.5	1	1
45	IT95K-627-34	416.5	320.7	7.0	2.5	1	1
48	IT96D-733	404.1	313.5	6.5	3.0	1	1
44	IT94K-437-1	407	309.6	7.0	2.5	1	1
31	IT98K-205-9	361.5	276.5	5.5	3.5	1	1
1	IT99K-407-8	339.1	274.3	4.5	4.0	1	1
18	IT97K-499-38	363.3	271.3	7.0	4.0	1	1
42	IT97K-1021-24	366.3	270.7	6.5	3.5	1	1
43	IT95T-1090-12	363.5	270.7	5.5	3.5	1	1

ABMV = Aphid borne mosaic virus

Table 3. Yield and yield components of top 20 cowpea lines planted out at Bunda College.

Entry no	no. of pods/ plant	Pod Length cm	Seeds/ pod	Average grain wt per plant (g)	Weight of 100 seeds (g)
46	42	12.72	9	77.79	20.23
21	55	13.9	12	63.25	16.02
20	49	13.84	9	59.68	18.05
2	52	14.25	11	59.50	16.52
23	49	15.25	11	59.37	17.18
38	63	12.97	10	57.99	13.76
6	37	17.02	10	57.83	20.53
48	55	13.58	10	55.57	15.75
13	44	14.16	12	55.11	14.87
37	52	14.2	9	54.22	16.02
19	53	14.31	10	53.10	17.47
10	35	14.57	11	52.78	15.6
5	60	11.47	8	51.96	16.25
1	52	14.47	7	50.97	19.43
34	42	15.6	11	49.43	19.71
22	44	13.01	8	48.40	18.61
52	38	17.84	15	48.22	12.64
36	42	13.59	9	46.88	20.52
18	56	12.04	8	45.57	15.18
16	35	10.5	10	45.53	19.68
8	51	12.2	8	45.27	16.73
32	38	11.08	8	45.21	19.47
45	49	13.89	9	45.02	14.69

3.0: Farmer group formation, capacity building, preference, and studies

3.1 Background

In Malawi, Agricultural Extension is organised in Agricultural Development Divisions (ADD), which supervise activities of Districts. District Agricultural Development Officer (DADO) heads the District Agricultural Office. Within the Districts, service is provided through Extension Planning Areas (EPA's). An Agricultural Extension Development Coordinator (AEDC) manages each EPA. The EPA is subdivided into several operational units called sections. An Agricultural Extension Development Officer (AEDO) mans a section. The ADEO is the frontline development officer and expected to be the delivery vehicle for all forms agricultural related technological information to the farmer. AEDO's also get involved in farmer organisation for various purses, such administration of subsidies, business groups and commodity oriented farmer clubs. Official statistics from government is usually available at section level and above. The two chosen sites are contrasting in climate, economic opportunities, and land holding sizes, as described in the next section of this report.

In order to work with coherent of farmers, groups of farmers were formed and will take part in farmer preference studies, participatory variety evaluation and later scaling out activities, including seed increase and dissemination. l

3.2. Sites for McKnight Cowpea Project Activities.

The research team re-examined statistics for cowpea production and identified Chikwawa and Zomba Districts as the operational districts for the project based on cowpea production statistics. Within Chikwawa, Mbewe EPA was chosen, while in Zomba, Mpokwa EPA was chosen. Details about land area, population structure and cowpea production in the two EPA's in given in Table 4. Table 5 shows statistics on geographical, physical facilities and social composition for Mbewe and Mpokwa EPA in Chikwawa and Zomba District.

Table 4. Land area, population structure and cowpea production in the Mbewe and Mpokwa EPA's in Chikwawa and Zomba Districts, respectively.

No.	Statistic, including units or size	Mbewe EPA Chikwawa	Mpokwa EPA Zomba
1	Total area, ha	111,375	29,272
2	Arable land, ha	29,426	18,932
3	Estate (large commercial farms) owned, ha	10,000	NA
4	Average land holding per family, ha	1.8	0.5
5	Total farming families	18,369	29,891
6	Population	81,795	179,346
7	Cowpea hectarage, District, 2005/06	8,722	2,628
8	Cowpea production, District, 2005/06	3,239	1267
9	Cowpea hectarage, EPA, 2005/06, tonnes	-	-
10	Cowpea production, 2005/06, tonnes	-	-

Table 5: Statistics and information geographical, physical and social facilities for Mbewe and Mpokwa EPA in Chikwawa and Zomba District.

No.	Parameter, including units or size	Mbewe EPA Chikwawa	Mpokwa EPA Zomba
1	Village Headmen	121	262
2	Total Sections	22	17
3	Manned Section	9	11
4	ADMARC Markets	6	2
5	Health Centres (Government and private)	5	4
6	Primary schools	4	NA
7	Secondary School	2	NA
8	Dip Tank	1	NA
9	Crashes	5	NA

NA = Not available

3.3 Farmer Research Groups.

Four farmer groups have been formed' two in each of the EPA's. The groups have been formed with the assitaqnce from both the ADD management, DAO management. For this to happen, Ms CC Mtambo, the lead researcher, organised briefing sessions involving all of the above in March 2007. During the briefing, the project rationale, objectives, workplans and expected outputs were shared with the staff. Staff at all these levels accepted and adopted our proposals to work in the area, and have been rendering their help when called upon. Table 6 presents group size and composition of four groups formed. All groups have same size of 30 and have ladies comprising 70 % or more. When we met all groups, the village headmen were present and they all pledged their support to the groups and their related project activities. All groups have elected leadership comprising a chairperson and vice, secretary and vice, treasurer and four committee members. The next step is to organise training on group dynamics. It is planned that specialists at the District or Division level of the Agricultural Extension System would do this. The training will also include the topic on farming as a business.

Table 6:. Farmer group size and composition.

Basic information	**Group Identity**			
	Mbewe EPA Chikwawa District		Mpoka EPA Zomba District	
	Group 1	Group 2	Group 1	Group 2
Total Membership	25	30	30	30
Male membership	15	5	8	8
Female membership	10	25	22	22
Village name	Mulangeni	Faraoh	Chibisa	Khuvinda
Section name	Alumenda	Mandarade	Somba	Bokosi
Group name	Chikondi Club	Faraoh	Mgwirizano	Mwaiwathu

3.4 Preliminary farmer feed back – shaping the project strategic approaches

The research team had opportunity to meet with the groups on April 4 and 5, 2007. The team explained to the groups the details about the project, in particularly that will inform the farmers or impact on them. These included the facts that they will be involved in preference studies, variety evaluation, seed increases and problem identification. In turn, farmers had a chance to present their expectations from the project. They also presented some of their current production problems, summarised in Table 7.

Table 7. Major constraints and current trends in cowpea production by farmer group

Group identity	Constraints and current trends in cowpea production
Chikondi Club, Mbewe EPA	Drop in cowpea growers due to beetle aphids and virus diseases attack. Market problem also existed. Farmers do not recall seeing Alectra in their fields. Farmers expect project to solve their pest, variety and market problems.
Faraoh Club, Mbewe EPA	Similar to Chikondi Club
Mgwirizano Club, Mpokwa EPA	Drop in cowpea growers to stingy ants and some beetle, aphids and virus diseases problems. Farmers expect project to solve pest and marketing problems. Some farmers have seen Alectra in their fields. Maize is main crop with cowpea, groundnut, pigeon pea and others area grown in intercrop.
Mwaiwathu Club	Similar to Mgwirizano Club

The simple matrix above shows that *Alectra* may not be a top ranking constraint in cowpea production in both areas. It may be difficult to find a variety resistant or tolerant to all the biotic stresses. Hence, it would be important for the project to link up well with entomologists to find systemic seed dressings that may prevent aphid and stingy ants, or use of botanicals for grain preservation. This information would be incorporated in the planned training on *Alectra* biology. Since use of pesticides cannot be avoided, training on farming as a business is important, to orient farmers to the culture spending to make more money. In addition, to stimulate participation and anticipation, it may be a good idea to furnish clubs with seed of current recommended varieties so that they can benefit from improved varieties right away, and practice being organised growers and traders.

3.5 Farmer training on group dynamics

Farmer group training was conducted for farmers in Zomba District and in July for Farmers in Chikwawa.

3.6 Farmer training on cowpea production and Alectra biology

This activity will take place in October 2007. In the mean time training material are being prepared. This training will cover all aspects of cowpea production, including cowpea production, disease and pest management (including *Alectra*), and will share with farmers the results of the preferences study. The training will also equip farmers with skills to evaluate varieties planted on plots, which they be managing during the season.

4.0: Student involvement.

Apart from the MSc student, a BSc project student is studying the biomass production of cowpea lines. Mr E. Mazuma from Chitedze Research Station supplied these lines. The idea is to find lines that can be used as green manures as well as be good yielder. In addition, some correlation and regression of leaf mass and canopy width will be done to establish an easier way of estimating biomass. In August 2007, one student has accepted

to study the rotational effects of these lines on maize production and another to screen them for *Alectra* resistance using the top ten entries with and without *Alectra* infestation.

ANNEX 4: Research undertaken in UK

1: Introduction

A pot trial was undertaken at the University of Bristol, Fenswood Farm glasshouse in UK, to examine the responses of a range of cowpea lines, one groundnut and one bamabra groundnut to accessions of *Alectra vogelii* from East and Central Africa. The objective was to check for any variation in the patterns of response of the legumes to parasite samples collected from different locations. Geographic differences in the host range of *A. vogelii* and of virulence on different cowpea genotypes are known to exist (Riches et al. 1992). Parasite variability could complicate the choice of resistant parents to be used in resistance breeding aimed at producing improved cowpea cultivars for East and Central Africa.

2: Methods

Fourteen cowpea lines, including cultivars that are widely grown in Malawi and Tanzania and lines previously shown to be resistant to both *A. vogelii* and *Striga gesnerioides* in West Africa were supplied by IITA and research departments in Malawi and Tanzania. These were raised in pots in soil infested with one of 6 samples of *A. vogelii.* Five had been collected from cowpea fields in Tanzania and one from groundnut in Malawi. Although care was taken to add the same volume of parasite seeds to the soil of each pot, no germination test was carried out and no attempt was made to provide equal numbers of viable seeds. Little development of the parasite accession collected at Isman Iringa (Tanzania) in 2006 was observed even on Blackeye, the susceptible control, so results are only considered for the remaining five *A. vogelii* accessions. The trial was sown on 21st May and final results collected at 84 days after sowing.

3: Results

Cowpea cv. Blackeye and all the cultivars that are widely grown in Malawi (Sudan and IT82-E-16) and Tanzania (Vuli 1, Vuli 2, Fahari and Tumami) were confirmed as susceptible to all accessions of *A. vogelii* (Table 1). They all supported large numbers of emerged parasite stems indicating that the conditions of the trial were adequate for screening for *A. vogelii* susceptibility. Three cowpeas, IT81D-994, B301 and IT97K-499-38 did not support the emergence of any of the five parasite accessions under the conditions of the trial. Very small parasite attachments (stems less than 5 mm in length) were observed on the roots on IT81D-994 in at least one replicate pot infested by all parasite accessions. Un-emerged parasite attachments only developed on B301 and IT97K-499-38 from the *A. vogelii* sample collected in Malawi. The longest subterranean shoots on these lines were 25 and 60 mm respectively and it is possible that these may have emerged had the trial been run for longer. IT97K-499-35 supported the emergence of *A. vogelii* from Bihawana in Tanzania and from Malawi. The low fresh weights of parasite stems demonstrate that development of the parasite on this line was limited. Un-emerged attachments of all accessions were seen on the roots of this line. IT98K-205-8 was only fully susceptible (i.e. supported parasite emergence) to *A. vogelii* from Malawi.

All parasite accessions emerged on IT99K-573-2-1 with the exception of those form Bihawana and Hombolo.

Only one stem of *A, vogelii* from Msungua in Tanzania emerged on one groundnut plant in the trial. CG7, the cultivar used in the trial, was not attacked by parasite samples from Mongu or Hombolo in Tanzania, but underground development was observed for samples from Bihawana and Malawi. It was only for the accession collected from groundnut in Malawi that large numbers of unemerged parasites were found on CG7 and these had shoots up to 32 mm long. There was no development of *A. vogelii* on the bambara line tested in the trial.

4: Implications

4. 1: Variation in A. vogelii: The data suggest that parasite sample from Malawi may be different from the others. This was collected from plants parasitizing groundnut. It was the only one to develop large numbers of attachments on groundnut AND was the only host in the trial that also allowed some development of B301. Although variability has previously been shown in the parasite susceptibility of groundnut lines, Riches et al. (1992) concluded that susceptible cultivars are likely to be attacked throughout the range of *A. vogeli*. In that study a sample of *A. vogelii* from groundnut collected from Chitedze in Central Malawi emerged on both B301 and a number of groundnut lines. B301 was shown to be resistant to samples of the parasite from West Africa and from some locations in East and southern Africa. Tanzania appears from the current study to be among these. There is no published information on the susceptibility of groundnut CG 7 to *Alectra* and further work with a greater number of groundnut lines is needed with samples from Tanzania and from a greater range of sites in Malawi.

Bambara TVSU 870 had previously been shown to be resistant to *A. vogelii* from Malawi and Kenya and should be tested further in infested fields in Tanzania.

4. 2: Sources of resistance to *A. vogelii*:

The trial provides evidence of two sources of resistance in cowpea to *A. vogelii* from Malawi and Tanzania. These have previously been widely studied in West Africa for resistance to both *A. vogelii* and *S. gesneoides*:

- B301 and lines derived from this by the breeding programme at IITA, including IT97K-499-35, IT97K-499-38 and IT98K-205-8 (Singh et al., 2006);
- IT81D-994 (Singh, 2002).

Of particular importance is that these two sources provide different resistance genes. The single dominant gene conditioning resistance to *Alectra* in IT81D-994 is different to the two duplicate dominant genes in B301 (Atokple et al., 1995). B301 along with IT90K-59 and IT90K-76, two lines derived from B301, supported the emergence of *A. vogelii* from the Blantyre/Shire Highlands of Malawi in pot trials (Mainjeni (1999). Data from the current trial also show emergence of the parasite from Malawi on B310 derived lines (e.g. on IT97K-499-35). IT81D-994 may therefore provide a better source of resistance for Malawi.

IT81D-994 is also a good source of resistance for the accessions of *A. vogelii* collected form Tanzania. However, lines derived from crosses using B301 as a parent also appear to offer useful sources of resistance for Tanzania. IT97K-449-38 looks particularly promising as no parasite stems developed on the roots of any plants challenged with *A. vogelii* from any location in Tanzania.

5.0: References

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Table 1: Response of 14 cowpea, one groundnut and one bambara groundnut lines to five accessions of *A.vogelii*. Mean number and fresh weight per pot of emerged A. *vogelii* stems (± S.E.) at 84 days after sowing. For cowpea lines with no emerged *A. vogelii* the number of unemerged parasite attachments is shown with the length of the longest unemerged parasite stem in brackets. No standard errors are shown when there were less than three pots per cowpea/*A. vogelii* combination.

	Alectra accession								
	Msungua (Tanzania)			Mongu (Tanzania)			Hombolo (Tanzania)		
Line	**Emerged**	**Fresh wt.**	**Un-emerged**	**Emerged**	**Fresh wt.**	**Un-emerged**	**Emerged**	**Fresh wt.**	**Un-emerged**
B301	0	0	0	0	0	0	0	0	0
IT81D-994	0	0	1 (5)	0	0	1.7 (5)	0	0	3 (19)
IT97K-499-38	0	0	0	0	0	0	No plants		
IT97K-499-35	0	0	3.6 (30)	0	0	4 (8)	0	0	4 (60)
IT98K-205-8	0	0	0.5 (15)	0	0	0	0	0	1 (11)
IT99K-573-2-1	3	0.7	-	0.3	0.05	-	0	0	31 (11)
Blackeye	14.7 ± 4.3	4.1 ± 2.1	-	13.3 ± 0.9	2.8 ± 1.2	-	15.7 ± 4.1	5.0 ± 0.7	-
Vuli 1	8.3 ± 2.6	0.54 ± 1.8	-	6.6 ± 2.0	1.4 ± 0.2	-	10.7 ± 3.8	1.2 ± 1.3	-
Vuli 2	14.7 ± 4.8	2.5 ± 0.5	-	5.3 ± 2.6	2.6 ± 1.9	-	15.3 ± 3.9	2.6 ± 0.5	-
Fahari	4.7 ± 1.3	1.2 ± 0.7	-	4 ± 2.3	0.4 ± 0.4	-	11.7 ± 1.2	2.9 ± 1.2	-
Tumami	9.7 ± 1.5	3.2 ± 1.7	-	8.7 ± 5.4	1.8 ± 1.2	-	12.3 ± 1.9	2.9 ± 0.9	-
Sudan	5.3 ± 1.8	1.8 ± 1.3	-	3.5	0.7	-	9.7 ± 1.9	1.5 ± 0.2	-
B305D	8.7 ± 3.3	1.7 ± 3.3	-	4.3 ± 3.4	0.2 ± 0.2	-	8.7 ± 2.8	2.1 ± 1.0	-
IT82-E-16	17.6 ± 3.8	3.4 ± 1.1	-	6.3 ± 2.0	3.4 ± 1.6	-	8.3 ± 0.9	2.5 ± 0.6	-
CG7	0.3 ± 0.3	0.03 ± 0.03	0	0	0	0	0	0	0
TVSU 870	0	0	0	0	0	0	0	0	0

Table 1 continued.

	Alectra accession					
	Bihawana (Tanzania)			Malawi (ex Groundnut)		
Line	**Emerged**	**Fresh wt.**	**Unemerged**	**Emerged**	**Fresh wt.**	**Unemerged**
B301	0	0	0	0	0	0.7 (25)
IT81D-994	0	0	4 (11)	0	0	5.3 (15)
IT97K-499-38	0	0	0	0	0	4.5 (60)
IT97K-499-35	0.3 ± 0.3	0.4 ± 0.4	-	2 ± 1.5	0.7 ± 0.5	-
IT98K-205-8	0	0	1 (43)	1	0.12	-
IT99K-573-2-1	0	0	12 (5)	1.6 ± 1.2	4.1 ± 2.6	-
Blackeye	12.5	4.5	-	9.3 ± 4.7	2.7 ± 1.6	-
Vuli 1	11.3 ± 3.3	4.2 ± 1.5	-	10.3 ± 1.6	3.9 ± 1.2	-
Vuli 2	11 ± 6.7	3.8 ± 2.2	-	9.3 ± 3.4	3.0 ± 1.1	-
Fahari	11.7 ± 2.8	1.6 ± 2.4	-	16 ± 3	6 ± 1.8	-
Tumami	9.3 ± 2.7	1.8 ± 2.7	-	15 ± 1.0	4.7± 1.4	-
Sudan	8.7 ± 2.9	3.3 ± 1.0	-	7.7 ± 7.7	1.9 ± 1.9	-
B305D	5	1.5	-	7.3 ± 2.3	3.0 ± 2.6	-
IT82-E-16	9 ± 1.5	2.9 ± 0.1	-	15.7 ± 3.5	5.9 ± 2.5	-
CG7	0	0	0.7 (2)	0	0	11.3 (32)
TVSU 870	0	0	0	0	0	0

Development and promotion of *Alectra* resistant cowpea cultivars for smallholder farmers in Malawi and Tanzania

McKnight Foundation Collaborative Crops Research Project No: 06-741

Project leader: Dr AM Mbwaga, ARI Uyole, Tanzania.
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Team report for 2006 to 2007

Team activities

Representatives of project partner institutions met in Mbeya Tanzania on 13th to 15th December 2006. Nine members of staff attended the meeting from research, district council extension departments, an NGO -INADES and Sokoine University of Agriculture (SUA) in Tanzania. Four participants from Malawi represented Bunda College, government and extension departments. Staff from the International Institute of Tropical Agriculture and the Natural Resources Institute, UK also participated. This project inception meeting was convened to allow staff from the various collaborating institutions to meet, familiarized themselves with the project and to agree the detailed work programme and allocation of tasks. A report of the inception meeting (*Development and promotion of Alectra resistant cowpea cultivars for smallholder farmers in Malawi and Tanzania: Project Inception Meeting in Mbeya, Tanzania, 13-15th December 20006)* was compiled and has been circulated to all project partners. This included a review of project outputs and details of the activities that were agreed by the meeting. Criteria for monitoring and evaluation of the project were also agreed.

Following the meeting, both of the national teams received 50 cowpea-breeding lines for screening from IITA. Seed was also provided to NRI, for trials work in UK by IITA and national programmes in Malawi and Tanzania.

Partners also decided to provide graduate and post-graduate training opportunities for students at SUA and Bunda College. Subsequently one master's research project has been initiated at each university with two undergraduate projects at Bunda College.

Insights and lessons learned

The inception meeting provided an opportunity for team members from each partner institution to get to know each other and to decide roles and responsibilities. An effort was made to agree monitoring and evaluation criteria and further work is now needed to put on-going monitoring in place. This will be reviewed when the team meets in Lilongwe in September. Plans have also been made to visit trial sites in both countries during the 2008 crop season.

Development and Promotion of *Alectra* resistant cowpea Cultivars for smallholder farmers in Malawi and Tanzania

McKnight Foundation Collaborative Crops Research Project No: 06-741
Mbwaga et al, Uyole Agr. Research Institute
September 2007

Introduction: Cowpea (*Vigna unguiculata*) is a crop of major importance to the nutrition of poor rural households in the drier and sub-humid regions of Eastern and Southern Africa, where diets tend to be overly reliant on starchy foods such as millet, sorghum, maize and cassava. Cowpea grain is an inexpensive, high quality source of protein and its vitamin-rich leaves are eaten as spinach. Women particularly value cowpeas, which help them to bridge the "hunger months" prior to the main cereal harvest also it adds cash to the household after selling the grain and dried leaves.
On-farm cowpea yields are extremely low, averaging 319 kg/ha in Tanzania and 388 kg/ha in Malawi. Use of late maturing cultivars, low plant density and insect damage are widely recognized as important constraints to improved cowpea production under on-farm conditions. Less well appreciated is the growing importance of the parasitic weed *Alectra vogelii*, which attaches itself to the roots of cowpea plants and interferes with the plants' ability to obtain water and nutrients. Recently-released improved cowpea cultivars that are earlier maturing and more tolerant of key insect pests and diseases are especially susceptible to *Alectra* attack, experiencing up to 50% yield reductions.

Cowpea field severely infested by *Alectra vogelii in Dodoma Tanzania*

A. vogelii is widespread from the Northern Province of South Africa, through Central Africa to Kenya and across West Africa to Mali. In Tanzania, *A. vogelii* is common in Mwanza, Shinyanga, Dodoma, Iringa and Ruvuma regions, while in Malawi, it is common in Lilongwe, Dowa and districts in central Malawi, the lower lying, drier areas of the southern region and the Blantyre/Shire Highlands

The overall goal of the project is to improve cowpea productivity on *A. vogelii*-infested land in Malawi and Tanzania by introducing *Alectra* resistance into cowpea cultivars that are also early-maturing, pest and disease tolerant and high-yielding under on-farm conditions. The specific objectives include
1: development of high yielding *A. vogelii* resistant cowpea cultivars and 2: promotion of high yielding *A. vogelii* resistant cowpea cultivars in both Malawi and Tanzania

The activities undertaken by the project 2006/07 season.

Cowpea Germplasm collection:

For Tanzania a total of 236 cowpea accessions were collected during the current season of which 50 from IITA Nigeria, 33 and 17 from Ilonga and Bihwana Agricultura Research Institutes respectively, and 30 from National Plant Gernetic Resource Centre (NPGRC). From farmers in the project areas 106 land races were collected These are being increased and screened at Ilonga for *Alectra* resistance. In Malawi fifty lines were received from IITA and they have been planted at Chitedze Research Station in un-replicated plots for seed increase and characterisation. Two local checks, ITD86-1 and Sudan have been included in these studies giving a total of 52 accessions.

Enhancing Capacity of cowpea farmers, especially women

In Tanzania sensitization and farmer group formation was conducted in three districts of Singida (2 villages), Dodoma urban (2 villages) and Iringa (2 villages)**:** This activity aimed at introducing the project idea, raising farmers' awareness, assessing the status of existing groups and building their interest in improving cowpea production. The total number of farmers from these 6 farmer groups is 167 of which 75 are women and 92 are men. The groups have been established between 2004 and 2006.

In Malawi Chikwawa and Zomba were identified to be the operational districts for the project. Chikwawa is the biggest producer of cowpea in terms of both hectarage and production. Zomba is one of the top four producers of cowpeas in Malawi. District level extension staffs have been identified and are assisting with identifying villagers and potential groups. The composition of four farmer research groups formed in Malawi, 89 are women and 36 men making a total of 115 members.

The intervention undertaken included ~~of~~ training farmers on aspects of *Alectra* biology and how it affects cowpea plant growth and development. A situational analysis was conducted with farmer groups to allow members to appreciate their situation, problems and challenges with regard to cowpea production, utilization, marketing and group development. This led to a strategy for participatory research and technology development process which will involve farmers, researchers and other stakeholders. Farmers have realized their situation and they are ready for a change in the six target project sites in Tanzania and four in Malawi.

Capacity building through students' research

One student has enrolled for MSc (Agricultural Economics) at Sokoine University of Agriculture and has developed a proposal titled: "*Assessment of production, marketing and consumption of cowpea in Tanzania: A case study of selected regions in Tanzania*". He will be supervised from the Department of Agricultural

Economics and Agribusiness. The same topic is also being addressed by a Masters student in Malawi at Bunda College, University of Malawi. Here, a BSc project student is also studying the biomass production of cowpea lines.

Farmer's preferences for cowpea
During germplasm collection farmers reported that cowpea to has many uses including as food, as a cash crop, animal feed and for increasing soil fertility. Farmers prefer high yielding cowpea varieties from which green leaves can be harvested for a longer period fro spinach, that have soft large seeds that are white to cream colour, and are resistant to pests and diseases. These traits need to be selected for when breeding *Alectra* resistant cowpea varieties.

Screen cowpea accessions for *Alectra* resistance:
From Malawi 5 accessions (IT99K-7-21-2-2, IT99K-494-6, IT99K-1060, IT97K-820-18, and IT03K-378-4) recorded zero emergence of *Alectra* throughout the 98 days of evaluation, which may suggest resistance. From Tanzania out of 130 accessions, 10 accessions showed zero emergence of *Alectra vogelii*. These included IT96D-733, IT00K-1207, IT89KD-288, IT99K-7-21-2-2, IT97-818-35, IT97K-499-8, IT99K-573-1-1, IT97-497-2 with origin from IITA Nigeria, TZA-256 from National Plant Genetic Resource Centre -Arusha (NPGRC) and B301 originating from Botswana. Accession IT99K-7-21-2-2 has shown to have zero *Alectra* emergences in both countries Malawi and Tanzania.

Future activates:
Once the resistance identified to date has been confirmed, lines will be selected for multiplication and testing in on-farm participatory variety selection with farmer research groups. Resistant parents will also be selected for use in a breeding programme.