



**CROP PROTECTION PROGRAMME**

**Improving farmers' access to and management of disease resistant cultivars in the Southern Highlands of Tanzania  
– Phase 2**

**R 8406 (ZA 0634)**

**FINAL TECHNICAL REPORT**

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## Acronyms and Abbreviations

ADP Mbozi	Agricultural Development Programme Mbozi Trust Fund
AMSDP	Agricultural Marketing Sector Development Programme
ARI	Agricultural Research Institute
ASDP	Agricultural Sector Development Programme
ASPS	Agricultural Sector Programme Support
CPHP	Crop Post Harvest Programme
CPP	Crop Protection Programme
CSC	Council Standing Committee
DADS	District Agricultural Development Strategy
DAEO	District Agricultural Extension Officer
DALDO	District Agricultural and Livestock Development Officer
DC	District Commissioner
DE	District Economist
DED	District Executive Director
DFID	Department for International Development
DFT	District Facilitation Team
FAO	Food and Agriculture Organisation
FCM	Full Council Meeting
FFS	Farmer Field School
FIPS	Farm Inputs Promoters
GLS	Grey Leaf Spot
GTZ	German Technical Cooperation
HSG	Highland Seed Growers
IFAD	International Fund for Agricultural Development
INADES Tz	Institut Africain pour le Developpment Economique et Social, Tanzania
MAFS	Ministry of Agriculture and Food Security.
MATI	Ministry of Agriculture Training Institutes
M&E	Monitoring and Evaluation
MIICO	Mbozi ADP Trust Fund, Ileje Rural Development Trust Fund, ADP Isangati Trust Fund Consortium
MIP	Maize Improvement Programme
MP	Member of Parliament
MSV	Maize Streak Virus
NGDO	Non Governmental Development Organisation
NGO	Non Governmental Organisation
NRI	Natural Resources Institute, UK
OPV	Open Pollinated Variety
PADEP	Participatory Agricultural Development and Empowerment Programme
PHS	Plant Health Services
PRA	Participatory Research Action
PRA	Participatory Rural Appraisal
PRSP	Poverty Reduction Strategy Paper
PS	Permanent Secretary
QDS	Quality Declared Seed
RAA	Regional Agricultural Adviser
RAS	Regional Administrative Secretary
RC	Regional Commissioner
RFSP	Rural Financial Services Programme
SACCOs	Savings and Credit Cooperative
SAPS	Structural Adjustment Programme
SEAGA	Socio Economic and Gender Analysis Programme
SH	Southern Highlands, Tanzania
SHZ	Southern Highlands Zone
SSA	Sub Saharan Africa
SUA	Sokoine University of Agriculture
SWOT	Strengths, Weaknesses, Opportunities and Threats
TARP II	Tanzanian Agricultural Research Programme Phase II
TFA	Tanganyika Farmers Association
TOSCI	Tanzania Official Seed Certification Institute
TPRI	Tropical Pesticides Research Institute
UH	Uyole Hybrid
URT	United Republic of Tanzania
USAID	United States of Agency International Development
VAEO	Village Agricultural Extension Officer
VETA	Vocational Education and Training Association
WDC	Ward Development Council
ZRELO	Zonal Research and Extension Liaison Officer

## Executive Summary

The 'Improving farmers access to and management of maize seed in the Southern Highlands of Tanzania – Phase 2' project began in April 2005 and followed on from project R8220 when DFID decided to extend its RNRRS research programmes for a further year. The project was funded by the Crop Protection Programme for a ten-month period and a total value of £69,997.

The project purpose was to validate and promote strategies developed within R8220 to reduce the impact of disease and improve quality and yield of maize in High Potential cropping systems for the benefit of poor people in the Southern Highlands (SH) of Tanzania. In particular, this included: promoting Grey Leaf Spot (GLS)-resistant maize OPV and hybrid varieties (including UH6303 developed within R8220) already identified in variety demonstration plots more widely in the R8220-targeted districts (Iringa, Njombe, Mbarali and Mbozi) and in the SH generally; validating a Maize Streak Virus (MSV)-resistant version of UH6303; and promoting training tools developed by R8220 in the districts. The project ran simultaneously with a sister project funded by the DFID Crop Post Harvest Programme which explored how to improve farmers and other stakeholders' access to information, training and products for maize systems in the SH.

This collaborative project was led by Dr Nick Lyimo of ARI Uyole, in collaboration with the district council agricultural extension officers for Mbozi, Mbarali, Iringa and Njombe districts, other ARI Uyole researchers and researchers from the UK's Natural Resources Institute.

The two project outputs were:

*Output 1. Disease resistant maize varieties appropriate to farmers' needs and adapted to local conditions validated by and promoted to farmers and other stakeholders.*

*Output 2. Further approaches for improving access to and management of quality seed by farmers validated and more widely promoted.*

The maize variety demonstration plots (begun during R8220) were continued for the 2004/05 season at 80 sites in four districts, then during the current 2005/06 season were condensed to focus not only on new maize hybrid entries with high tolerance to the maize streak virus (MSV) disease but also on different districts of Rungwe and Mbeya rural as well as continuing the search for OPVs with MSV tolerance in the irrigated MSV hot spot areas of Mbarali district. The new improved varieties, particularly the hybrids, continued to exhibit higher grain yields than local cultivars in most locations, and both UH615 and UH6303 seed are now in high demand from farmers in the Southern Highlands. Both these varieties have also recently been approved for release in highland areas of Uganda. The superior MSV tolerance of the 'new' UH6303 versions was clearly demonstrated in Rungwe and Mbeya rural districts this season. The Mbarali OPV trials are yet to be harvested.

District and zonal maize promotional strategies were developed by the respective extension staff and the zonal research and extension liaison officer. The project supported farmer and other stakeholder maize variety and agronomy field days at the demonstration sites in all four districts. Meetings have been held with the District Executive Directors offices in the four focal districts, three of whom pledged financial and human support in terms of producing additional copies of the range of Swahili language maize information leaflets produced by the project and continuing the village based demonstration plot maize variety activities. A local seed company Highland Seed Growers Ltd and the Regional Agricultural Advisors agreed to support maize variety demonstration activities in Ruvuma and Rukwa regions. In November 2005 a SH Maize Innovation Systems Stakeholder workshop was held at which the outputs of these projects were shared, discussed and key outstanding issues agreed on by a wide range of key stakeholders.

The project's outputs have already contributed to the realisation of the project's goal which is livelihoods of poor people improved through sustainably enhanced production and productivity of RNR systems, by: raising farmers and other stakeholders' awareness and experience of new high yielding and disease resistant varieties; supporting the development of a public-private partnership agreement between Highland Seed Growers Ltd and ARI Uyole Maize Improvement Programme; developing new MSV tolerant lines and hybrids; and developing, testing and promoting a range of maize production and disease management leaflets.

## Background

Maize is the most important food crop in Tanzania. This staple food accounts for 60% of dietary calories as well as up to 50% of utilisable protein for the majority of the Tanzanian rural population. It is the most widely cultivated crop in the country, covering about 45% of the area under annual crop cultivation in Tanzania. For national food security, maize is the most important crop in alleviating hunger. Although maize is such a widely cultivated crop, the Southern Highlands (SH) of Tanzania (comprising Iringa, Ruvuma, Mbeya and Rukwa regions) provide the most favourable climatic conditions for the production of maize. Currently, the SH account for almost 50% of the total national maize production and up to 90% of the annual purchase of maize for the national strategic grain reserve is normally done in the SH. Although maize plays such an essential role in the livelihoods of people in the SH (as well as consumers outside the zone), changes with major implications for peoples' livelihoods have been taking place. These include shocks such as *EL Nino*, trends such as increasing population, declining soil fertility and changing policies (e.g. structural adjustment programmes (SAPs) aiming to reduce the role of the state and enhance the influence of markets resulting in eg the removal of subsidies on inputs, reduction in the number of public sector workers ) and institutions (public sector research and private seed companies) – Moshi et al 1997. These occur against a background of persistent crop (e.g. stemborers) and storage pests and diseases (e.g. *Maize Streak Virus* (MSV)).

Poor access to quality seed by farmers has been a major constraint for a long time, both during the 20+ years monopoly of the national seed company, TANSEED and since. During this period, inefficiency and poor management limited its ability to operate a seed system capable of sustaining farmers' requirements for good quality seed. Most of the certified seed, which was marketed through a limited distribution network, had been of questionable purity and in many cases exhibited unacceptably low rates of germination. In response, farmers rejected this enterprise by gradually dis-adopting virtually all types of certified seed marketed by TANSEED, consequently leading to its collapse by 2002. This situation severely disrupted the certified seed system, encouraging unscrupulous traders to resort to marketing fake or un-adapted seed, consequently plunging poor farmers into deeper trouble and making them lose faith further in the so-called improved seed. Subsequently, private seed companies, both international and [increasingly] local, have entered the Tanzanian seed market. With respect to seed of improved maize varieties, there has been a significant increase in price and a subsequent decline in returns to the crop. Farmers appear to have adapted their livelihood strategies in response by e.g. growing a larger area of maize to compensate for a decline in fertilizer use, switching to other crops, reducing the amount of improved certified seed purchased and making greater use of re-cycled seed. The outcome has varied, but for many still dependent on maize, the returns from the crop have declined, with implications for people's financial situation (e.g., less money to purchase inputs, possibly unable to support children going to school). The current situation is still associated with a lack of trust or confidence held by farmers in improved crop varieties from seed companies and other institutions dealing with seed distribution.

There have been a number of community-based maize seed initiatives in Eastern and Northern Zones of Tanzania. The ASPS [Agricultural Sector Programme Support] Seed Unit and TOSCI [Tanzanian Official Seed Certification Institute] have made significant progress in developing a protocol for local production of 'quality declared seed' [QDS], i.e., seed produced by a registered seed producer which conforms to minimum standards and subject to quality control measures. Elsewhere, under project R7429, Ugandan farmers learnt about the principles of seed management and successfully multiplied seed of the MSV-resistant maize variety Longe 1 using a village-based system. Previous DFID-, FAO- and GTZ-funded work had also developed acceptable on-farm seed and grain pest management practices in East, West and Southern Africa. The pre- and post-harvest protection of seed determines a) whether it carries inocula of various pests and diseases and b) seedling vigour, essential for good establishment in the face of weeds and other adverse biotic and abiotic factors.

A new and extremely destructive foliar disease of maize was reported in Ruvuma region during the 1995/96 season. A crop loss assessment carried out in the major maize producing areas of this region during the 1996/97 season indicated that the disease, causing grain yield losses ranging from 15 to 40% had affected some 61,869 hectares of maize. This "new" disease was later identified and confirmed to be Grey Leaf Spot (GLS), a serious foliar disease caused by the fungus *Cercospora zeae maydis* Tehon and Daniels. By mid-1998, the disease had spread to all four regions comprising the SH, and all local cultivars as well as most of the commercial maize varieties under cultivation across the zone during that season succumbed to the disease. During epidemics, MSV can also cause up to 80% loss in maize grain yield; instances of even complete crop loss are not uncommon in some parts of the SH. This disease is a particularly serious problem in irrigated maize and where maize is grown out of season. In the intermediate altitude maize growing parts of the SH, up to 43% of sample farmers identified MSV as a serious constraint on maize production. Promotion of some maize cultivars in some parts of the country has been unsuccessful because of their susceptibility to this disease.

Seed, one of the key inputs/ assets, is particularly important to crop protection as it determines the genetic resistance of the crop to pests and diseases. The Maize Improvement Programme (MIP) at Uyolet Agricultural Research Institute commenced a massive screening and evaluation of both local and exotic commercial and pre-commercial maize varieties and inbred lines for GLS tolerance during the 1997/98 season. The MIP quickly identified promising parental materials and initiated their seed increase so as to facilitate the formation of new GLS-tolerant maize varieties. Around this point [2002], the first phase of the CPP-funded project on 'Improving farmers' access to and management of disease resistant cultivars in the Southern Highlands of Tanzania' [R8220] was initiated in the SH by the MIP and partner organisations. This project targeted four districts in the SH, namely Njombe, Iringa, Mbarali and Mbozi. Evaluation of the GLS-tolerant germplasm both on-station and on-farm in these districts confirmed the superiority of several potential new maize hybrids one of which was officially released during the 2000/2001 season under the name UH615. A further GLS-tolerant hybrid, UH6303, was released during December 2004, close to the end of R8220. Other MSV-tolerant (but not GLS-tolerant) OPVs were also available, e.g., Staha and TMV1 but variety trials conducted by R8220 in Mbarali district had found that this tolerance was inadequate under the very early and severe MSV disease occurring in irrigated areas, where vectors and disease are maintained year-round. In particular, the irrigated area at Igomelo village was identified as a 'hotspot' for MSV spread. This enabled intensive screening for MSV tolerance and the identification of a source of particularly strong MSV tolerance (Gibson *et al.*, 2005).

The Iringa Stakeholder Workshop (held in July 2003) identified opportunities to improve certified, QDS and farmer-saved seed systems. Following this workshop and the validation of several new maize cultivars through 80 village-based demonstrations, private seed companies expressed interest in facilitating access for farmers to some of those varieties validated through these village-based demonstrations in the SH. These companies were also interested responding to farmers request for making seed more accessible to them by packaging it in small, more affordable pack sizes.

Training needs were also identified with farmers and other stakeholders both by surveys across the four districts and at the Stakeholder Workshop. Farmers expressed demand for information/training at all stages of the crop cycle. With regard to seed management, demand related to modern (e.g., information on new varieties) and local varieties (e.g., understanding differences between hybrids, OPVs and landraces; methods for improving farmers' own seed). Insect and disease management training needs included diagnosis and management information using both industrial pesticides and botanicals. Soil management featured highly and there was a high demand for information on both inorganic and organic methods of enhancing fertility. In response, training leaflets were developed to: help farmers and other stakeholders diagnose disease and soil deficiency symptoms; understand MSV disease; better manage their own open pollinated seed varieties, soil fertility and the different stages of their maize crop. These training tools which have been being promoted through this project and the sister CPHP funded project R8422 include:

- Open pollinated maize varieties: hints on seed management and variety maintenance for small farmers.
- Ugonjwa wa milia kwenye mahindi (Maize streak virus information sheet)
- Kanuni Za Kilimo Bora Cha Mahindi. (Agronomic Recommendations for Maize Production)
- Matumizi ya Mbolea Katika Kilimo Bora Cha Mahindi (Fertilizer practices for maize production)
- Kuwa Daktari Wa Mahindi Yako (Be your Own Maize Doctor: A guide towards nutrient deficiency and foliar disease symptoms in maize production)

During a mini-workshop held in July 2004, with strong representation from district agricultural and livestock department officers (DALDOs) within the target districts the demand both for seed of improved varieties and the promotion of these training tools was confirmed.

<b>Group</b>	<b>Evidence for demand</b>
Farmers	<ul style="list-style-type: none"> <li>– Demand for improved maize seed in affordable packages (District reports, Agricultural Sector Programme Support (ASPS) – Seed Unit Reports; Stakeholder Workshop Proceedings (2004); IPR Reports of ARI-Uyole;</li> <li>– Demand for training in seed management (SUA MSc thesis 2004 by P. Nickson; Farmer seminar reports 2003/4, Project M&amp; E reports)</li> <li>– Demand for knowledge/assistance on improvement of soil fertility (Situation analysis rpt)</li> </ul>
Extensionists	– Updated training materials/tools requested: DALDOs' reports; personal comm. by 4 DALDOs
NGOs	– Demand for seed management training tools: ADP-TF Progress/evaluation reports; INADES reports; CARITAS reports
District councils	<ul style="list-style-type: none"> <li>– Donor-funded projects: ASPS – Seed Unit reports; DADS reports</li> <li>– Donor requests, e.g., to USAID</li> </ul>
Stockists/seed & fertiliser companies	– Demand for training: Stakeholder Survey Report 2004; Stakeholder Workshop Proceedings 2004.
Policymakers in ministries	– Demand for farmer training etc esp. on fake seed: DRD's closing remarks to Stakeholder Workshop, 2004; IRA Report, 2004
Training institutes	<ul style="list-style-type: none"> <li>– Demand for updated information: (Ref. ARI-Uyole researchers (pers. Com.))</li> <li>– Demand for new training manuals: (Ref. ARI-Uyole researchers (pers. Com.))</li> </ul>
Other institutions	– Demand for updated information: ARI-Uyole/SUA request for collaboration on GLS; Selian/ARI-Uyole request on GLS/MSV breeding approach

A small linked proposal aiming to add value to R8220 by addressing the above demands was developed by the project team and supported by the CPP. It aimed to, as necessary, develop further, validate and promote these outputs both within the districts targeted by R8220 and more widely. It planned to achieve this by utilising the knowledge of, and partnerships developed with, both public and private sector maize stakeholders developed during R8220 including local seed and/or fertiliser companies and stockists and NGOs such as INADES and ADP-TF. The proposal aimed to benefit farmers, various service providers and, indirectly, maize consumers throughout the region (as indicated in the table below).

<b>Benefiting group</b>	<b>How benefits will be achieved</b>
Farmers	Access to better seed, better production practices and knowledge broadly will result in more productive crops leading to more secure food supplies and/or increased profit
QDS* farmers	Information on how to maintain seed better
Extensionists	Access to training materials and information generally; improved links to scientists
CBOs**	Access to training materials and information generally
NGOs	Access to training materials and information generally
Researchers	Improved links to extensionists and farmers ensuring their research remains relevant

	<i>and is used</i>
District councils	<i>Improved local food production/business activities leading to improved livelihoods in their districts</i>
Stockists/seed & fertiliser companies	<i>Improved sales of maize seed and fertiliser associated with farmers having increased knowledge of benefits. Stockists improved knowledge enabling them to give farmers better advice and hence customer satisfaction</i>
Policymakers in ministries	<i>Information and potential model for uptake in other parts of country</i>
Training institutes	<i>Information and up-to-date training materials and tools</i>
* Quality Declared Seed; **Community-based organisations	

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## **Project Purpose**

The project aimed to validate and promote strategies developed within R 8220 to reduce the impact of pests and improve quality and yield of maize in High Potential cropping systems for the benefit of poor people in the Southern Highlands of Tanzania. In particular, these included promoting GLS-resistant maize OPV and hybrid varieties (including UH6303 developed within R8220) already identified in variety demonstration plots more widely in the R8220-targeted districts and in the SH generally, validating an MSV-resistant version of UH6303 and promoting training tools developed by R8220 in the districts.



## Research Activities

### Output 1. Disease resistant maize varieties appropriate to farmers' needs and adapted to local conditions validated by and promoted to farmers and other stakeholders.

Farmer groups had been formed in each of four villages in Mbozi, Njombe, Mbarali and Iringa Districts and these had participated in hosting and data collection for variety demonstration trials in 2002/3 and in 2003/4 (see FTR for R8220). A further set of trials were planted in late 2004 as soon as it seemed likely that CPP would fund an extension to the project. As before, the trials were hosted in all four villages in all four districts. Within each village group [and to an extent, within each district], up to 7 varieties plus a local check had been selected for testing based on previous trial results and knowledge of the scientists of up-and-coming varieties (Table 1). Five members of each farmer group agreed to host a trial comprising a single plot of each of the test varieties; the varieties were randomly distributed to plots in each trial, the different trials providing replication. The four villages per district and five demonstration plots per village amounted to 20 demonstration plots per district and a total of 80 village-based demonstration sites in the project's target area.

Management of the trials was as for the equivalent trials of R8220. Farmers guided by village extension officers and scientists collected data on crop growth, pests and diseases and the trials were harvested, in all cases as part of R8406.

**Table 1. Entries evaluated through the village-based demonstrations during 2004/5.**

District	Village	Entries evaluated
<b>Mbozi</b>	Mpito	UH6304, PAN691, TMV-2, UH6303, UH615, H625, Local
	Ibembwa	-do-
	Igunda	-do-
	Mponela	UH6304, UH615, H625, Staha, Local
<b>Mbarali</b>	Majenje	Kilima-ST, PAN67, SC627, Staha-ST, Local
	Mahongole	-do-
	Ihahi	-do-
	Igomelo	-do-
<b>Njombe</b>	Igagala	UH6304, PAN691, TMV-2, UH6303, UH615, H625, Local
	Mtwango	-do-
	Mhaji	-do-
	Utalingoro	-do-
<b>Iringa</b>	Ihimbo	UH6304, PAN691, TMV-2, UH6303, UH615, H625, Local
	Kitayawa	-do-
	Wenda	-do-
	Mangawe	-do-

#### **Activity 1.1. Validation and promotion of a new MSV/GLS resistant versions of UH6303 released in Phase I**

These variety demonstrations were carried out in villages where both MSV and GLS constitute a constraint to increased maize production among resource poor households in three districts in the Southern Highlands of Tanzania: Mbarali, Rungwe and Mbeya Rural District.

##### **Site selection (residual moisture planting)**

Sites for Rungwe and Mbeya Rural districts were selected in June/July 2005 in collaboration with the District Extension Officers (DEOs) and Village Agricultural Extension officers (VAEOs). The DEOs

selected the villages, while the VAEOs selected the experimenting farmers within their villages. The two districts were selected because MSV was known to be endemic there and serious GLS outbreaks occasionally occur. In addition, these districts are unique in that planting of maize is done under residual moisture between the months of June and August. The crop is later supported by seasonal rains which begin in December. Harvesting is done in February/March of the following year. This is in contrast to most other areas in the Southern Highlands where planting is done in December, while harvesting is carried out between July and September of the following year (depending on altitude). Criteria for selection of the participating farmers named in Table 2a was as follows:

- *hard working*
- *willing to provide a plot and to do all basic field operations such as ploughing and weeding*
- *possess an irrigable plot in the case of Mbarali farmers*
- *participate in planting of the demos, fertilization and insect control in collaboration with researchers and extension workers*
- *participate in data recording and monitoring*
- *ready to show other farmers the demonstrations and to share experiences with them*
- *plots should be located in a prime area(near main road, village path, school, church, village centre, etc) so that maize varieties under promotion can be observed easily by other farmers.*
- *at least 1-2 of the 4 farmers in each village must be women*

**Table 2a. Experimenting Farmers (residual moisture planting)**

	Name of Farmer	Gender	Village	Ward	District
1	Christopher Bukuku	M	Kyimo	Kyimo	Rungwe
2	Yesaya Kilindu	M			
3	Jaison Kijalo	M			
4	Kaini Mafwenga	F			
5	Elia Fwanda	M	Lukata	Kinyala	
6	Mussa Boniface	M			
7	Edward Mwalukasa	M			
8	Bernadeta Mhagama	F			
9	Peter Sanga	M	Ntokela	Isongole	
10	Alfred Mandwanga	M			
11	Mwalimu Sigalla	F			
12	Efesi Mtega	M			
13	Elisha Mwahalende	M	Ilembo		Mbeya Rural
14	Ntuta Wailesi	M			
15	Mariam Japhet	F			
16	Paulina Saanane	F			
17	Julius Sawa	M	Shilanga		
18	Elias Shila	M			
19	Nesi Keneth	F			
20	Shilwa Nyanda	M			

### Activity 1.2. Validation of MSV resistant version of OPVs

#### (a) Site selection (irrigated planting)

In Mbarali district, site selection was done in October 2005 following the same procedure used in Rungwe and Mbeya rural districts above. However, in Mbarali district the sites had to have access to irrigation water, with preference being given to those where irrigated maize production is practiced throughout the year. Such sites constituted environments conducive to the development of a high MSV disease pressure, so as to facilitate validation of the MSV resistant versions of the open pollinated cultivars, Staha and Kilima. Names and locations of the farmers selected by the VAEOs are given in Table 2b.

**Table 2b. Experimenting farmers (irrigated planting)**

	Name of Farmer	Gender	Village	Ward	District
1	Joram Mwakibibi	M	Igurusi		Mbarali
2	Martin Mwaisikili	M			
3	Asumwisye Kamwela	M			
4	Keneth Sogolela	M			
5	Josmary Mbilinyi	F	Chimala		
6	Tembo Ringo	M			
7	Saidi Ali	M			
8	Aba Hamisi	F			

**(b) Materials and Methods**

In Rungwe and Mbeya rural districts, entries under evaluation included three versions of the MSV-tolerant UH6303, i.e. versions 4, 10 and 13. Two commercial hybrids, H625 and PAN691 were used as MSV-susceptible checks at all sites. In Rungwe and Mbeya rural districts, large plots of 5.1 x 13.5m were used. Such plots consisted of 18 rows spaced at 0.75 x 0.3m with 18 plants per row.

In Mbarali, six entries were evaluated, which included two top cross hybrids involving Staha-ST as the female parent, and another two top cross hybrids involving Kilima-ST as the female parent. For comparison, Staha-ST and Kilima –ST were used as checks because they are commonly grown by farmers in Mbarali district. Experimental units consisted of six-row plots, measuring 5.1 by 3.75m. Standard spacing of 75x30cm was used, and each row consisted of 18 plants.

Planting of the trials at all sites was done jointly by ARI-Uyole maize staff, farmers and the resident village extension worker. In order to allow for statistical analysis of data in both Rungwe, Mbeya rural and Mbarali districts, entries were randomized at each site, and each farmer's site constituted a replication (4 replications per village). Nitrogen and Phosphorus were applied at 120 kg N and 20kg P/ha respectively. Stalk borers were controlled using Selecron (720gm profenofos/litre) at 2.0 L of the product per ha when the maize plants were 25 –30 cm tall. This is the optimum stage for control when the pest is most susceptible. Thinning to one maize plant/stand was done by farmers before insecticide application. Trials were kept weed free through manual weeding, which was carried out two times, or even three at a number of sites, ensuring that plots were clean up to the grain filling stage.

**(c) Monitoring and Evaluation of the Demonstrations.**

Monitoring and evaluation of the demonstration plots was done using a participatory approach, which included farmers, VAEOs and the project team (researchers from ARI Uyole). There was one visit from the private sector, when a representative from PANNAR Seed (South Africa) visited Yesaya Kilindu's plot in Rungwe district, wanting to know what materials this farmer had grown in his plot and from where he had obtained them. It was planned right from the beginning that five monitoring and evaluation trips would be made to the trial sites, particularly in order to track the development, spread and severity of MSV over time. Monitoring sessions and the dates on which they were carried out are as shown below.

**Table 3. Monitoring and Evaluation Schedule for maize demonstrations in Rungwe, Mbeya rural and Mbarali districts.**

M&E activity	Dates for the different districts		
	Rungwe	Mbeya Rural	Mbarali
Immediately after crop emergence	15 <sup>th</sup> - 16 <sup>th</sup> Sept, 2005	25 <sup>th</sup> – 26 <sup>th</sup> Sept, 2005	14 <sup>th</sup> Dec, 2005
During top dressing of nitrogen fertilizer	23 <sup>rd</sup> - 24 <sup>th</sup> Nov, 2005	28 <sup>th</sup> – 29 <sup>th</sup> Nov, 2005	Not yet done
At flowering time	19 <sup>th</sup> – 20 <sup>th</sup> Dec, 2005	22 <sup>nd</sup> -23 <sup>rd</sup> Dec, 2005	Not yet done
During grain filling	20 <sup>th</sup> – 25 <sup>th</sup> Jan, 2006	16 <sup>th</sup> -19 <sup>th</sup> Jan,2006	Not yet done

In Rungwe and Mbeya rural districts, the first four monitoring sessions as shown above, were carried out, however, the fifth one, i.e. harvesting, is still five weeks away as we prepare this Final Technical Report. In Mbarali, planting was delayed until the last week of November, 2005, following breakdown of the irrigation system serving this area. At the time this FTR was prepared, these trials were still awaiting harvest.

**(d) Data collected:**

During the monitoring and evaluation activities carried out in Mbeya rural and Rungwe districts, information was collected on the dates various operations were carried out, number of farmers encountered at various demonstration sites, incidences of foliar diseases, particularly stages of plant development at which MSV infection started, number of plants infected with MSV, as well as rating of the severity of infection for each entry in the demonstrations. Grain yield data will be collected at the appropriate stages of crop harvesting at each location.

**Output 2. Further approaches for improving access to and management of quality seed by farmers validated and more widely promoted**

**Activity 2.1 Development of district maize promotion strategies**

The district agricultural extension officers from the projects' four focal districts of Mbarali, Njombe, Mbozi and Iringa each developed a district maize promotion strategy during the July 2004 mini-workshop on learning tools. These are detailed in Appendix 1. However at that time no costing was done, and the officers responsible were asked to submit a budget to the project leader.

**Activity 2.2 Meeting with District Executive Directors (DEDs)**

This activity was carried out in October 2005 by the ARI-Uyole Maize Research staff in collaboration with the Zonal Research Extension Liaison Officer. Appointments to meet the District Executive Directors (DEDs) were made through our collaborators in the respective agricultural extension offices in Mbarali, Mbozi, Iringa and Njombe districts. The aim of these meetings was to present and discuss preliminary district maize promotion strategies in order to facilitate achievement of wider ownership and sustainability of the project's outputs. These districts are beneficiaries of a recently formed District Agricultural Development Strategy (DADS), a project which is adequately funded by DANIDA seeking to improve agricultural productivity in rural areas. Existence of this new initiative in the very districts which had been covered by R8220 and R8406 is seen as presenting a very good opportunity through which outputs of the project, including their wider dissemination, could conveniently be achieved. In addition to the DADS, some districts, such as Njombe and Iringa, are also beneficiaries of another project, i.e. Participatory Agricultural Development and Empowerment Project (PADEP), through which our project's outputs could also achieve wider dissemination.

**Activity 2.3. Implementation of district maize promotion strategies**

The District maize promotion strategies were developed (but not costed) by the extension officers from the four project districts and then discussed in a mini workshop held at VETA Centre, Mbeya 26<sup>th</sup> – 30<sup>th</sup> July 2004. The outcome of this task was a list of activities from each district, which, after scrutiny by the project implementation team in November 2004 and April 2005, it was clear that it was not possible to implement most of them during CPP Phase II because of the large budget requested and the short duration of the project. It was suggested that some of the activities should be implemented by the districts themselves (in collaboration with the CPP project

team at ARI Uyole) through funding by their relevant District Development Directors agricultural budget. This was one of the agenda discussed with the district authorities during the meeting with DEDs (see 2.2).

One promotional strategy identified and proposed for financial support by all the four districts was to conduct field days using the already established maize demo plots (CPP Phase-1). This proposal was felt feasible and cost effective, and therefore it was approved for implementation in May-July 2005 when the demos were still in the field. Field days were held in three districts (Mbozi, Iringa and Njombe.). The activity could not be carried out in Mbarali district because the crop was already dry and harvested by end of May.

## **Activity 2.4. Development/modification of training tools as demanded by the districts**

### **2.4.1. Modification of Training Tools**

The training tools developed in Phase I of the project (R8220) have undergone some changes/modifications in order to include new information, as well as better photos and re-wording in order to make the salient points clearly understandable by farmers, VAEOs and others e.g. stockists. These changes are based on interaction and feedback from stakeholders in on-going activities, surveys (Stathers et al 2005) and workshops. The last revision was done in November 2005 following feedback during the maize innovation system stakeholders workshop (Mbeya, VETA, 9-10 Nov 05).

### **2.4.2. Maize Training Manual**

During the development of district maize promotion strategies at the mini-workshop held in Mbeya in July, 2004, a training manual was identified by extension officers as an important reference tool in maize production.

In response to this need, advice and ideas were sought from various stakeholders, including agricultural training institutes, maize research personnel at various research centers in the country as well as agricultural extension staff across the Southern Highlands zone. The objective was to gather information which would assist in the development of a maize production manual targeting:

- Field Agricultural Extension staff
- Agricultural Trainers in agricultural colleges and NGOs
- Maize researchers
- Progressive farmers and input suppliers

The information gathered was carefully compiled, from which it has been possible to develop a framework for the maize production manual, which is expected to serve as a vital learning tool for a wide range of stakeholders.

## **Activity 2.5. Development of zonal maize promotion strategies in partnerships with the private sector**

A draft zonal maize promotion strategy was developed by the ZRELO in 2005 (Appendix 2). This was presented to 57 stakeholders at the Southern Highlands maize innovation systems workshop in November 2005. Following this a meeting was convened (7<sup>th</sup> Dec 2005) between the ARI-Uyole Zonal Research Extension Liaison Officer (ZRELO), the District Agricultural Extension Officer for Sumbawanga (Rukwa region), the Regional Agricultural Advisor for Ruvuma region, the Project coordinator for Highland Seed Growers Limited and two members of the Maize

Improvement Programme at ARI-Uyole to further develop this strategy. Another specific activity already undertaken has been the compilation of a list of input stockists and their contact details in the SH, which enhance opportunities for future communication.

## **Activity 2.6. M&E of stakeholders activities, lesson learning and implications (for policy)**

### ***Farmer research group and demonstration plot evaluation***

An evaluation of the learning process accompanying the variety demonstration plots was conducted in Oct/Nov 2005 to assess the communication approaches and tools which were developed, by focusing on the farmer research groups. The evaluation was organized jointly by projects R8422 and R8406. The specific aims of the evaluation were to:

- 1) Identify and describe the types of people (e.g. gender, age, wealth) reached by project activities and how representative they are of the wider community.
- 2) Indicate the extent to which the process has responded to the goals/ needs of different types of farmers
- 3) Identify and evaluate in detail with a range of farmers:
  - a. New information or understanding gained through project activities which can help farmers achieve their goals
  - b. Which approaches and tools were useful in facilitating access to this new information or understanding
  - c. Whether or not farmers are using this new information or understanding (If Yes, how and if No, why not).
  - d. The outcomes (positive or negative) of using this new information or knowledge
- 4) Facilitate farmer group members and, to the extent possible, other stakeholders (eg Village extension officers) to assess the research process and make suggestions as to how this may be improved in the future.

The evaluation was sub-contracted to a small team of three (Ahaz Mussei, socio-economist ARI Uyole), Mr Mangasin (M&E expert, IFAD ASMDP), Elimpaa Kiranga (ZRELO, Southern Highlands) who conducted the exercise between 29th October – 5th November 2005 in Mbarali and Njombe districts with two farmer research groups in each district (Majenje & Ihahi, Mbarali; Mtwango & Utalingoro, Njombe) who were viewed as the most and least successful groups respectively. The key findings were presented at the Nov 2005 Maize Innovation System Stakeholders Workshop and a full report was prepared (Kiranga et al, 2005).

### **Additional activity. The Southern Highlands Maize Innovation System Stakeholders Workshop: Improving Understanding and Enhancing Access to Quality Seed and Other Products**

The Southern Highlands Maize Innovation System Stakeholders Workshop: Improving Understanding and Enhancing Access to Quality Seed and Other Products was held from 9-10th November, 2005 at VETA Mbeya.

The workshop aims were to a) share the projects' experiences, outputs, lessons and b) to identify policy implications including helping each stakeholder group to identify the way forward. This workshop was to be held under phase 1, but, following consultation with CPP management, was carried over to phase 2 to make full use of project outputs.

## OUTPUTS

### **Output 1: Disease resistant maize varieties appropriate to farmers needs and adapted to local conditions validated by and promoted to farmers and other stakeholders.**

Results on performance of the maize varieties under evaluation during the 2004/5 season are presented in Tables 4 to 7. The new improved maize varieties continued to exhibit higher grain yields than the local cultivars at most locations and outstanding performance was achieved on some farmers' plots across the districts, e.g., at Mtwango in Njombe District, yields of >8t/ha being achieved quite frequently. This confirms that high maize grain yields are possible under rural farmers' field conditions using improved maize varieties and management practices recommended by ARI-Uyole. In particular, hybrid varieties generally outyielded both local checks and open-pollinated varieties (e.g., TMV-2), even at locations where average yields were generally low, suggesting that hybrids are probably worth the expense of annual seed purchases even in more marginal environments, valuing the crop in cash terms only and assuming hybrid and local grain sell at similar prices. This conclusion was also merited in sites in Mbarali with the hybrid SC627, where the crop is grown under irrigation and MSV can be severe.

Table 4: Village mean grain yield of maize varieties evaluated in Njombe district during the 2004/5 season.

VILLAGE	No	M/F	NAME	YIELD (T/HA, BY VARIETY)								Mean
				LOCAL	UH6304	PAN691	TMV-2	UH6303	UH615	H625	STAHA	
MTWANGO	1	M	Joniphas Ngeve	6.58	9.50	9.75	7.66	9.08	7.85	8.76	-	8.45
	2	M	Elias Wikedzi	5.51	6.68	6.31	8.27	8.25	5.96	6.09	-	6.72
	3	F	Anna Ngeve	4.87	8.60	6.63	4.32	5.91	5.39	9.32	-	6.43
	4	M	Odillo Kinyamagoha	5.61	8.49	7.99	6.09	6.82	6.94	7.68	-	7.89
	5	F	Lea Mbusye	6.40	6.88	6.51	6.42	8.01	7.65	8.28	-	7.16
			<b>MEAN</b>	<b>5.79</b>	<b>8.03</b>	<b>7.44</b>	<b>6.55</b>	<b>7.62</b>	<b>6.76</b>	<b>8.03</b>	-	<b>7.17</b>
UTALINGORO	1	M	Protas Mlengule	4.75	6.92	5.75	5.78	6.32	5.63	5.54	-	5.81
	2	F	Anastazia Sanyigu	3.05	3.77	3.86	3.64	4.65	3.77	3.75	-	3.78
	3	M	Sylvesius Myamba	0.55	2.40	1.81	1.47	2.28	1.08	1.77	-	1.73
	4	F	Ostakia Mlengule	5.25	6.53	6.59	5.88	6.42	7.26	6.38	-	6.33
	5	M	Elias Mpete	Discarded due to severe soil fertility problem at the site								
			<b>MEAN</b>	<b>3.40</b>	<b>4.90</b>	<b>4.51</b>	<b>4.19</b>	<b>4.92</b>	<b>4.62</b>	<b>4.36</b>	-	<b>4.42</b>
MHAJI	1	F	Emilia Wikunge	4.15	4.91	3.95	7.85	5.64	6.01	6.99	-	5.64
	2	M	Nicskon Kilasi	6.98	7.96	6.75	5.73	6.83	5.34	5.58	-	6.45
	3	F	Joyce Mhami	3.04	4.20	2.38	2.96	2.89	3.73	4.34	-	3.51
	4	M	Michael Mg'ong'o	4.98	3.89	6.01	5.02	5.24	6.41	3.74	-	5.04
	5	F	Hellen Mkami	5.61	5.02	8.52	7.86	9.10	7.04	6.87	-	7.42
			<b>MEAN</b>	<b>4.95</b>	<b>5.20</b>	<b>5.52</b>	<b>5.89</b>	<b>5.94</b>	<b>5.91</b>	<b>5.50</b>	-	<b>5.56</b>
IGAGALA	1	F	Alatwnukila Mtokoma	4.79	5.56	5.44	4.39	4.48	5.86	5.10	-	5.09
	2	F	Zubeda Mgyaya	4.97	5.29	5.36	4.09	5.42	4.95	3.94	-	4.86
	3	F	Bitia Msigwa	4.07	6.03	6.14	5.00	5.54	6.47	4.59	-	5.41
	4	M	Ignasi Ngailo	3.44	5.23	5.58	5.45	6.07	5.89	6.02	-	5.38
	5	M	Dawod Kawogo	7.22	7.79	8.38	8.07	8.71	7.61	8.36	-	8.02
			<b>MEAN</b>	<b>4.90</b>	<b>5.98</b>	<b>6.18</b>	<b>5.40</b>	<b>6.00</b>	<b>6.15</b>	<b>5.60</b>	-	<b>5.75</b>



Table 5: Village mean grain yield of maize varieties evaluated in Iringa district during the 2004/05 season.

VILLAGE	No	M/F	NAME	YIELD (T/HA, BY VARIETY)								Mean
				LOCAL	UH6304	PAN691	TMV-2	UH6303	UH615	H625	STAHA	
IHIMBO	1	M	Hassan Kiongosi	3.22	5.35	5.48	4.57	5.38	3.84	4.80	-	4.66
	2	M	Twaha Hassan	5.25	4.11	8.09	7.26	8.15	5.94	5.72	-	6.36
	3	M	Linus Kivamba	5.21	7.58	6.53	6.11	7.46	6.44	5.52	-	6.41
	4	F	Sauda Kifunge	4.58	8.91	8.51	6.81	8.26	8.28	7.36	-	7.53
	5	F	Rukia Mata	3.22	5.58	6.91	5.99	6.48	5.49	5.00	-	5.52
				<b>MEAN</b>	<b>4.30</b>	<b>6.31</b>	<b>7.10</b>	<b>6.15</b>	<b>7.15</b>	<b>6.00</b>	<b>5.68</b>	-
WENDA	1	M	Longino Koko	4.09	7.26	8.03	6.44	7.33	8.91	7.69	-	7.11
	2	M	John Kilendu	2.05	3.11	3.59	5.66	6.21	4.16	5.25	-	4.29
	3	F	Esterina Kutika	3.93	5.08	6.71	5.58	5.81	6.38	4.51	-	5.43
	4	F	Laura Christian	6.90	8.89	8.37	7.40	9.31	8.30	8.64	-	8.26
	5	M	Michael Chadenile	6.55	7.20	6.02	5.37	5.56	5.99	5.99	-	6.10
				<b>MEAN</b>	<b>4.71</b>	<b>6.31</b>	<b>6.55</b>	<b>6.10</b>	<b>6.84</b>	<b>6.75</b>	<b>6.42</b>	-
KITAYAWA	1	M	Venance Banga	4.32	7.96	6.99	4.05	6.71	5.98	7.06	-	6.15
	2	F	Emelita Nyinge	3.69	7.73	6.49	3.38	6.21	7.01	4.77	-	5.61
	3	-	Kitayawa Pr. School	discarded due to very severe soil fertility problem at the site								
	4	M	Hezron Nyagawa	Discarded due to poor demo management								
	5	M	Longino Mpelembwa	discarded due to severe rat damage								
				<b>MEAN</b>	<b>4.01</b>	<b>7.85</b>	<b>6.74</b>	<b>3.72</b>	<b>6.46</b>	<b>6.50</b>	<b>5.92</b>	-
MANGAWE	1	M	Gaspar Mfikwa	Crop wiped out by drought								
	2	M	Samwel Gwivaha									
	3	M	Celestine Msemwa									
	4	F	Matrida Nyengela									
	5	F	Theodora Lukinga									
			<b>MEAN</b>									

Table 6: Village mean grain yield of maize varieties evaluated in Mbozi district during the 2004/05 season.

VILLAGE	No	M/F	NAME	YIELD (T/HA, BY VARIETY)								
				LOCAL	UH6304	PAN691	TMV-2	UH6303	UH615	H625	STAHA	Mean
MPITO	1	F	Lina Mwamwezi	4.26	5.39	8.43	5.20	9.15	6.18	6.55	-	6.45
	2	M	Baridi Mwamwezi	5.32	8.23	7.36	5.48	7.65	6.88	6.67	-	7.00
	3	F	Maria Mgalla	6.34	8.54	9.65	7.18	9.17	7.13	8.14	-	8.02
	4	M	Edward Mbwama	3.24	7.97	7.75	4.64	7.01	5.01	5.05	-	5.81
	5	M	Enock Kibona	7.16	6.89	5.65	5.08	7.37	6.49	6.26	-	6.41
				<b>MEAN</b>	<b>5.27</b>	<b>7.41</b>	<b>7.77</b>	<b>5.51</b>	<b>8.07</b>	<b>6.34</b>	<b>6.54</b>	<b>-</b>
IBEMBWA	1	M	Koria Pulumba	3.06	6.11	6.09	4.94	6.08	4.40	5.32	-	5.14
	2	M	Keneth Ndidi	1.70	4.86	3.83	2.58	4.68	4.55	5.13	-	3.90
	3	F	Christina Mgalla	5.06	7.37	7.78	6.06	8.17	7.45	7.65	-	7.08
	4	F	Fausta Mwasapania	3.34	5.60	4.57	3.67	5.31	3.95	3.35	-	4.26
	5	M	Mohamed Nassoro	4.23	6.36	6.86	5.76	6.63	5.46	7.40	-	6.10
				<b>MEAN</b>	<b>3.48</b>	<b>6.06</b>	<b>5.83</b>	<b>4.60</b>	<b>6.18</b>	<b>5.16</b>	<b>5.77</b>	<b>-</b>
IGUNDA	1	M	Charles Nzowa	6.06	6.08	6.48	6.02	5.90	7.12	6.77	-	6.35
	2	F	Evelina Sanga	4.06	4.34	5.00	3.74	4.48	4.36	3.85	-	4.26
	3	F	Veronika Mwamlima	6.03	6.61	8.78	7.18	8.04	8.74	8.65	-	7.72
	4	-	Igunda Pr. School	3.44	5.18	5.08	3.44	4.96	4.29	4.90	-	4.47
	5	M	Kalola Tusamale	5.92	6.37	6.01	5.65	6.10	6.54	3.94	-	4.05
				<b>MEAN</b>	<b>5.10</b>	<b>5.72</b>	<b>6.27</b>	<b>5.21</b>	<b>5.90</b>	<b>6.21</b>	<b>5.62</b>	<b>-</b>
MPONELA	1	F	Tabia Msukwa	3.08	4.95	-	-	3.56	5.92	-	4.21	4.34
	2	F	Mpasya Bukuku	4.19	6.98	-	-	4.87	4.26	-	2.79	4.62
	3	F	Sofia Mwampashi	3.95	5.63	-	-	6.43	5.88	-	3.34	5.05
	4	M	Andendekisye Fiao	4.66	8.20	-	-	8.29	7.24	-	3.59	6.40
	5	M	Wilson Chisunga	4.04	5.18	-	-	4.98	5.07	-	2.81	4.42
				<b>MEAN</b>	<b>3.99</b>	<b>6.19</b>	<b>-</b>	<b>-</b>	<b>5.63</b>	<b>5.67</b>	<b>-</b>	<b>3.35</b>

Table 7: Village mean grain yield of maize varieties evaluated in Mbarali district during the 2004/5 season.

VILLAGE	No	M/F	NAME	YIELD (T/HA, BY VARIETY)								
				LOCAL	KILIMA-ST	PAN67	SC627	STAHA-ST				MEAN
IHAHI	1	F	Joina Goliama	2.91	3.17	3.63	3.19	2.28				<b>3.04</b>
	2	M	Festo Mgaya	2.42	2.64	3.21	2.96	2.43				<b>2.73</b>
	3	M	Lufunyo Mwidete	3.22	2..75	3.53	3.57	2.65				<b>3.14</b>
	4	M	Tawi Mwilongo	2.02	2.27	2.74	3.69	2.92				<b>2.73</b>
	5	F	Enea Sanga	3.21	4..22	5.95	3.64	3.67				<b>4.14</b>
			<b>Mean</b>	<b>2.76</b>	<b>3.01</b>	<b>3.81</b>	<b>3.41</b>	<b>2.79</b>				<b>3.16</b>
IGOMELO	1	M	Patrick Fute	1.87	4.28	5.55	5.76	4.51				<b>4.41</b>
	2	F	Maria Mturi	<b>All entries stolen presumably for seed!</b>								
	3	M	Mridi Kidumba									
	4	F	Flora Omari									
	5	M	Daudi Mpanye									
			<b>Mean</b>	<b>1.87</b>	<b>4.28</b>	<b>5.55</b>	<b>5.76</b>	<b>4.51</b>				<b>4.41</b>
MAJENJE	1	M	Erasto Ng'ahara	5.39	7.12	5.55	8.66	6.07				<b>6.56</b>
	2	M	Richard Japhet	7.01	7.18	5.53	11.09	7.56				<b>7.67</b>
	3	M	Firoz Mahenge	7.06	6.21	6.89	8.40	7.13				<b>7.14</b>
	4	M	Absalom Msetule	5.54	6.44	6.37	8.40	4.72				<b>6.29</b>
	5	F	Esta Mhema	4.39	3.80	5.01	5.71	4.66				<b>4.71</b>
			<b>Mean</b>	<b>5.88</b>	<b>6.15</b>	<b>5.70</b>	<b>8.45</b>	<b>6.03</b>				<b>6.48</b>
MAHONGOLE	1	M	Zablon Mwakifuna	2.02	2.17	3.38	2.55	2.45				<b>2.51</b>
	2	M	Daudi Mwakibinga	2.79	3.82	4.84	4.08	3.20				<b>3.75</b>
	3	F	Attu Mwinuka	2.45	2.62	3.92	3.15	3.30				<b>3.09</b>
	4	F	Noelia Francis	4.72	4.42	3.97	6.45	3.32				<b>4.58</b>
	5	F	Atukelage Kapalila	3.62	2.91	4.30	6.64	4.02				<b>4.30</b>
			<b>Mean</b>	<b>3.12</b>	<b>3.19</b>	<b>4.08</b>	<b>4.57</b>	<b>3.06</b>				<b>3.61</b>

### **Activity 1.1. Validation and promotion of a new MSV/GLS resistant versions of UH6303 released in Phase I**

Monitoring and evaluation of the demonstrations in both Rungwe and Mbeya rural districts were particularly difficult as a result of considerable variation in germination dates both within and between experimental units. Plant emergence ranged from 9 to 21 days after planting, causing large differences in the stages of plant development between and within demonstration plots. This situation caused considerable difficulty in assessing agronomic performance of the entries under evaluation and even more difficulty in assessing MSV resistance/tolerance, which was one of the main objectives of running these cultivar demonstrations.

Out of the 12 demonstrations established in Rungwe district, only 7 exhibited a low (within plot) variation in germination dates, thereby permitting meaningful assessment and collection of various types of field data. The remaining four plots have continued to receive regular husbandry; however, they are considered too variable within-plot to furnish good field data for statistical analysis. In Mbeya rural district, with 8 cultivar demonstrations, 4 of them had reasonably uniform germination, making it possible, therefore, to use these plots for meaningful data collection

The incidence of *Maize streak virus* (MSV) was relatively low; however, it was high enough to reflect reasonably clear differences between susceptible and resistant/tolerant entries that had been included in the demonstrations. In assessing the materials, data on infected plants at each site were recorded and converted into percent infection for each entry. In addition, the severity of infection for each entry was determined based on a 1 to 5 rating scale, a score of 1 signifying a high degree of resistance, while a score of 5 indicated that a given entry was highly susceptible.

A comparison between the three UH6303 versions as a group, versus PAN691 and H625 as checks (Tables 8 & 9 and Figs 1&2) shows a clear difference between them with regard to reaction to MSV, further confirming the resistance of the “new” UH6303 to MSV, a foliar disease now regarded as a biotic stress of economic importance in many maize producing parts of Tanzania. Further confirmation of the level of MSV resistance now incorporated into UH6303 is evidenced in Fig. M-1, where UH6303 exhibited superiority with regard to resistance to MSV in comparison with PAN691 (Fig. M-2) and H625 (Fig. M-3). A participatory monitoring and evaluation of the maize cultivar demonstrations at a number of sites generated clear excitement from the farmers involved, as seen from Mr. Christopher Bukuku (Fig. M-4) in his plot planted with a local MSV- susceptible variety. He then happily moved to his demonstration plot, explaining to his fellow villagers the satisfaction he has had after noticing the superiority of UH6303 with regard to resistance to MSV and high grain yield potential (Fig M-5).

This confirmation regarding the resistance of UH6303 to MSV now paves the way for a rapid multiplication of the resistant lines constituting this hybrid, so that enough foundation seed is generated to meet certified seed requirements for farmers in MSV-prone maize producing areas of the Southern Highlands and elsewhere across the country.

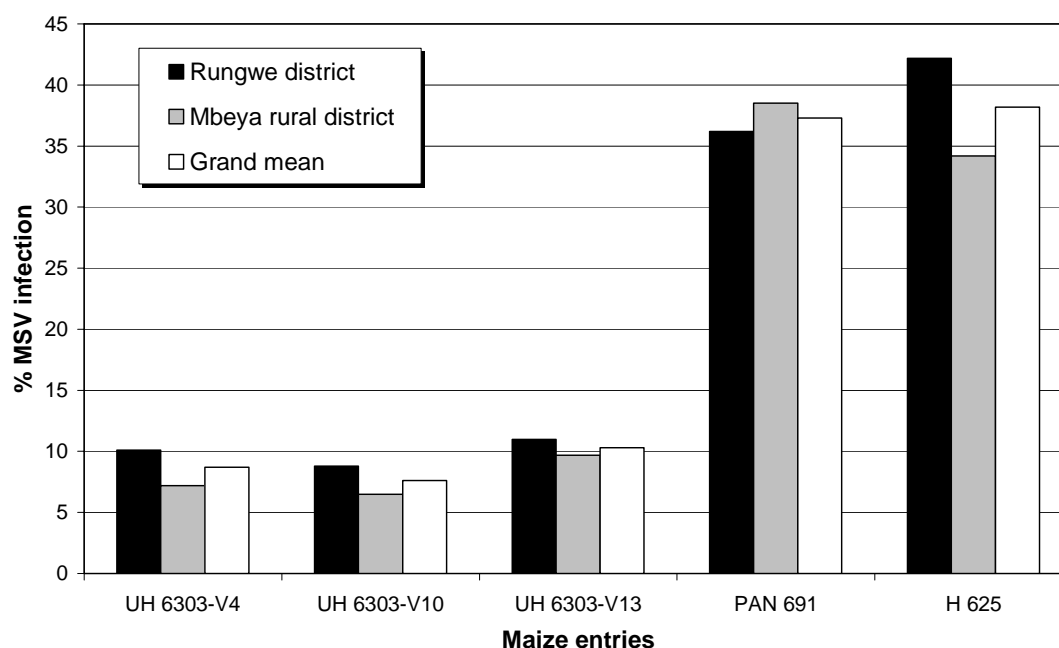
**Table 8. Incidence of MSV-affected plants in farmers' demonstration plots in Rungwe district expressed in terms of percent infection (%) and severity on the 1-5 rating scale.**

ENTRY	Farmers' demonstration plots													
	1 Jaison Kijalo		2 Christopher Bukuku		3 Kaini Mafwenga		4 Elia Fwanda		5 Edward Mwalukasa		6 Bernadetta Mhagama		7 Alfred Mwandwanga	
	%	1-5	%	1-5	%	1-5	%	1-5	%	1-5	%	1-5	%	1-5
UH6303-V4	12	2.0	6	1.2	12	2.2	13	2.0	7	1.7	10	2.0	11	2.0
UH6303-V10	8	1.5	9	1.2	14	1.2	9	1.7	8	1.2	6	1.5	8	1.2
UH6303-V13	11	1.7	7	1.5	9	1.7	16	2.2	12	1.5	13	1.7	9	1.5
PAN 691	43	3.7	34	3.5	46	4.0	48	4.2	37	3.8	41	3.7	35	3.7
H625	47	4.0	42	3.7	43	3.7	44	4.2	41	3.5	38	3.5	41	3.7

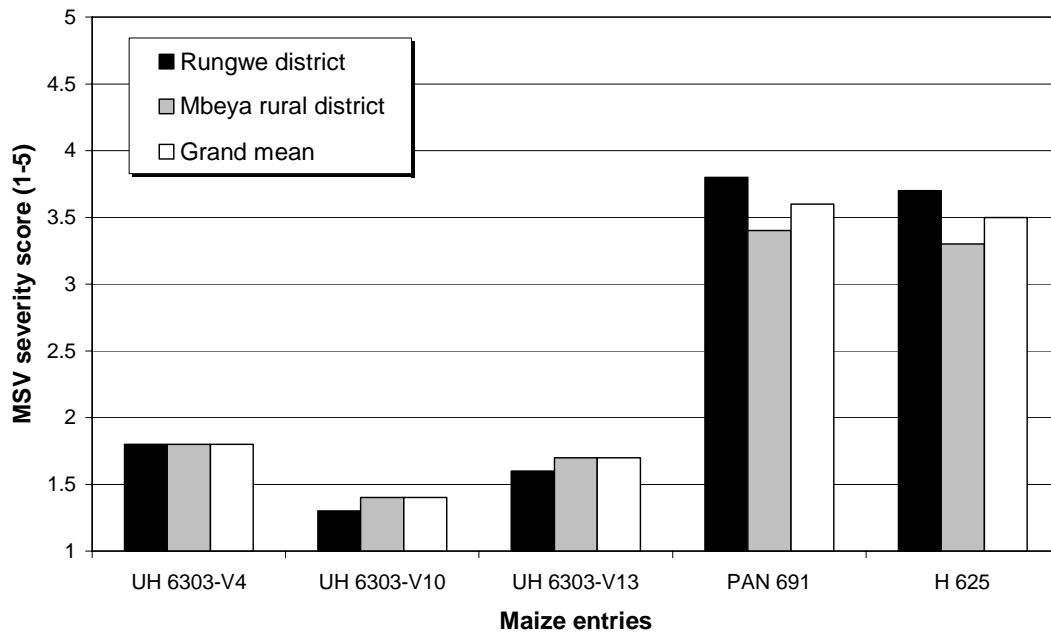
**Table 9. Incidence of MSV-affected plants in farmers' demonstration plots in Mbeya rural district expressed in terms of percent infection (%) and severity on the 1-5 rating scale.**

ENTRY	Farmers' demonstration plots							
	1 Ntuta Wailesi		2 Elias Shilla		3 Paulina Saanane		4 Shilwa Nyanda	
	%	1 - 5	%	1 - 5	%	1 - 5	%	1 - 5
UH6303-V4	7	1.7	4	1.5	10	2.0	8	2.0
UH6303-V10	5	1.2	7	1.5	8	1.7	6	1.5
UH6303-V13	9	1.5	10	1.7	9	2.0	11	1.7
PAN 691	34	3.2	38	3.2	41	3.5	41	3.7
H625	30	3.7	35	3.5	38	3.0	34	3.2

**Figure 1. MSV percent infection of different maize varieties in farmers' demonstration plots in Rungwe and Mbeya rural districts of the Southern Highlands of Tanzania (2005/06)**



**Figure 2. MSV severity on different maize varieties in farmers' demonstration plots in Rungwe and Mbeya rural districts of the Southern Highlands of Tanzania (2005/06)**



**Fig. M-1. The MSV-tolerant version of UH6303 in Mr. Elias Shila's demonstration in Mbeya rural district.**



**Fig. M-2. The first check entry, PAN691 in Mr. Elias Shila's plot showing clear symptoms of susceptibility to MSV in Mbeya rural district.**



**Fig. M-3. The second check entry, H625 also with symptoms of susceptibility to MSV in Mr. Elias Shila's plot in Mbeya rural district.**



**Fig. M-4. Mr. Christopher Bukuku with his local variety in his plot in Rungwe district. The cultivar is unproductive and susceptible to MSV.**



**Fig. M-5. Mr Christopher Bukuku now in his maize demonstration, welcoming some villagers to evaluate the new MSV resistant hybrid, UH6303.**





## Output 2: Further approaches for improving access to and management of quality seed by farmers validated and more widely promoted

### 1) District maize promotion strategies

In accomplishing this task, most of what has been attained centred around the development of the maize promotion strategies which had been developed by district extension officers in a mini-workshop held at Mbeya in July, 2004. The meeting with District Executive Directors (DEDs) which sought to achieve wider ownership and therefore, sustainability after the end of project was unanimously endorsed by the DEDs who also agreed to commit themselves to financial support from the 2006/07 district budgets. The project, however, was advised to follow up this matter closely with relevant district officials by April, 2006, particularly with regard to financial support for the production of additional learning tools and seminars/training of stockists in efficient provision of services to farming communities.

Participation of a total of 193 farmers in the final set of demonstrations carried out in 2005 in Mbozi, Njombe and Iringa provided an additional opportunity for more farmers to learn about the availability of improved maize cultivars that meet their needs and how appropriate field management could result in significant improvement of maize under farmers' field conditions. The questions and issues that were raised by farmers during these events provided further inputs in the effort to modify already developed training tools so as to meet the demands of farmers and other stakeholders, particularly stockists and other partners involved in providing services to rural farming communities. Useful information was also obtained from the interaction of farmers and Research/Extension staff, providing useful inputs to the initial steps of developing a maize production manual, an outline of which has already been completed.

### 2) Meetings with District Development Directors (DEDs)

The team made visits to the districts of Iringa, Mbozi, Mbarali and Njombe. The outcomes of these meetings are shown in Appendix 4.

### 3) Development and modification of training tools

#### a) Leaflets

This and the preceding project have developed a number of leaflets and modified existing leaflets as tools to enhance farmers' ability to manage maize systems

These revised learning tools included:

- Kanuni za Kilimo Bora cha Mahindi (*Principles of Maize Production*)
- Matumizi ya Mbolea katika Kilimo Bora cha Mahindi (*Fertilizer practices for maize production*)
- Ugonjwa wa Milia kwenye Mahindi (*Maize Streak Virus information sheet*)
- Kuwa Daktari wa Mahindi Yako (*Be Your Own Maize Doctor*)
- Matumizi Bora ya Madawa ya Kilimo (*Proper Use of Agricultural Pesticides*)
- Hifadhi Bora ya Nafaka (*Storage of Cereals*<sup>1</sup>)
- Kuzuia Bungua (*Control of Stalk Borers*)
- Kumthibiti Dumuzi (*Control of the Larger Grain Borer*)

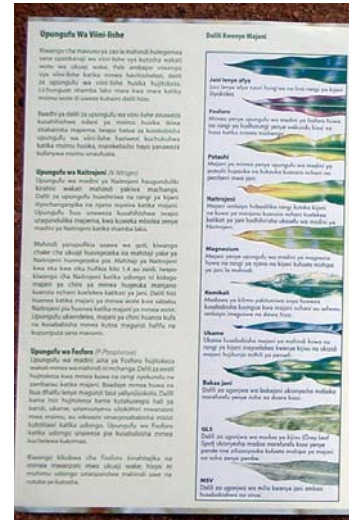


<sup>1</sup> Hifadhi Bora ya Nafaka (Storage of Cereals), Kuzuia Bungua (Control of Stalk Borers) Kumthibiti Dumuzi (Control of the Larger Grain Borer) were originally produced by the Central Zone Communication Office with support from the DFID Crop Protection Programme Project R8349

A seed management handout for farmers and VEOs (in both English & Kiswahili) entitled 'Open pollinated maize varieties: hints on seed management and variety maintenance for small farmers' is near completion.

Electronic copies of the first two leaflets have already been submitted to the printing press through the Farmer Education Department within the Ministry of Agriculture, Food Security and Cooperatives, ordering the printing of 15,000 leaflets (i.e. 7,500 for each leaflet). Funds for this work were delayed and were eventually received during the first week of February, 2006. Now we are in a position to move forward with the order, so that these learning tools are collected and their distribution effected before the end of February, 2006. Distribution of these leaflets will be carried out in the project's target area, including other parts of the Southern Highlands by involving extension staff as well as seed stockists.

There are plans to add electronic copies of the leaflets to the Tanzanian Ministry of Agriculture's website <http://www.kilimo.go.tz> as many of them are appropriate to areas other than just the Southern Highlands, it is hoped this will facilitate access to them.



**b) Maize Training Manual**

A framework for the maize management manual has been developed (see Appendix 5). Development of the full manual is set to commence by May, 2006, and funding for this work will be sought from the Ministry of Agriculture, Food Security and Cooperatives.

**4) Zonal maize promotion strategy**

A draft zonal maize promotion strategy was developed by the ZRELO in 2005 (Appendix 2). This was presented to 57 stakeholders at the Southern Highlands maize innovation systems workshop in November 2005. Following this a meeting was convened (7<sup>th</sup> Dec 2005) between the ARI-Uyole Zonal Research Extension Liaison Officer (ZRELO), the District Agricultural Extension Officer for Sumbawanga (Rukwa region), the Regional Agricultural Advisor for Ruvuma region, the Project coordinator for Highland Seed Growers Limited and two members of the Maize Improvement Programme at ARI-Uyole to further develop this strategy.

Three main agenda items, as follows:

1. Reviving maize cultivar demonstration activities in the zone.
2. Collaboration among stakeholders in promoting maize production technologies.
3. The role for Highland Seed Growers Ltd as a private sector partner in maize promotion/technology dissemination in the Southern Highlands zone.

After all members went through the agenda items, the chairman requested suggestions and ideas from the participants on each agenda, in an attempt to come up with plans of action on each one of the major items in the agenda. A summary of what was discussed and agreed is given in Appendix 6.

**Public –Private partnerships**

Involvement of the private sector in achieving wider promotion in the entire Southern Highlands (SH) zone has met with considerable success following an unusual level of commitment as exhibited by Highland Seed Growers Limited (HSG), the local seed company which has shown a keen interest in improving access to quality seed among farmers in the SH. Involvement of the private sector in maize promotion has so far yielded the following outcome.

1. The company has already prepared a report which reflects the company's profile and what it has achieved so far, as well as work plans for the 2005/06 season. This report was made available to ARI-Uyole on 22<sup>nd</sup> December, 2005, for distribution to the Regional Agriculture Advisors and the DALDOs in the four regions comprising the SH. This effort is aimed at making this new enterprise better known among stakeholders for increased and better

cooperation. A brochure describing the company and its objectives as well as activities in the zone is already underway. When ready, copies will be distributed among farmers and other stakeholders in the SH.

2. In order to address the acute shortage of seed, HSG plans to produce at least 500 tonnes of certified seed maize for distribution in the SH zone. This quantity is more than twice the amounts which had been provided in previous seasons.

3. HSG has funded the planting and husbandry costs for 6 demonstrations in Rukwa region. Initial plans had included Ruvuma region; however, the drought situation in the region led to the postponing of this activity until the 2006/07 season. In addition to funding these demonstrations, HSG has already indicated that it would fund at least one field day event in Rukwa region if the district and regional authorities would agree to share 50% of the costs of carrying out these events.

The attached report (Appendix 3) gives further details which reflect the commitment of HSG in working with the public sector in addressing farmers' needs with regard to improved seed maize as well as other services.

## **5) M&E of stakeholders activities, lesson learning and implications (for policy)**

### **a) Farmer research group and demonstration plot evaluation**

The review of the key findings were presented at the Nov 2005 Maize Innovation System Stakeholders Workshop and a full report was prepared (Kiranga et al, 2005) a summary of which can be found below.

#### *Type of people reached by the project activities in the villages*

*Farmers groups* – Farmer selection had been done by the district agricultural extension staff based on the individual farmer's willingness to participate in the project, instead of facilitating farmers with common interests and bonds to form groups.

*Gender* – The research group farmers are male dominated on a ratio of 3:2.

*Age* - The majority of the research group members were from 40-70 years (70%) with the remaining being between 30-40 years.

*Education* - The majority of the research farmers (80%) had completed primary school.

*Wealth* – The research group members represented the medium wealth class of the community.

*Agricultural trainers* - In the villages visited, only two of the four had resident agricultural extension staff. Village extension officers were taken on board during project implementation as the link between research and farmers. In the process of implementation, they reported that they lacked well-defined roles.

*Stockists/Agricultural input distributors* - In the villages visited the number of stockists was limited. For instance at Ihahi and Utalingoro the nearest stockists are located at Chimala (12kms) and Njombe (14kms) respectively. In Majenje there were two stockists who had to serve 620 households equivalent to a ratio of 1:310, while Mtwango had four stockists serving 1164 households a ratio is 1:291.

#### *Process and response to farmers' needs*

In the visited villages all research group members have been trained on the required information regarding seed management, insect and disease management and well as soil fertility management. The required knowledge at all stages of crop cycle has been availed to farmers by the project through organised training sessions and field visits. To supplement this training, reference materials were provided in the form of leaflets and handouts (Kanuni za kilimo bora cha mahindi, Ugonjwa wa milia wa mahindi, Matumizi ya Mbolea katika Kilimo cha

Mahindi, and Kuwa daktari wa mahindi yako). However, the process had limited provision for participatory monitoring and evaluation (PM&E) for the different stakeholders involved in implementing the project activities.

*Identification of new information gained through the project*

The discussions with farmers in the villages visited identified their understanding of information gained through project activities which can help them achieve their goals. The approaches and tools have been useful in facilitating access to and use of the new information; and the outcomes are as shown in Table 10. Availability of improved maize seed was still a major need in the four villages.

**Table 10: New information and approaches/ tools used to achieve goals of farmer research group members in Njombe and Mbarali districts**

Village, District	New information/ understanding	Approaches/ tools used to facilitate access	Use of information	Outcomes
Majenje & Ihahi, Mbarali	Seed management	Demo plots, training seminar, exchange visits, leaflets, handout	Plan to produce seeds- QDS	Increase seed demand in village
	Plant spacing	Practical planting in demo plots	Apply spacing of 75x30cm in own fields	Increased yield per unit area
	Post harvest technology	Training seminar, measure moisture content, use of insecticides, farm visits	Apply in maize harvest and storage	Reduced incidences of post harvest losses
Mtwango, Njombe	Quality maize seed	Demo plots, training seminar, exchange visit, study visit, handouts	Use quality seeds in own fields	High demand for quality seeds which exceeds supply
	Use of fertilizer	Demo plots, leaflets, training seminars	Apply at lower rates	Recommended rates not used due to high prices
	Planting methods	Demo plots, leaflets, seminars	Use recommended spacing	Increased yields
Utalingoro, Njombe	Plant spacing	Demo plots, training seminars, handouts, leaflets, study visit	Use recommended spacing	Low yields due to poor soils
	Disease diagnosis	Demo plots, leaflets, training seminar	Use cultural control measures	Able to diagnose disease
	Understanding of hybrid seeds	Demo plots, training seminar	Have knowledge	Limited application of knowledge

*Farmers' assessment and suggestions on research process*

A Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis was used to facilitate farmers in assessing the research process and suggest areas that need improvement. Farmers' opinion and comments from the four study villages are described in Table 11.

**Table 11. SWOT analysis of the farmer research group process in four villages in the Southern Highlands.**

Village, District	Strengths	Weaknesses	Opportunities	Threats
Majenje, Mbarali	<ul style="list-style-type: none"> <li>• Commitment, solidarity and good relationship between research farmers</li> <li>• Availability of trainers (Extn and Research)</li> <li>• Family members involved in project activities</li> <li>• Existence of collaboration among partners</li> <li>• Stockists and input distributors available in the village</li> </ul>	<ul style="list-style-type: none"> <li>• Poor attendance of some members for project activities</li> <li>• Group do not have binding rules</li> <li>• Promotion strategy not well defined</li> </ul>	<ul style="list-style-type: none"> <li>• Existence of irrigation scheme</li> <li>• Recognised by the village government</li> <li>• Can produce QDS</li> <li>• Other farmers have shown interest to join</li> <li>• Access to market centres (Mbeya, Iringa and Songea)</li> <li>• Access to loans through their SACCOS</li> <li>• Available stockists</li> </ul>	<ul style="list-style-type: none"> <li>• Thieves of QDS</li> </ul>
Ihahi, Mbarali	<ul style="list-style-type: none"> <li>• Existence of research farmers</li> <li>• Solidarity and good relationships among research farmers</li> </ul>	<ul style="list-style-type: none"> <li>• Don't have an extension officer</li> <li>• No stockists and input distributors</li> <li>• Group has no legal status</li> </ul>	<ul style="list-style-type: none"> <li>• Existence of irrigation scheme</li> <li>• Recognised by the village government</li> <li>• Have skills and expertise to produce QDS</li> <li>• Other farmers have shown interest to join</li> </ul>	<ul style="list-style-type: none"> <li>• Rainfall changes can affect irrigation scheme</li> <li>• Privatisation of irrigatable Kapunga farm</li> </ul>
Mtwango, Njombe	<ul style="list-style-type: none"> <li>• Have the knowledge on maize production</li> <li>• Have enough land to grow maize</li> <li>• Existence of research farmers</li> <li>• Recognised by the village government</li> <li>• Solidarity and good relationships amongst research farmers</li> <li>• Availability of trainers (Extn and Research)</li> <li>• Existence of collaboration among partners</li> <li>• Stockists and input distributors available in the village</li> </ul>	<ul style="list-style-type: none"> <li>• No land for group demonstration plot</li> <li>• Long-term plan not shared with farmers</li> </ul>	<ul style="list-style-type: none"> <li>• Existence of stockists and input suppliers in the village</li> <li>• Recognised by the village government</li> <li>• Have knowledge and experience that can facilitate QDS production</li> <li>• Other farmers have shown interest in joining</li> <li>• Research farmers can be stockists</li> <li>• Existence of a SACCOS in the village</li> </ul>	<ul style="list-style-type: none"> <li>• Fake seeds and inputs</li> <li>• Changes in climate may affect the rainfall pattern</li> <li>• Unavailability of promoted seeds</li> </ul>
Utalingoro, Njombe	<ul style="list-style-type: none"> <li>• Existence of research farmers</li> <li>• Solidarity and good relationships among research farmers</li> </ul>	<ul style="list-style-type: none"> <li>• Don't have an extension officer</li> <li>• No stockists and input distributors</li> <li>• Lack confidence to demand information on soil test results</li> </ul>	<ul style="list-style-type: none"> <li>• Existing shop owners can be encouraged to deal with farm inputs</li> <li>• Recognised by the village government</li> <li>• Other farmers have shown interest in joining</li> </ul>	<ul style="list-style-type: none"> <li>• Poor soils in relation to maize production</li> <li>• Rainfall pattern changes</li> <li>• Maize receive second priority in term of income earning crops</li> </ul>

*Conclusions and recommendations*

The project has made significant achievements in facilitating farmers to test maize varieties revealing an overwhelming preference by farmers for UH6303 which they believe will enable them to improve their livelihoods. Approaches and tools used by the project have facilitated the farmer research groups to access new information on various aspects of maize production and seed management. As a result of the awareness created, demand for quality seed has increased faster than available supply. For instance at Mtwango village in Njombe district, their requirement for the coming 2005/2006 season is ~1.5 tons of UH6303 against the 500

kg promised through Matanana farm. It was noted that aspects of economic analysis received little attention during the activities, and given the income earning opportunities of this crop, it would be an area worth investing more farmer training resources in.

- It is recommended that a more participatory research group approach such as FFS is adopted in future, to strengthen farmers' field and management skills through a more discovery learning based approach, this would also help in expansion to other areas as farmer graduates become trainers.
- The research process has not adequately responded to farmers' demands for quality seeds. In the case of villages in Mbarali district, further efforts are needed to support farmer seed production or on-farm multiplication for QDS.
- In Njombe there is a high preference for seeds which are tested and produced in the local environment, efforts should be made to enhance certified seed production through formalised public private partnerships so farmers' can access the seeds of their choice.
- A wider range of tools could be used in future to help impart maize management information to participating and non-participating farmer research group members.
- The learning process and access to information could be enhanced through a more effective feedback mechanism. Participatory planning, implementation and monitoring and evaluation should be adopted in the research process.

#### **b) Southern Highlands Maize Innovation System Stakeholders Workshop: Improving Understanding and Enhancing Access to Quality Seed and Other Products**

A joint stakeholders workshop "The **Southern Highlands Maize Innovation System Stakeholders Workshop: Improving Understanding and Enhancing Access to Quality Seed and Other Products**" was organized by projects R8406 and R8422 from 9-10<sup>th</sup> November, 2005 at VETA Mbeya.

The workshop aims were to a) share the projects' experiences, outputs, lessons and b) to identify policy implications including helping each stakeholder group to identify the way forward. Specifically to involve these stakeholders in: analysing information collected from three seasons of maize variety demonstration plots in four districts of the Southern Highlands; analysing information collected on access to quality pre and post harvest maize information and products; identifying the important lessons that have been learnt and which could be shared; utilising these findings to begin multi-stakeholder brain storming on themes relating to the maize innovation system in the Southern Highlands and developing policy implication trees.

The workshop was attended by 57 of the 70 invited stakeholders (5 NGOs, 3 seed companies, 3 stockists, 8 district extension staff, 4 ward/village extension staff, 15 farmer research group members, 8 public sector researchers, 4 other researchers, 1 ZRELO, 3 regional agricultural advisors, 1 TOSCI, 1 DED, and 1 PADEP (9 of whom were female)). Many of the participants had attended the Southern Highlands Maize Seed Stakeholders workshop in Iringa in July 2003 and so were familiar with the projects aims and with each other.

The programme was structured so that on the first day participants would hear a series of grouped presentations prior to informal paired discussion and noting of key issues emerging (which were then pasted on to the wall, and later grouped to capture the important themes emerging from the workshop). The two research projects hosting the workshop were introduced by their respective leaders, Dr Lyimo and Mr Nsemwa to provide the background to the workshop. Table 12 lists the presentations that followed; handout notes of the presentations were given to all participants.

**Table 12. Titles of presentations given at the Southern Highlands Maize Innovation System Stakeholder Workshop**

Assessing performance and adaptability of improved maize cultivars under farmers' conditions – <i>Mr Temu</i>
Progress towards the development of MSV resistant varieties in the Southern Highlands – <i>Dr Lyimo</i>
Seed certification – <i>TOSCI Njombe officer</i>
Maize agro-biodiversity in the Southern Highlands – <i>M.M. Mkuchu</i>
Zonal Maize Promotion Strategy – <i>Mr E. Kiranga</i>
Farmer Research Group Members experience of access to maize information, training and products ( <i>4</i> )

*separate 10 min presentations one/ district)*

District Extension Officers experiences of current and future strategies for extension delivery of maize information, training and products *(4 separate 10 min presentations, one/ district)*

Private Sector Seed Companies' experiences of current and future strategies for private sector delivery of maize information, training and products *(3 separate presentations: Tanseed International; East African Seed; Highland Seed.)*

Project's research findings on how different maize stakeholders access maize information, training and products – *Mr Nsemwa*

Reflections on farmer ownership, understanding and influence on maize project activities – *Mr Kiranga*

In the evening of Day 1 a few participants stayed to review and collate the brainstorming/key issue stickers that pairs had stuck up following the groups of presentations. In stakeholder groups (farmers, stockists, seed companies, researchers, extensionists, NGOs, policy makers), participants then further brainstormed on and discussed key issues, themes and policy implications arising from the presentations and discussions. Each stakeholder group then developed implication trees for each of the key issues, detailing the effect and actions that could be taken by their own stakeholder group to enhance or negate these effects. These implication trees were then shared in plenary.

The main issues emerging from several of the stakeholder groups, causes, implications and solutions are captured in Table 13.

**Table 13. Key maize innovation system issues emerging from several stakeholder groups, their causes, implications and potential solutions**

Issue	*No. of groups	Causes	Implications	Solutions
Insufficient seed supply	5	<ul style="list-style-type: none"> <li>• Low production</li> <li>• Seed shops in town/ urban areas</li> <li>• Limited resources (human, equipment, capital)</li> <li>• Inappropriate seed packaging</li> <li>• Poor market system and/ or distribution</li> </ul>	<ul style="list-style-type: none"> <li>• Fake/ not genuine/ poor quality seed</li> <li>• Accelerated poverty</li> <li>• Food shortages, low income</li> <li>• Continued use of traditional seed</li> <li>• A decline in maize production</li> </ul>	<ul style="list-style-type: none"> <li>• Stockists advise to farmers to purchase inputs in cooperation</li> <li>• Stockists need to be reliable when they sell bulk broken inputs</li> <li>• Producers to use small sized packages</li> <li>• FRGs to produce seed</li> <li>• Facilitate and build capacity of FRGs to produce &amp; market QDS</li> <li>• Facilitate improvement of traditional seed</li> </ul>
Inappropriate packaging	4	<ul style="list-style-type: none"> <li>• Large seed pack size which doesn't consider financial capacity of farmers</li> </ul>	<ul style="list-style-type: none"> <li>• A decline in maize productivity</li> <li>• Farmers not capable of purchasing good quality seed so use traditional seed</li> </ul>	<ul style="list-style-type: none"> <li>• Manage high costs through cooperatives</li> <li>• Buy in bulk cooperatively &amp; bulk break</li> </ul>
Seed production at farm level (QDS & PSS)	3	<ul style="list-style-type: none"> <li>• Low farmer capacity to select and produce seed scientifically</li> <li>• Low status of farmer saved seed</li> </ul>	<ul style="list-style-type: none"> <li>• Use of inferior seed</li> <li>• Low yields</li> <li>• Farmers unable to buy inputs</li> </ul>	<ul style="list-style-type: none"> <li>• Build capacity of farmers to produce, select, process and store seed</li> <li>• Enhance marketing</li> <li>• Combine effort, purchase good quality seed in bulk and bulk break</li> </ul>
Training partnership inadequate	3	<ul style="list-style-type: none"> <li>• Limited resources for multi-stakeholder participation</li> <li>• Lack of platform/ forum that links stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>• Resources are not used properly</li> <li>• Farmers are confused</li> <li>• Low participation of stakeholders</li> <li>• Narrow/ limited knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• Establish collaboration, meet and discuss matters of common interest</li> <li>• Strategic use of limited resources</li> <li>• Encourage culture of information exchange/ sharing</li> </ul>
Poor seed distribution	3	<ul style="list-style-type: none"> <li>• Seed shops are in urban areas/ towns</li> <li>• Poor linkages between stakeholders</li> <li>• Distributors have low capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Good quality certified seed does not reach farmers</li> </ul>	<ul style="list-style-type: none"> <li>• Effective market communication</li> <li>• Partnering to ensure that seed reaches farmers at village level – remote areas.</li> </ul>

*\*No. of groups represents the number of different stakeholder groups who mentioned this as a key issue.*

The afternoon of the second day involved the participants in analysing and interpreting information on a range of topics collected by the projects, four groups worked simultaneously and then presented back to the plenary. The group work was: a) review and interpretation of maize leaflets - farmer representatives, stockists and VAEOs; b) strategies for addressing the policy implications that were raised by the different stakeholder groups – policy makers, DEDs, RAAs, PADEP, TOSCI, Seed Unit; c) review and interpretation of seed fair evaluation data set; d) review and interpretation of stockists survey evaluation data set. A report of the stakeholder workshop is currently being finalised (Gondwe et al, in prep.).



## CONTRIBUTION OF OUTPUTS TO DEVELOPMENTAL IMPACT

### *Contribution towards DFID's and the GOT's developmental goals*

DFID is generally working towards the millennium development goals, including halving the proportion of people in extreme poverty and suffering hunger between 1990 and 2015. In many sub-Saharan African (SSA) countries, poverty is growing, agricultural production and food security are worsening. Labour productivity is also declining, with HIV/ AIDS a major contributory factor. The underlying forces include population change (generally increasing, but influenced by HIV/AIDS), policies and markets (generally a trend towards liberalization), institutions & organizations and social context. Food crop production per capita is generally declining, although specific reasons varying with location. Agriculture is a key sector in most SSA countries and increasing agricultural productivity is regaining prominence as a strategy for stimulating growth and hence poverty reduction. URT's Poverty Reduction Strategy Paper (PRSP) considers agriculture to be critical to Tanzania's economic, social and development goals. The national Agricultural Sector Development Programme - which arose in response to the PRSP – that has the overall aim of creating an enabling environment for improving agricultural productivity and profitability, improving farm incomes, reducing rural poverty and ensuring household food security. The ASDP has identified strengthening of the institutional framework, public and private sector roles in improving support services and strengthening marketing efficiency for inputs and outputs as three of the five key strategic issues that need to be addressed. The project's outputs are consistent with the above as further explained below.

The project outputs have targeted the main food crop [maize] and the zone with the highest potential for maize production in Tanzania [SH], with a view to safeguarding not only the local food security but also that of the entire nation as a whole. It is from the SH that Tanzania derives up to 50% of its total national maize production.

Further maize variety demonstrations in rural communities (including areas which have very limited access to new maize production technology in any form for the last 20 years), have created awareness of new high yielding and disease resistant varieties. These safeguard and improve farmers' livelihoods as most depend on maize both for food and cash income. As part of these promotion activities, a range of maize cultivars have been evaluated in 16 villages on 80 farmers' fields for a further season. Uyole-bred maize hybrids have maintained a high tolerance to GLS and a high grain yield. A Memorandum of Understanding has been agreed with the Highland Seed Growers Ltd for the sale of the Uyole-bred hybrid, UH615, which includes considerable resources being ploughed back into the Maize Improvement Programme, enabling the development of further hybrids.

MSV has continued to constrain crop yields in irrigated areas in lower-lying Mbarali district. It can also be a major constraint for the main crop elsewhere in Tanzania, occasionally major epidemics leading to instability of the cropping system. An MSV "hotspot" identified at one of the target villages in Mbarali district has continued to be used to identify and develop cultivars with high levels of resistance to this disease. As a result, we have been able to select new resistant advanced lines and hybrids, several of which are currently undergoing verification under farmers' field conditions, with the aim of presenting new GLS/MSV resistant hybrids for release over the next several months. In a very recent development UH615 and UH6303 were presented before the Ugandan Variety Release Committee meeting in Entebbe on 16th February and both of them have been accepted as commercial maize cultivars in the Highlands of Uganda

Various leaflets on maize production and disease management developed by R8220 have been validated by farmers and other stakeholders. Several thousand of these leaflets have been printed. DALDOs have expressed a keenness to print many further copies and plans are being made to co-ordinate orders so as to obtain major cost savings. Details are set out in this report.

Various activities have been conducted as part of a co-ordinated programme with the Crop Post Harvest Programme (CPHP) project R8422 [Improving farmer and other stakeholders' access

to quality information and products for pre and post harvest maize management in the Southern Highlands of Tanzania]. The activities and findings of these two projects have provided an opportunity for lesson learning which may have implications for within the SH, other parts of Tanzania and for improving agricultural service provision more generally.

## **Contribution to lesson learning**

### **Context**

The project has explored how to improve farmers and other stakeholders' access to and management of disease resistant maize cultivars in the Southern Highlands of Tanzania i.e. we considered information/ knowledge/ innovation issues in a single commodity and sub-national context. The project has worked with **on-going policies and processes** in Tanzania. In common with many countries this includes a process of decentralisation of service provision and strengthening of public-private partnerships. The project has built on the successes of R8220 and more recently in partnership with the CPHP funded project R8422.

### **Overall process**

This project (with a sister CPHP project) facilitated the building of relationships with a wide range of stakeholders from the public, private commercial, NGO sectors, together with farmers organised in farmer research groups. This process was facilitated by an initial stakeholder analysis and wide stakeholder consultations through surveys and workshops. The projects have worked towards improving communication and finding common ground for improving access to information, training and products. This process has been challenging, transaction costs were high, but there are clear indications of returns to the investment.

Key issues and insights were:

- Importance of understanding how farmers and other stakeholders are accessing/ have accessed information, training and products which are influencing their current practices. This requires the development, application and implementation of methods with key stakeholders to identify farmer's sources of information, training and products based on what farmers do. This creates the foundations for improvement.
- Farmers' criteria for assessing sources of information and suggestions for how services can be improved to best meet farmers' preferences are key. However, from our experience in the S. Highlands many farmers and some service providers were unused to such questions. To be effective, a free atmosphere must be developed to encourage an open dialogue. Farmer groups have the potential to create platforms for mutual learning about improving service provision.
- Farmer groups as an approach for facilitating research and promotion are being widely encouraged. There are clearly major advantages to groups, but it is important to understand which part of the community is represented by the groups and how much interaction there is between group members and others in the community. For example, the farmer research groups we worked with did not have an even gender balance and most appear to be in middle wealth categories.
- Learning tool development with farmers – the process of developing leaflets with appropriate content, style etc was iterative and required considerable time and resources despite being facilitated by relatively high literacy rates in Tanzania and a widely-used single national language, Swahili.
- Although leaflets can be an important learning aid, the preferred form of learning for most farmers is through personal interaction and 'learning by doing'. The Farmer Field School approach is being promoted in Tanzania, but scaling up this approach remains a major challenge, there is limited evidence of sharing of information with non-FFS participants and ways are needed to reduce the apparently high costs. Approaches are needed to support and improve the capacity of facilitators, perhaps through increased use of the internet, now widely available at district level in Tanzania.

- Complexity of and communication between stakeholders - there are many stakeholders involved in service provision with differing perceptions and interests. It is important to appreciate and, if possible, work with the diversity. This process can have high transaction costs, but service providers working with the project emphasised the major benefits of improved communication and collaboration. Some stockists emphasised the importance of discussing issues with fellow stockists and there appear to be opportunities to enhance this process further to identify mutual benefits such as joint negotiation with supply companies servicing the Southern Highlands.
- Identifying how service providers are accessing/ have accessed information, training and products- this does not appear to have formerly received much serious attention, particularly with regard to the private sector. Similarly, asking stakeholders to share suggestions on how farmers' and service providers' access to maize information, training and products may be improved does not seem to have been a common practice and provided a wide range of ideas which can be built upon through a decentralised process of service provision. For example, many personnel working in stockist's shops have received little or no training, but there was clear demand and understanding that this would bring benefits in terms of attracting and retaining customers. Private sector capacity would be a very useful area for further action research.
- Stakeholders' perceptions of issues, causes, implications and practical solutions to improve innovation system are closely linked to the above. This was explored through a stakeholder workshop in the S. Highlands and has sown the seeds for future initiatives in the zone.
- Policy makers are key suppliers and users of information - but who are the policy makers at the different levels? Stakeholders' perceptions of policy makers are important. How to engage with policy makers at different levels? Experiences and strategies of a range of public, private and NGO stakeholders were shared and documented.
- Public and private sector organisations at a distance from farmers are responding less well to farmer demand than those closer to farmers, e.g., stockists are breaking company packs into smaller units in response to farmer demand.
- Personal interactions and relationships are important – this emerged clearly over the life of the project.
- Quality assurance - completing learning tools in a decentralised system can be a long, iterative process with potentially high transaction costs. There are often trade offs between getting something finished and disseminated and developing a 'perfect product'. Creating a 'version1' and distributing with caveats is one option
- Locally developed innovations e.g. seed - one important way in which research innovations can be introduced sustainably into local knowledge systems is through enhancing capacity effectiveness and morale of LOCAL organizations. For example, it may be the case that for a smaller more localized company it would be economic to produce just 50 tonnes of seed of a particular variety with very specific local requirements. National or international seed companies are very unlikely to do that.
- Formal and informal institutional arrangements are needed to provide **incentives** for stakeholders in order to improve their own and other stakeholders' access to knowledge and stimulate innovation.
- Infrastructure e.g. ICTs, mobile phones. There need to be incentives in place for stakeholders to access new information, acquire understanding and act on it. The appropriate infrastructure can contribute to a dynamic institutional environment, but systems need to be in place that ensure access and encourage appropriate use. The

internet, email, access to computers and mobile phones have been crucial to the development and implementation of this project.

- Public-private partnerships – ARI Uyole/ MAFS have developed a partnership with at least one company which is providing resources for the development of new maize varieties. Initially, at least, both these organisations are based in the Southern Highlands and there is clear potential for innovation e.g. new varieties to emerge from this partnership. This has evolved at least partially because of the amended Plant Breeders Rights Act.
- Legal frameworks - the Plant Breeders Rights Act in Tanzania has created incentives for breeders and others to develop new varieties, but there is little incentive for any stakeholder to work with farmers to improve the management of their own varieties.
- Informal arrangements at local level and linking higher up the supply chain – bulk breaking and re-packaging of products is common and is in response to farmers' demand. In other retail sectors (e.g. shampoo, toothpaste, tea) selling in very small packs is common. This approach allows farmers to try out new products at a very low cost. The case is strong for big business to be more entrepreneurial and to re-engineer products to reflect the economics at the 'Bottom of the Pyramid' including: small unit packages, low margin per unit, high volume. At times, some development agencies appear to be undermining the need for companies to do this e.g. through providing one off contracts for seed for relief programmes.

#### ***Promotion pathways to target institutions and beneficiaries.***

The project has identified the following organizations which agreed to play key roles in the uptake and promotion of the realised outputs.

1. The District Councils through their Agricultural Extension Departments in Mbozi, Mbarali, Njombe and Iringa will participate in the uptake and promotion of the outputs. Farmer Field Schools which are now being piloted in the districts will serve as one of the strategies for this promotion. The district level extension workers and the division/village-based extension officers will be key players in the dissemination of the outputs through farmer training fora, on-farm/demonstration activities including the various training and learning tools developed by this project. These have been planned through district promotion strategies and budgets have already been agreed with some DEDs for 2006/7..
2. Non-governmental organizations operating in the SH. Specifically targeted are:
  - INADES – Formation Tanzania (Institut Africain pour le Development Economique et Social). Their philosophy is centred on empowering rural communities to bring about self advancement, using a gender sensitive Action-Research-Training approach. Currently, this NGO is supporting over 80 farmer groups in Mbeya, with the main aim of improving their livelihoods through increased food production and profitable marketing of surplus farm produce.
  - The ADP-Mbozi Trust Fund, an agricultural NGO operating in Mbozi District since 1986. Its mission is to support the efforts of resource-constrained rural communities in the district by improving agriculture, rural infrastructure, education as well as primary health care. With regard to agriculture, one of the strategies is to improve food and cash crop production, thereby increasing nutritional levels and household income in rural communities.
  - The Isangati Development Programme. With a mission similar to ADP-Mbozi, this NGO is working in Mbeya Rural District.
  - The Ileje Rural Development Trust Fund, working with poor rural communities in Ileje district. One of its strategies is to increase food self sufficiency at household level.
  - CARITAS: This is a Catholic NGO with extensive experience in working with rural communities in an effort to improve livelihoods among poor people.

- VECO (Vredeseilanden Office). This NGO seeks to empower resource-poor communities to manage their own food security situations by promoting sustainable agriculture and economic processes. Currently, it is working in 5 districts within Mbeya region.

3. The Agricultural Sector Programme Support Programme (ASPS) – Seed Unit under the Ministry of Agriculture and Food Security. The ASPS-DANIDA-funded on-farm seed production activities have been expanded to cover Mbeya and Ruvuma regions. Some farmers who received training on Quality Declared Seed Production and management are now included in the ASPS on-farm seed production project so that they may participate in village-based seed production activities, consequently improving seed availability, particularly for open pollinated maize varieties in those rural areas of the SH which are poorly served by the commercial seed sector.
4. Private Seed Companies. These seed companies will produce and distribute new maize cultivars validated by farmers under this project. Highland Seed Growers Limited have signed a memorandum of understanding and are now starting to produce and distribute seed in the Southern Highlands. Two varieties (UH615 and Uh6303) have been released for the highlands in Uganda.
5. Input stockists. Much stronger links have developed between ARI Uyole, district extension and a number of stockists through e.g. workshops, seminars, joint visits to demonstrations and there is clear interest from stockists to improve their capacity with regard to maize management as a means of improving their service and attracting more customers.

#### **Publications:**

R.W. GIBSON, N.G. LYIMO, A.E.M. TEMU, T.E. STATHERS, W.W. PAGE, L.T.H. NSEMWA, G. ACOLA, R.I. LAMBOLL (2005) Maize seed selection by East African smallholder farmers and resistance to *Maize streak virus*. *Annals of Applied Biology* 147: 153-159.

#### **Internal Reports:**

GONDWE, B., NSEMWA, L.T.H., STATHERS, T., LAMBOLL, R., LYIMO, N., TEMU, A., and GIBSON, R. (in prep.) Southern Highlands Maize Innovation System Stakeholders Workshop: Improving Understanding and Enhancing Access to Quality Seed and Other Products. Report of the stakeholders workshop, 9-10th November, 2005 at VETA Mbeya, Tanzania. DFID project R8422 and R8406. ARI Uyole, Mbeya, Tanzania.

KIRANGA, E.K., MANGASIN, S.H. and MUSSEI, A. N. (2005) An evaluation of maize variety demonstration farmer research group activities in the Southern Highlands of Tanzania. ARI Uyole, Mbeya, Tanzania. pp 11.

STATHERS, T., NSEMWA, L.T.H., LAMBOLL, R., and LYIMO, N.G. (2005) Improving farmer and other stakeholders' access to quality information and products for pre and post harvest maize systems management in the Southern Highlands of Tanzania: Report of the Inception Workshop, 22nd-24th February 2005, at the Catholic Youth Centre, Mbeya, Tanzania. DFID project R8422. ARI Uyole, Mbeya, Tanzania. pp 48 + xxvi.

#### **Other Dissemination of Results:**

GIBSON, R.W., MANU-ADJENING, J.A., LAMBOLL, R.I., LYIMO, N.G., ACOLA, G. (2005) Some farming practices may delay the development of virus-resistant landraces. Presentation at the IX International Plant Virus Epidemiology Symposium, April 4 – 7, 2005. Lima, Peru

ANON, (2005) Kuwa Daktari Wa Mahindi Yako (Be your Own Maize Doctor: A guide towards nutrient deficiency and foliar disease symptoms in maize production). ARI Uyole, Mbeya, Tanzania. pp 6.

LYIMO, N.G. (2006) Open pollinated maize varieties: hints on seed management and variety maintenance for small farmers. ARI Uyole, Mbeya, Tanzania.

## **FOLLOW-UP INDICATED/PLANNED:**

### **FUTURE OPPORTUNITIES TO IMPROVE THE MAIZE INNOVATION SYSTEM IN THE SOUTHERN HIGHLANDS AND BEYOND :**

1. The project has laid the groundwork for improving traditional maize farmer seed selection practices through a partnership with formally-trained maize breeders, e.g., through the development and promotion of the training leaflet, 'Open Pollinated Maize Varieties: hints on seed management and variety maintenance for small farmers'. To an extent, the QDS system has addressed the same issue though restricting itself to released OPVs. The village demonstration trials indicated that currently available OPVs and landraces have similar yields, implying that improving the latter should receive at least similar investment.
2. In the screening trials for MSV resistance at the MSV hotspot at Igomelo (Mbarali district), farmers are being given free access to maize cobs on plants not selected for further work. Cobs have also been stolen. Resistance in these materials has been concentrated by de-tasselling susceptible plants, so the cobs available to farmers carry an enhanced level of resistance to MSV. It is hoped that in both cases these cobs will enter the farmers' traditional seed selection system. One problem with previous forms of MSV resistance is that they were selected for very inefficiently by the traditional seed selection system; it is important to take this opportunity to monitor whether, as seems likely, this new extreme form of resistance is selected for more effectively by the traditional system.
3. The new MSV-resistant hybrids possess an extreme form of resistance that appears not to have previously been incorporated within cultivars. It is therefore important to test this material as widely as possible both within East Africa and throughout the African continent.
4. At present, the project has collaborated primarily with local seed producers having a seed distribution coverage focused on the SHs. The success of UH615 (and hopefully UH6303) is likely to lead to demand for seed produced by Uyole-ARI over a much larger geographical area, especially now these varieties have been released in Uganda. This provides opportunity to examine how geographical scale affects the development and uptake of public sector maize varieties.
5. It has become clear during project activities that the Zonal Research and Extension Liaison Officer [ZRELO] is considerably under-resourced both in terms of modern communication equipment, travel and communication budgets and consumables. According to early drafts of the DRD mid-term plan and the Agricultural Sector Support Project<sup>2</sup> (ASSP) proposal the Government plans to address this issue. This allows novel approaches to be tested, for example, Knowledge Management principles, developed in the private sector but now being introduced to developed country public sector agencies.
6. Research led primarily by the CPHP-funded sister project R8422 identified several currently under-appreciated avenues of information and learning – such as stockists, primary schools and parents. There are various issues associated with some of these. Stockists' primary job is to sell products rather than provide information or advice and consequently receive little training in this latter role. There are concerns over children being exploited as labour rather than receiving training during primary school agricultural lessons. Perhaps at least partially in response to this, national and, in some areas, local education policy makers are removing or substantially reducing agriculture in curricula of primary and secondary schools. A study of the whole formal training system with respect to agriculture, seeking an understanding of such issues, would make a critical contribution towards understanding learning-based approaches for different target groups and agricultural innovation systems.
7. Learning approaches. The Ministry of Agriculture has adopted the Farmer Field School approach and is promoting this at district level. Learning tools developed by both projects

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<sup>2</sup> This project is being funded by the World Bank and IFAD under the umbrella of the Agricultural Sector Development Programme

appear to be suitable for FFSs. Is there scope to build on this and develop a FFS training manual for maize, together with associated learning approaches, e.g., participatory video and also to examine the potential of other electronic media including exchange of tools, approaches and new ideas on a Ministry or other website? We would monitor and learn from the process.

8. Research carried out primarily under R8422 documented non-farmer stakeholders access to information, training and products and how these may be improved. Further work in this area would be valuable in the context of identifying opportunities for capacity building of public, private commercial and not-for-profit organizations and ultimately farmers.
9. In a process facilitated primarily by CPHP-funded sister project R8422, a preliminary assessment of agricultural stakeholders' perceptions of who the policy makers are and their experiences in engaging and trying to influence policy indicated this were complex and varied with strata. A wider stakeholder consultation would further clarify stakeholders' perceptions and experiences and this would make with policy makers more effective engagement.
10. Related to 7 above, there is general consensus that outcomes of agricultural policies are often not as originally intended. For example, maize export policy varies according to the perceived food security situation in Tanzania. When food shortages occur, the Government may prohibit maize export [resulting in lower producer prices] even though the maize going to food deficit areas is generally imported. Subsidies to crop inputs present similar scenarios. Research<sup>3</sup> on the 'winners and losers' of such actions would provide valuable information for government and donor policy makers.

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<sup>3</sup> NRI (David Walker, Jonathan Coulter) has carried out some work (with DFID/EU funding) on food relief policy in Ethiopia and neighbouring countries. As an initial step it would be useful to look at their detailed findings.

## Appendix 1. District maize promotion strategies

### a) Iringa district

What	Who is being targeted?	What approach could be used?	What tools should be used?	Who does it?	When is it done?	Where?	Inputs	Contributors/ collaborators		Comments/target
								CPP	Other sources	
Seed mgmt	Farmers in projects' farmers gps & others interested	Farmer field days	-Learning plot -Dr Lyimo hand out -TOSCA hand out -ASPS/seed handout	VAEO/ DCO	Tassling (Feb/ March April)	4 project villages and ASPS/seed Villages	1. Leaflets – 400 2. Diesel – 200 lts 3. Sodas & bites – 20 crates & 400 sambusa	Fuel & refreshments	Dist council (transport & staff); Uyole (Leaflets)	400 farmers
		Farmer exchange visits	Learning plot in other villages	DCO/ VAEO  Uyole	Apr/ May	4 project villages	1. Fuel – 300 lts 2. Lunch for 5 extn staff 3. Lunch for 60 farmers	Fuel & Lunch	Dist council (transport & staff)	60 farmers
		District seminar	Practical learning plot (irrigation area) FFS plot	DCO/ Uyole/ TOSCA	Nov. – Dec. 04	Ilula	1. Bus for 48 2. Fuel – 150 lts 3. Leaflets – 96 4. DSA farmers – 48 5. DSA – 4 + driver	DSA & Busfare	Dist council (transport & staff & fuel); Uyole (handouts)	48 farmers
Seed mgmt	VAEOs	District seminar	Dr Lyimos handout TOSCA handout -ASPS/seed handout	DCO/ Uyole/ TOSCA	Nov. – Dec. 04	Ilula	1. Bus for 80 2. Fuel – 120 lts 3. Handout 80 4. DSA – (5 + 4 VAEO + driver	DSA, Busfare & Stationary	Dist council (transport, staff, fuel & fuel); Uyole (handouts)	80 VAEO
Soil fertility mgmt (agenda of farmers themselves)	Farmer group members & others interested	FFS approach	Matumizi ya mbolea leaflet Be your own Maize doctor Organic & inorganic fertiliser (MRP)	DCO/ Uyole/	Dec 04 to Jan. 05	4 project villages	1. Fuel – 200 lts 2. Lunch allow. – 3 SMS & Driver 3. Leaflets – 144 4. Refreshments for 53 members	Fuel, refreshments & Lunch allowance	District council (transport, staff, Uyole (leaflets)	48 farmers



What	Who is being targeted?	What approach could be used?	What tools should be used?	Who does it?	When is it done?	Where?	Inputs	Contributors/ collaborators		Comments
	DSMS	TOT seminar	As above	DCO & Uyole	Nov – Dec. 04	Ilula	1. Bus for 4 2. Fuel – 80 lts 3. Handouts/ leaflets–12 4. DSA (3 resource + 12DSMS)	DSA & Refreshment	District council (Transport; Staff); Uyole (leaflets)	12 DSMS
Knowledge of inorganic fertilisation	Stockists	Seminar	Fertiliser composition use & handling (MRP)	DCO/ Uyole/ TFC	Dec. 04	Iringa	1. Bus - 11 2. Fuel – 30 lts 3. Handouts/ leaflets–11 4. Refreshment 5. DSA (Uyole + TFC + stockist)	DSA	District council (refreshments for stockist, fuel) Uyole - handout	23 (11 + 12)
Crop Mgmt (maize)	Farmers/ Farmer gps in the 4 project villages/ other villages	Field days FFS Exchange visit	Leaflets on: maize husbandry, fertilisers; diseases; diagnosis of deficiencies; insects (field – storage)	DCO/ Uyole/ researchers of various disciplines	Jan. 04	In the 4 project villages	1. Fuel – 300 lts 2. Farmer lunch allowances - 600 3. Handout/ leaflets–1200 4. Refreshments – 600 farmers 5. DSA (Uyole + district fms)	Fuel DSA Refreshments	District council (transport, staff) Uyole (handouts/ leaflets)	600 farmers
	VAEO	Seminar	As above	DCO/ Uyole researchers	Jan. 05	Ilula FTC	1. Fuel – 80 lts 2. DSA for VAEO 3. Bus fare for 80 VAEO- . DSA 4 for Uyole, 1 DCO & 80 for VAEOS	DSA & Busfare	District council (Transport; Fuel); Uyole (handouts/ leaflets)	80 VAEO

N.B. Still need to be refined by a team at district level/ office, especially as regards: 1) numbers of leaflets required; 2) development activities related to maize promotion in the district; 3) looking for other collaborators/ supporters to the programme in the district

## b) Mbarali district preliminary maize promotion strategy

What	Training need	Who is being targeted?	What approach could be used?	What tools should be used?	Who does it?	When is it done?	Where?	Contributors		Remarks
								CPP	District council/ farmers	
Seed management	Indication of germination % on seed packets	Farmers Extensionists Commercial seed producers	Farmer Field days Exchange visits District seminar TOSCA to enforce existing seed labelling laws Inspection	Demo plots Handouts Letter from TOSCA to seed company	DALDO office TOSCA Project team	Sept - May	Project Villages District HQ	3 Lunch allowances for VAEOs DSA = 5 extn; 2 researchers; 10 kg of maize seed, 4 flip charts, 4 masking tape, 4 boxes of marker pens, 45 notebooks & pens, refreshments for 47 members; Fuel	District Council = vehicles; Farmers = sisal twines & pegs	40 farmers  1 Day seminar
	How to get weather forecast	All farmers Extensionists Ward to district level leaders	Group meetings (abide to their timetables) Village/ public meetings Individual radio/ newspaper access	Radios Newspapers Posters	Met dept.  DALDOs office	Oct-Nov	DALDOs office	3 Lunch allow. VAEOs DSA for 2 extensionists 1 box marker pens 25 manila sheets Fuel – 40 lts -Lunch allow. 4 VAEOS	Transport (vehicles, motor cycles)	11 wards  The activity will take two days
	Benefits of early planting, proper spacing and improved seeds	All farmers	Gp meetings Field days at demo plots	Leaflets Demo plots	Project team DALDOS	Oct- May	In pilot villages	3 Lunch allow. VAEOs DSA for 5 extn, 2 researchers, 4 flipcharts, 5 bags of fertiliser, 3 masking tapes, 5 tape measure	Pegs & sisal twine = farmers District council = Vehicle & motorcycle; sign boards	1 tape measure for 1 extn
Crop management	4. Info on different varieties and use of oxen planters	All farmers (project villages) Extensionists (district HQ, project ward) Stockists ( 15 whole district) Seed producer farmers (project villages)	Field days at demo plots Farmer gp meetings Distribution of leaflets and maps to stockists, extensionists Seminar for stakeholders	1. Leaflets (100 pcs) (Kanuni 8) 2. Map showing varieties suited to the different areas of SH (30) 3. Demo plots of diff varieties	1. Project team (using feedback from farmers) 2. Project team 3. Farmers & DALDOs office & project	By October Jan. 2005	DALDOs office In project villages -MATI Igrusi	3 Lunch allow. VAEOs DSA = 5 extn; 2 researcher; Fuel = 180 lts; 20 kg of seeds; 5 bags of fertiliser; 2 lts of i'cide; 4 flip charts; 4 boxes of market pens; -Stationery 24 pers x 1 day -DSA for 24 persons	District Council = Vehicle & motorcycle; Farmers = Sign boards, sisal twines	1 plot per project village (=4 plots)

What	Training need	Who is being targeted?	What approach could be used?	What tools should be used?	Who does it?	When is it done?	Where?	Contributors		Remarks
								CPP	District council/ farmers	
	Use of different herbicides & optimisation weed mgmt	Project farmers Extensionists	Group meeting Conduct demos Seminar for extensionists	Leaflets Demo plots -Herbicides Brochures	Project team DALDO -Plant protection Dept. ARI Uyole	Nov – Feb	Project villages -MATI Igurusi	3 Lunch allowances for VAEOs DSA = 2 extn, 2 researchers; Fuel = 180 lts; 20 kg of seeds; 5 bags of fertilisers; 2 lts of l'cide; 4 lts of herbicide; refreshments; 4 boxes of marker pens; 4 flip charts; 45 notebooks & pens	District council = Vehicle & motorcycle Farmers = Sisal twines & pegs	40 farmers, 1 demo plot per village Seminar to be done together with training need No. 4
	5. Insect pests and disease control and identification	Project farmers Extensionists	Gp meetings at farmers field Gp meetings Demo plots Field days at demo plots	Leaflets  Farmers fields Demo plots	Project team (using feedback from farmers) DALDOs	Dec – May	Project villages	3 Lunch allowances for VAEOs Fuel = 120 lts; DSA = 5 extn; refreshments for 45 members; 4 flip charts; 2 boxes marker pens	District council = vehicle & motorcylce	40 farmers, 1 demo plot per village
	6. Advantage s of timely harvest	All farmers	Visit different fields at diff grain ripening stages Gp discussion	Farmers fields	DALDO	Apr – June	Project villages	3 Lunch allowances for VAEOs Fuel = 120 lts; DSA = 5 extn; refreshments for 45 members; 4 flip charts; 2 boxes marker pens	District council = vehicle & motorcylce	40 farmers, 1 demo plot per village
Soil fertility management	7. Plant nutrient deficiency symptoms, sources of plant nutrients, & fertiliser application (OM& inorganic fertilisers)	Farmers Extensionists	Gp meetings Visit fields to see deficiency symptoms & diff fertiliser performances	Leaflets showing diff deficiency symptoms Leaflets on fertiliser use Farmers fields Bwana shamba soil testing kit	Project team* DALDO	Dec - June	Project villages	3 Lunch allowances for VAEOs DSA = 5 extn & 2 researcher ; Fuel = 120 lts; 4 flipcharts; 4 boxes of marker pens; 4 masking tape; refreshments	District council = vehicle	40 farmers

### c) Mbozi district preliminary maize promotion strategy

What	Who is being targeted?	What approach could be used?	What tools should be used?	Who does it?	When is it done?	Where?	Budget
1. Seed mgmt	Farmers (from 18-60 yrs, men & women)	FFS Field days	Learning plots Leaflets Agricultural shows	Farmers Village extension officers District extension officers Local village govt	Oct/ Nov – Jun/ July	At the 4 project villages	a) Learning plots – Materials: 100kg of TSP (4 villages); 200 kg of CAN (4 villages); 20 kg of seeds (diff vars); 1 lt of insecticide; fuel – 400 lts; DSA for DCO, VEOs & Researchers. b) Leaflets – Kanuni 8 (100); Matumizi ya mbolea (100); Uzalishaji na utuuzaji bora wa mbegu (50); Ugonjwa ya milia (100); Utumiaji bora wa mbolea za miamba/ minjingu (100) c) Field days – Transport Fuel 400 lts; DSA for DCO, VEOs, Researchers; Refreshments – farmers & invited guests =60 people; materials 1 box marker pens; 20 manila sheets; 4 masking tapes; 8 sign boards; 4 flip charts
2. Soil fertility	Farmer gps Vill extension officers, ward & districts	Gp meetings FFS Field days	Demo plots Leaflets Poster	Researchers Farmers Public extension (district/ village/ NGOs)	The whole year	At the villages	a) Demo plots – Treatments = top dressing only CAN, minjingu + CAN, TSP + CAN. Minjingu 100kg. Materials; TSP 100 kg; CAN 200 kg; Seed 10 kg (UH615), field materials. b) Transport cost fuel 400 - DCO, VEOs & Researchers. Soil analysis, DSA for DCO, VEO @ 6 days
3. Crop Mgmt	Farmers Public extn NGOs	FFS Field days	Demo plots Leaflets Posters Agric shows	Farmers 60 Researchers 1 Public extension 2(district/ village) Village local govt 2	Dec - June	ADP Ukwile At the 4 villages	Posters – Be your own maize doctor (50) Follow up to village groups Transport costs – Fuel 560 lts; Upkeep (DSA) DCO, VEO & Researchers – Refreshment for 65 members = 7,028,000/=

#### d) Njombe district preliminary maize promotion strategy

What	Who is being targeted?	How/ What approach could be used?	What tools should be used?	Who does it?	When is it done? (season)	Where?	Requirements	Contributors	
								CPP	Other sources & district council
Seed & seed mgmt	Individual farmers	Village meetings	Leaflets				To be developed further in a district council strategy		District council
	Farmer gps	gp meeting	Leaflets Small packs of new varieties	District extn, farmers	2004/5	Village	Soda 2 crates, 40 pens, 40 notebooks, 2 flipcharts, 4 masking tape, 2 boxes marker pens, 1 ream, p/copy services, 40 * 5 leaflets = 200, 50 lts diesel * 3 trips * 4 villages, 3 facilitators (lunch)	Refreshments, leaflets, fuel, lunch	Stationeries (D/C)
	Public extn (village)	gp meeting	Leaflets Small packs of new varieties	District extn, farmers, ARI Uyole	2004/5	District	1) DSA 4 staff for 2 days 2) Meal allowances for 2 days (TOSCA, DCO, DALDO, DEO) 3) Stationeries (flipchart 2, masking tape 2, p/copy paper 1 ream, 1 box pens, 1 box markers 4) DSA (researcher * 2 days) 5) 10 leaflets * 5 types 6) Bus fare (4 staff) 7) Hall charges	DSA, meals, leaflets, busfares	Stationeries (D/C) Hall charges
	Stockists/ Distributors	Market place, field days	Leaflets, agric shows Small packs of new varieties	District extn, farmers, ARI Uyole	2004/5	Town/ ward	1) 30 stockist @ 2 leaflets 2) Stationeries 3) DSA (researcher) 4) Bus fare (stockist) 5) Meal allowance (DCO stockist & TOSCA)	DSA Busfares Meals Leaflets	Stationeries Hall charges
Soil fertility mgmt	Individual farmers	Village meetings	Leaflets (as below)	Farers VAEOs, Researchers	2004/05	Village	To be developed further in a district council strategy		District council

Farmer gps	Exch visits	Leaflets on soil fertility problems and remedies -small packs of improved fertiliser -small packs of MRP (Minjingu)	District extn, farmers, ARI Uyole	2004/5	Village	1) Fuel 150 lts 2) 40 leaflets (matumizi ya mbolea) 3) 2 crates of soda	Fuel Leaflets Refreshments	
Public extn	Field visit	Demo & learning plots -small packs of fertilizer small packs of MRP (Minjingu) in acidic soils	DEO, DALDO, Uyole		Village	1) Fuel 50 lts * 2 trips * 4 villages; 2) Lunch (6 staff * 2 * 4 villages +driver) 3) DSA (researcher) * 2 trips * 4 days	Fuel Leaflets Refreshments	
Stockists/ Distributor s	Training	Leaflets -small packs of fertilizer small packs of MRP (Minjingu) in acidic soils	District extn, Uyole	2004/5	District	1) 30 stockist @ 1 leaflet 2) Stationeries 3) DSA (researchers) 4) Meal allowance (DCO) 5) Bus fare (stockist)	Leaflets Bus fares DSA Meals	Hall charges Stationeries

Crop Mgmt	Farmer gps	Field days	Demo plots	District extn, farmers, ARI Uyole	2004/5	Village	1) Fuel 50 lts * 4 villages 2) Refreshments (8 crates) 3) Meal allowance (DCO, DALDO, VAEO & Driver) 4) Stationery 5) DSA (Researcher)	Fuel DSA Refreshment Meals	Stationery
	Public extn	Field visit	Demo & learning plots	District extn, farmers, ARI Uyole	2004/5	Village	1) Fuel 50 lts * 2 trips * 4 villages 2) Lunch (6 staff & driver * 4 villages) 3) DSA (Researcher) * 2 trips * 4 days	Fuel DSA Meals	
	Stockists		Leaflets			Town	To be developed further in a district council strategy		District council
	Marketing & coop officers	Farmer marketing officers meetings, gp meetings, market places	Leaflets, loudspeaker	District extn, farmers, ARI Uyole	2004/5	Town/ward/village	To be developed further in a district council strategy		

## Appendix 2: ZONAL MAIZE PROMOTION STRATEGIES

### STRATEGIES FOR ACCESSING FARMERS WITH CERTIFIED MAIZE SEEDS AND FERTILISERS

What	Who is being targeted	What approach could be used	What tools should be used	Who does it	When is it done	Where	Inputs	Collaborators
Develop district stockist directory	Stockists	Survey	Questionnaires	District Food officers	30 <sup>th</sup> Nov. 2004	Implementing districts	Fuel DSAs	District Council RAA
Develop zonal directory	Stockists	Compilation districts directories	District Reports	ZRELO	Feb. 2005	SHZ	Meal Allowance	RAA
Sensitisation workshop	Stockists	Seminar	Handouts	Project Team ZRELO	10 <sup>th</sup> Dec. 2004	Makambako/ Mbeya	DSAs Fuel Fares	District council RAA
Develop Action Plan	Stockists	Group/Individual	Flip charts	Project Team ZRELO	10 <sup>th</sup> Dec. 2004	Makambako/ Mbeya	DSAs Fuel Fares	District council RAA
Promotion	Stockists General Public	Campaign	Promotional materials Mobile van	ZRELO	15 <sup>th</sup> Dec. 2004	Participating districts	DSAs Fuel	Zonal Communication Centre District Council
Monitoring and Evaluation	Stockists	Visits	Monitoring and Evaluation system	Project Team ZRELO	On-Going	Districts	DSAs Fuel	District Councils





HIGHLAND SEED GROWERS LIMITED  
P.O. BOX 2604  
MBEYA

**COMMERCIAL SEED PRODUCTION AND  
MARKETING IN THE SOUTHERN HIGHLANDS  
OF TANZANIA**

*PROGRESS REPORT*

*AND*

*PLANS FOR THE 2005/06 SEASON*

20<sup>th</sup> December, 2005

## INTRODUCTION

Highland Seed Growers Limited (HSG) is a private seed company, incorporated in Tanzania under the Companies Ordinance through certificate no 40450 on 28<sup>th</sup> November, 2000.

The company's main office is located in Room 9 on the East Wing of the 1<sup>st</sup> floor, in the NIC Regional Office Building, Plot No. 38. Block H, along Sisimba street. This company is wholly owned by Tanzanians.

The core activities of the company are:-

- To produce, process, and distribute improved certified seed of various crops directly to farmers and through stockists as well as other private and public institutions engaged in agriculture within the country.
- To conduct Research and Development work in collaboration with public Agricultural Research Institutes within the country, so as to speed up agricultural technology transfer among rural farmers in the country.

### Company Objectives

The company's general objective is to increase agricultural productivity and income per household through improvement in the overall efficiency of the seed supply system in the Southern Highlands of Tanzania. In pursuit of this major objective, the company seeks to accomplish the following:-

- To scale down the chronic shortage of good quality seed by embarking on large scale certified seed production to meet the needs of farmers in the Southern Highlands zone.
- To improve access to quality certified seed by creating a distribution network capable of addressing the needs of both urban and rural farming communities.
- To ensure timely delivery of the right quantities of good quality seed at an affordable price, particularly to remote rural farming communities of the Southern Highlands zone.

Attainment of the above specific objectives may significantly increase the capacity of rural farming communities to improve their livelihoods by reducing their vulnerability to hunger while increasing their opportunities to generate income from the sale of surplus produce.

### Mode of Operation

Among the five different types of seed enterprises existing in the world, Highland Seed Growers Limited has chosen to operate as a private seed company with partial government support. Under this approach, HSG has the opportunity to access new varieties for various crops from public research institutes for commercialization, including as well, access to germplasm that may provide a base for research under the private sector. Most governments help the commercial seed sector in this manner, and fortunately, this holds true for Tanzania as well. One good example is the collaboration which exists between Alpha Seed Company and Horti-Tengeru in Arusha, where the former is producing and marketing horticultural seeds released by Horti-Tengeru. Under this mode of operation, therefore, HSG does not have to have a fully independent Research and Development department within its establishment, rather, HSG will collaborate with public agricultural research institutes in carrying out R&D activities for mutual benefit. HSG sees several advantages following this approach, as follows:

- Agricultural Research & Development is a very expensive undertaking. Running of R&D activities in a collaborative manner, as described above, will clearly lead to lowering of costs associated with development of new technologies, e.g.

improved crop varieties. This saving may eventually make it possible for HSG to supply quality seed at a cheaper price to rural farming communities.

- Under the above approach, technologies will be developed faster and more efficiently and will reach farmers much faster. This is because HSG is willing to contribute funding to address some specific and sensitive areas of R&D, as we realize that inadequate funding for public agricultural research has consistently been a major hindrance in technology development and dissemination in Tanzania.
- HSG does not have to deal with breeder and foundation seed production, instead, it will purchase these materials from public research stations and foundation seed farms, which are currently under the Ministry of Agriculture. This will give the enterprise more time to concentrate on quality certified seed production (through closer monitoring of its contract certified seed growers) including close monitoring of seed distribution channels.
- Given the above, the government does not have to become directly involved in certified seed production and marketing activities. Instead, it will mainly be concerned with protecting the seed industry and the farmer/consumer as a whole through appropriate legislation, e.g. monitoring adherence to current seed production laws and regulations, monitoring and arresting unofficial/illegal seed imports, some of which could carry destructive pests and diseases, as well as protecting consumers against purchase of inferior (fake) seed.

The above strategy is in line with current government policy, which has been encouraging public/private partnerships in various activities related to economic development across the country.

## **ACTIVITIES/ ACHIEVEMENTS TOWARDS OBJECTIVES**

A: Activities carried out between 2001/02 to 2003/04

Being a new enterprise, HSG has had to embark on various activities aimed at elevating the status of the company, so that it may eventually participate efficiently and competitively in seed production and distribution activities across the country. So far, HSG has accomplished the following.

1. Visit to Njombe, Songea and Mbinga (March – April 2002) to get acquainted with the problem of Grey Leaf Spot (GLS) in maize. This effort was necessary, because the company was formed during a period characterized by a concern from the government regarding the potential threat of GLS to national food security.
2. On 14<sup>th</sup> February, 2003, the company was registered by the Ministry of Agriculture and Food Security as a grower and supplier of various categories of crop seeds, such as cereals, legumes, oil seeds and vegetables in the country.
3. On 19<sup>th</sup> April 2004, the Company entered into a Memorandum of Understanding with the Ministry of Agriculture and Food Security seeking collaboration on Research and Development as well as certified seed production activities, for mutual benefit.
4. Visit to Kampala in Uganda (August 2004) to study the model used by FICA, a private local seed company which had a memorandum of understanding with Namulonge Research Station, with a view to marketing research products out of this station, in the spirit of Public/Private Partnership
5. Soliciting funding through interaction with potential financiers and donors, in order to strengthen the capacity of HSG with regard to large scale certified seed production, processing and marketing. This activity has been going on since January, 2002.

B: Activities carried out during the 2004/05 season.

6. Contribution of Research and Development funds amounting to Tshs. 10 million to the Maize Research Programme at ARI-Uyole, in support of collaborative disease resistance screening work, with particular emphasis on Maize Streak Virus (MSV) disease. Considerable progress has been made regarding this effort and preliminary results have shown that a success rate of up to 70% has so far been attained.
7. Meeting with Mbegu Technologies Inc. (4<sup>th</sup> -6<sup>th</sup> October, 2004) which is another local private seed company located in Moshi, with a view to establishing collaboration in Research and Development activities, as well as certified seed production and marketing.
8. Production of certified UH615 seed maize during the 2004/05 season at the Songwe Prison Farm. The company had desired to produce large quantities of certified seed, however, the amount of foundation seed obtained from ARI-Uyole permitted the cultivation of only 15 hectares. Further problems were encountered during seed production, as severe moisture stress hit the field during flowering time, consequently leading to a very low seed harvest. Only 13 metric tons of clean certified seed were produced and this amount was quickly sold to farmer groups in Njombe and Mbozi districts by the second week of November, 2005.

PLANS/ STRATEGIES (2005/06 season)

The company is gradually making progress towards its objectives, however, considerable financial back-up is required in order to participate successfully in commercial seed production and distribution, including the provision of other vital services to farmers. As from the 2005/06 season, HSG plans to achieve or to carry out the following activities.

1. Certified Seed Production Processing and Promotion

(a). During the 2005/06 season, HSG will participate in large scale certified seed production through the use of contract growers. HSG aims to produce enough quantities of both UH615 and H6303 certified seed, so as to satisfy the current high seed demand for these two hybrids. Contract growers have already been identified and HSG completed distribution of foundation seed to these clients as indicated in table 1 below.

Table 1. Contract Growers participating in Certified UH615 Seed Production during the 2005/06 season

CONTRACT GROWER	Location/Region	Area planted (Hectares)
Mollo Prison	Rukwa	50
Dabaga F.S. Farm	Iringa	50
Simon K. Danda	Ruvuma	50
Laela Agricultural Station	Rukwa	15
Matanana Farm	Iringa (Njombe)	13
Songwe Prison	Mbeya	10
Ndolezi Farm	Mbeya (Mbozi)	20
TOTAL area planted		208

(b). In addition to certified seed maize, HSG has also decided to embark on certified Sunflower seed marketing. Dabaga Foundation Seed Farm in Iringa has already accepted to cultivate 5 hectares of the sunflower variety 'Record' and upon harvest, the material will be processed and marketed by HSG.

(c). During the 2005/06 season, Highland Seed Growers will install a seed processing factory in Mbeya. In addition, we plan to also engage small mobile seed processing

facilities which will be used to process certified seed produced in remote areas, such as Mollo Prison Farm in Sumbawanga.

(d). Highland Seed Growers intends to participate in further promotion of UH615 and UH6303 through demonstrations, in collaboration with ARI-Uyole during the 2005/06 season, concentrating in those areas of the Southern Highlands where these two hybrids are not yet well known by farmers. HSG will seek the assistance of District Extension personnel in identifying such areas, and is ready to contribute towards costs of organizing field visits and field days for farmers, Village Extension Officers and stockists at a number of sites, in order to facilitate rapid dissemination of knowledge about modern maize production technology and to create awareness about these products.

## 2. Information, Training and Distribution of Certified Seed

i. As from April 2006, HSG will visit all four regions of the Southern Highlands, in order to continue promoting itself and to establish contacts with District Extension personnel, stockists and farmer groups across the zone, an effort which is expected to explore further, means and ways of setting up appropriate channels of seed delivery and distribution, especially in remote rural areas.

ii. HSG intends to participate and to share with other institutions, some of the costs involved in training and disseminating currently available information on quality seed and other types of knowledge related to crop production to various categories of stakeholders across the Southern Highlands zone.

## 3. Research and Development

As already stated, it is very difficult for a seed production and marketing enterprise to function effectively in a competitive certified seed market without the back up of Research and Development work. HSG will continue its partnership with Public Agricultural Research Institutes, particularly, ARI-Uyole, in the formulation and development of demand-driven technologies and to disseminate them across the Southern Highlands, in order to contribute to food security and poverty reduction among farmers in the zone. During the 2005/06 season, HSG intends to continue its R&D activities in collaboration with ARI-Uyole as follows:

1. To continue screening for MSV disease resistance in order to achieve MSV-resistant versions of currently available maize hybrids as well as to explore the possibility of forming new MSV-tolerant hybrids for the intermediate elevation maize producing parts of the country, where this disease constitutes a barrier to increased maize production.

2. To initiate screening for tolerance to Striga (witch-weed) in some low and intermediate maize producing parts of the Southern Highlands where this parasitic weed already appears to threaten maize production. HSG has already acquired some germplasm in the form of inbred lines as well as hybrids from the International Institute of Tropical Agriculture (IITA) and has already requested technical advice and input from the weed specialist at ARI-Uyole, Dr. J. Kayeke, who has already agreed to collaborate with HSG in accomplishing this task.

3. During the 2004/05 season, HSG supported and funded two trips to Ruvuma region aimed at facilitating early maturing maize germplasm collection by staff from the Maize Improvement Programme. An additional effort to collect this type of germplasm will be made during the 2005/06 season. The objective of this involvement is to identify early maturing landraces which would undergo further improvement at ARI-Uyole, so as to eventually come up with early maturing top-cross hybrids for low and intermediate elevation maize producing areas, particularly those that are frequently faced with short and unreliable rainfall. This effort is expected to increase food security among rural farmers residing in areas with marginal and unreliable rainfall in the Usangu plains of Mbeya and Iringa, as well as in Tunduru district in Ruvuma region.

Highland Seed Growers Limited will continue to cooperate with the Ministry of Agriculture Food Security and Cooperatives, in all areas where Public/Private Partnership approaches present themselves as effective and efficient means of moving forward as far as National economic and social development is concerned.

#### **Appendix 4. Meetings with District Executive Directors (DEDs)**

The team made visits to the districts of Iringa, Mbozi, Mbarali and Njombe as shown in the itinerary below (Table a).

**Table a. Dates and places visited to initiate implementation of District Maize Promotion strategies**

<b>Date</b>	<b>Where</b>	<b>Person met and Designation</b>
13 <sup>th</sup> October 05	Iringa	Mr....., District Planning Officer (Ag. DED)
17 <sup>th</sup> October 05	Mbozi	Mr A. Mwakigombaki, District Economist (Ag. DED)
20 <sup>th</sup> October 05	Mbarali	Mr. J.J. Katunzi, District Planning Officer (Ag. DED)
21 <sup>st</sup> October 05	Njombe	Mr. M. Mkupete, District Development Director

#### **Agenda**

The main achievements of the meetings were to brief the DEDs on what the CPP project has accomplished in its 3 years of operation in their districts, and how they could take up the outputs of the CPP Maize Promotion project (in collaboration with ARI Uyole) for wider dissemination after the latter comes to an end. This ensured convergence between this project and the district agricultural plans so that outputs of the Maize promotion project were integrated into those district plans for wider uptake and sustainability.

#### **Outcome of the meetings**

##### **Iringa District**

Accompanied by Mr. Ndongole, the District Farmer Field School (FFS) Coordinator, the team from ARI-Uyole met the Acting DED, Mr...

The DED himself was away on official duty and would not be available for the whole week.

The team from ARI-Uyole briefed the Acting DED on activities implemented by the CPP Maize Promotion in selected targets in the Southern Highlands zone, later on giving details on what had been achieved in Iringa district since the 2002/2003 season. He was informed that during its three years of operation, the project found out that:

- farmers were generally unaware of what improved maize varieties to plant in their area together with the accompanying agronomic practices.
- limited knowledge on proper use of fertilizers(organic or inorganic) in maize production.
- limited knowledge on the control of common insect pests of maize, e.g. stalk borers.
- Many stockists have been found to be disturbingly unaware of the need to sell seed based on suitability and adaptability to a given area, instead, they are primarily concerned with maximizing sales. The same situation holds true for pesticides and fertilizer as well.
- Many VAEOs are surprisingly weak and out-of date regarding basic maize production recommendations. In certain areas, some farmers have been found to be better informed on certain aspects of modern agriculture than their VAEOs.

The acting DED was further informed that the CPP Maize Promotion project, through the three years of on farm demonstrations, had contributed significantly to raise awareness and exposure among farmers and VAEOs on improved maize cultivars, quality seed, fertilizer use and agronomic practices that go with the crop in the target area. He was further made to understand that the project was now coming to an end and that incorporation of our project's outputs in their district agricultural development plans, together with ARI-Uyole's participation, would go a long way in ensuring wider and sustainable uptake of these outputs for the benefit of farmers in the district. It is at this juncture that the team from ARI-Uyole had requested to know what kind of commitment the district could make in terms of financial and human resources, in collaboration with ARI-Uyole towards meeting this challenge.

After thanking the team for the enlightening presentation, which brought him up to date regarding the three-year maize promotion effort, the acting DED fully agreed with the need to

inject some elements of wider adoption and sustainability of the realized outputs, because he felt that this whole effort was closely related with the national strategy for food security and poverty alleviation. He fully supported the need for closer collaboration with research in implementing certain activities and he asked for assistance in identifying such areas for implementation and that those identified would be incorporated into the district's agricultural development plans for the 2006/07 financial year. Below are areas of collaboration which were jointly agreed with the acting DED for implementation during the 2006/07 financial year.

- (i) Farmer Field School program (already funded through DADs). FFS is in operation in Kilolo District (30 FFS) and Iringa district (30 FFS). The FFS is also expanding into schemes in Luganga (Pawaga division), Mangalali (Kalenga division), Nyamahana and Mapogoro (Idodi division); Nyanzwa and Igunda (Mahenge division). The CPP outputs can be disseminated easily through FFS.
- (ii) Training of VAEOs and farmers (short courses, seminars, exchange visits)
- (iii) Training of stockists (seminars, short courses, recommendation charts)
- (iv) Provision of relevant learning tools (leaflets, brochures, hand books, training manuals). Districts to avail funds for printing the various learning tools.
- (v) Monitoring and Evaluation of the program in collaboration with the District officers

This collaboration protocol will commence in the 2006/2007 financial year (when the budget for the various activities will be presented in the district financial plan).

### **Mbarali District**

We met Mr. J.J. Katunzi (Ag. DED) accompanied by the Ag DALDO Mr. J. Salu. Mr. S.Z. Muyinga, the DED, was away on official duty. The Ag DED was briefed on the CPP maize promotion project and the type of activities which had been carried out for the past three seasons. Similar to the discussion in Iringa, the acting DED was presented with a summary of the team's finding for the three-year period. The list did not differ from what was presented in Iringa, however, there was an additional observation which was quite specific to Mbarali district, and this had to do with Maize Streak Virus (MSV). This disease was recognized by many farmers in the district as number one limiting factor in maize production both under irrigation or rain-fed conditions.

The acting DED was informed that the on-farm demonstrations carried out in Mbarali for 3 seasons had contributed to raising awareness on the seriousness of MSV and the potential threat this disease posed to food security. One of the most disappointing observations, however, was that agricultural extension personnel in the district had kept quiet about this problem for a long time without reporting it to ARI-Uyole for action. Thus, it was through the CPP maize promotion project that the severe problem of MSV in Mbarali district had been detected. Farmers in this district have since then continued to express the need for MSV resistant maize cultivars and have been expecting a solution to this problem through the CPP-maize promotion project. The acting DED was informed that efforts to address the MSV problem began following the first season of maize cultivar evaluations in Mbarali, at Igomelo village and that good progress towards availability of MSV resistant varieties had been attained.

The acting DED commended the research efforts described above and called for a round table sitting to identify how the district could link up with and assist in further promotion of the outputs realized so far.

As a first step, he fully agreed with the need for Mbarali district to cooperate with ARI-Uyole on the on-going effort of solving the MSV problem in the district. He indicated that the office of the DED would provide fuel as per request from ARI-Uyole, to support on-going research activities aimed at finding a sustainable solution to the problem of MSV, in addition to supporting promotional efforts for wider uptake of realized outputs across the district.

The team from ARI-Uyole was told that Farmer Field School (FFS) activities had already been initiated in Mbarali district as from the 2005/06 season and that ARI-Uyole was invited to link



up with the program in the dissemination of maize production technologies using the FFS approach. In addition, the acting DED confirmed that he would enter into the 2006/07 budget, an expenditure item to cover the costs of printing further copies of leaflets, as well as the training of Village Extension Officers and stockists on current maize production technology as well as the handling and marketing of agricultural inputs, with special reference to quality seed and agro-chemicals. However, he warned the ARI-Uyole team that it was up to them to closely follow up and to remind the DED's office on the financial commitment already made, as there was possibility that some of these pledges could be forgotten.

### **Njombe District**

In the company of Ms. Liana Sipora (DALDO Njombe) and Sylvester Mhoka (DEO Njombe), we met Mr. Mohammed Mkupete, the DED. Some briefing on the CPP maize promotion project was done, followed by a discussion on lessons learnt during implementation of the various activities carried out during the three-year project.

Lessons learnt in Njombe district were similar to what has already been reported for Iringa, however, the DED was also informed that there was a serious problem regarding the sale of 'fake' seed in Njombe, largely due to failure of the current seed system to meet farmers' requirements for improved seed. This deficiency was seen to pave the way for unscrupulous traders to market inferior material in the name of improved certified seed. At this juncture, the ARI-Uyole team sought to hear the views and position of the DEO regarding the need to attain wider dissemination of the realized outputs across the district and what resources were at his disposal to assist in pushing forward this strategy in Njombe district.

On his part, the DED first of all thanked ARI Uyole for its many years of involvement in agricultural research in the district, noting that this effort had contributed to improved agricultural productivity in Njombe, particularly with regard to maize production technology. In response to the request for support from his office, he stated that his office could not offer support during the current financial year, however, he promised to take up this matter during the 2006/07 financial year. He specified learning tools as the one item which he would financially support, so that enough leaflets, posters, etc are printed and distributed to stakeholders within the district. He then called upon the DALDO to identify areas of linkage and convergence within the district's agricultural development plans so that ARI-Uyole could be requested to provide technical backstopping in such areas for the benefit of various stakeholders.

The DALDO responded by saying that the FFS approach, which was set to commence during the 2005/06 season would be a suitable strategy, through which ARI-Uyole could link with the district in providing not only technical backstopping but also as a means for disseminating new knowledge to various stakeholders, since maize was such an important crop in the district. The DALDO immediately put words into action, extending an invitation to the visiting team to attend and participate in the first FFS planning meeting, in Njombe on 24<sup>th</sup> October 2005. The invitation was accepted and one member of the ARI-Uyole team, Mr. A.E. Temu, attended the meeting, signifying the beginning of collaboration in carrying out maize promotion activities in Njombe through the FFS approach.

### **Mbozi District**

The district maize promotion strategy meetings commenced in Mbozi district, however, among the four meetings held with the objective of initiating district maize promotion strategies, it is from this district where we recorded least success. After failing to meet either the DED on the District Planning Officer, we had to settle for the District Economist (DE). After presenting before him the outputs of our project and the issues we thought could be absorbed into their district agricultural development plans to ensure wider dissemination and sustainability, the DE indicated that he would present those ideas for consideration to the DED after he was back in office. We saw no need of going into much further discussion, as we felt that the official was too junior to make any firm decisions on most of the issues at hand. A decision was taken that the Zonal Research Extension Liaison Officer would make a follow-up on these issues with the DED by 15<sup>th</sup> February, 2006.

## Appendix 5. Draft outline for a maize management training manual

Chapter no.	Title	Contributors
	<b>Introduction to the training manual and its use</b>	
<b>1</b>	<b>Maize General</b>	
1.1	History, origin	
1.2	Importance of maize	
1.3	Botany of maize	
1.4	Physiology of maize	
1.5	Climatic requirements	
1.6	Soils	
<b>2</b>	<b>Getting ready for maize production</b>	
<b>2.1</b>	<b>Varieties</b>	
2.1.1	Preferred maize characteristics	
2.1.2	What to consider in variety selection	
<b>2.2</b>	<b>Seed</b>	
2.1.3	Types of seed (landraces, OPVs, hybrids)	
2.1.4	Principles of seed selection in OPVs	
2.1.5	Production of seed (certified, QDS)	
2.1.6	Seed dressing and storage	
<b>3</b>	<b>Crop establishment and development</b>	
<b>3.1</b>	<b>The field and crop establishment</b>	
3.1.1	Methods of field preparation (manual, chemical, mechanical, zero/minimum till)	
3.1.2	Cropping systems <ul style="list-style-type: none"> <li>- Mono-cropping</li> <li>- Intercropping</li> <li>- Mixed cropping</li> </ul>	
3.1.3	Soil fertility management <ul style="list-style-type: none"> <li>• characteristics of a fertile soil</li> <li>• rotations, fallows, crop residues, legumes</li> </ul>	
3.1.4	Planting time and Methods	
3.1.5	Plant density and planting patterns	
<b>3.2</b>	<b>Crop development</b>	
3.2.1	Growth stages of maize	
<b>3.3</b>	<b>Plant nutrition</b>	
3.3.1	Nutrient needs of the maize crop	
3.3.2	Disorder symptoms (N, P and K deficiencies)	
3.3.3	Nutrient management <ul style="list-style-type: none"> <li>• other nutrient deficiencies</li> <li>• water deficiency</li> <li>• nutrient toxicity</li> <li>• symptoms of virus infection</li> <li>• types of fertilizers and their composition(organic/inorganic)</li> <li>• amount of nutrients needed by maize</li> <li>• time of nutrient application</li> <li>• methods of application</li> <li>• maize fertilization guidelines by agro-ecology</li> <li>• nutrient needs of the maize crop</li> <li>• composting methods</li> <li>• Fertilizer Response Curves</li> <li>• Economics of fertilizer use</li> </ul>	
<b>4</b>	<b>Pests, diseases and the agro-ecosystem</b>	
4.1	<b>Biodiversity and food webs</b>	
<b>4.2</b>	<b>Life cycles</b>	
4.2.1	Insect life cycles	
4.2.2	Lifecycles of fungi, bacteria and viruses	
<b>4.3</b>	<b>Natural enemies</b>	
4.3.1	Predators	
4.3.2	Parasites	
4.3.3	Pathogens	
4.3.4	Common natural enemies in maize fields	
<b>4.4</b>	<b>Natural enemies and pesticides</b>	
4.4.1	What are pesticides?	
4.4.2	Pesticides, natural enemies and pests	

4.4.3	Pesticides and human health	
4.5	<b>Maize pests damaging stems in the field</b>	
4.5.1	Stalk borers	
4.5.2	Cutworms	
4.5.3	Termites	
4.6	<b>Maize insect pests damaging leaves in the field</b>	
4.6.1	Grasshoppers	
4.6.2	Armyworms	
4.6.3	Aphids	
4.7	<b>Maize insect pests damaging roots in the field</b>	
4.7.1	Chafer grubs	
4.7.2	Nematodes	
4.8	<b>Maize diseases in the field</b>	
	<ul style="list-style-type: none"> <li>• Where do diseases come from?</li> <li>• Maize disease control <ul style="list-style-type: none"> <li>• Cultural</li> <li>• Resistant varieties</li> </ul> </li> </ul>	
4.8.1	Maize Streak Virus	
4.8.2	Grey Leaf Spot	
4.8.3	Head and Ear Smuts	
4.8.4	Blights and Rusts	
4.9	<b>Management of weeds</b>	
4.9.1	Types of weeds Impact of weeds on maize yield	
4.9.2	Cultural management	
4.9.3	Chemical management	
4.9.4	Integrated management	
5.0	<b>Post-harvest practices</b>	
5.1	<b>Post-harvest handling and storage</b>	
5.2	<b>Dry storage</b>	
5.2.1	Drying techniques	
5.2.2	Storage technologies <ul style="list-style-type: none"> <li>• Baskets</li> <li>• Solid wall bins</li> <li>• Metal storage bins</li> <li>• Bag storage</li> </ul>	
5.3	<b>Storage pest and disease management</b>	
5.3.1	Prevention <ul style="list-style-type: none"> <li>• Making sure that the product is in good condition for storage</li> <li>• Keeping the store in good condition</li> <li>• Practicing good storage hygiene</li> </ul>	
5.3.2	Monitoring	
5.3.3	Management of storage insect pests in dried maize <ul style="list-style-type: none"> <li>• Sun-drying</li> <li>• Re-drying</li> <li>• Rolling and shaking</li> <li>• Traditional protectants</li> <li>• Synthetic chemical protectants</li> <li>• Insect proof containers</li> <li>• Storage duration</li> <li>• Varietal differences</li> <li>• Hygiene</li> </ul>	
6	<b>Maize processing and utilization</b>	
6.1	<b>Maize for food security</b>	
6.2	Chemical composition and nutritional value of maize <ul style="list-style-type: none"> <li>• Energy source</li> <li>• Vitamins</li> <li>• Protein</li> </ul>	
6.3	<b>Processed products of Maize</b>	
6.3.1	Equipment	
6.3.2	Favorite Maize recipes	

7	<b>Marketing</b>	
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7.1	The maize enterprise	
7.2	The marketing process	
7.3	Maize market constraints	
7.4	Understanding the market	
7.5	Marketing costs	
7.5	Marketing margins	
<b>8</b>	<b>Farm management skills</b>	
8.1	<b>Observing the crop and its environment</b> <ul style="list-style-type: none"> <li>• Why should we do routine observations?</li> <li>• Observation of the environment</li> <li>• Crop observation</li> </ul>	
8.2	<b>Experimentation</b> <ul style="list-style-type: none"> <li>• Concepts of agricultural statistics</li> <li>• Common statistical designs for field experimentation</li> <li>• Field plot sizes</li> <li>• Layout of trials/demonstrations</li> <li>• Data collection and recording for analysis</li> <li>• Simple field data interpretation</li> </ul>	
8.3	Economic analysis of a maize enterprise	
8.4	Proposal development by farmer groups	

## Appendix 6. Meeting to develop a zonal maize promotion strategy

A meeting was convened (7<sup>th</sup> Dec 2005) between the ARI-Uyole Zonal Research Extension Liaison Officer (ZRELO), the District Agricultural Extension Officer for Sumbawanga (Rukwa region), the Regional Agricultural Advisor for Ruvuma region, the Project coordinator for Highland Seed Growers Limited and two members of the Maize Improvement Programme at ARI-Uyole to further develop a zonal maize promotion strategy.

In attendance:

Name	Position	Role during Meeting
E. Kiranga	ZRELO	Chairman
N.G. Lyimo	Maize Improvement Programme	member
A.E. Temu	Maize Improvement Programme	member
J.A. Mwiga	Director, Highland Seed Growers Ltd.	member
S. Msanga	Regional Agriculture Advisor (Ruvuma)	Secretary
T. Mwambene	District Ag. Extension Officer (Rukwa)	member

The chairman opened the meeting by thanking the participants for their response to the call to have the meeting. After reminding members about the importance of the Southern Highlands zone with regard to maize production and therefore, national food security, he called for the initiation of the zonal strategy for promoting maize production in the regions comprising the Southern Highlands. Following this introduction, participants came up with three main agenda items, as follows:

1. Reviving maize cultivar demonstration activities in the zone.
2. Collaboration among stakeholders in promoting maize production technologies.
3. The role for Highland Seed Growers Ltd as a private sector partner in maize promotion/technology dissemination in the Southern Highlands zone.

After all members went through the agenda items, the chairman requested suggestions and ideas from the participants on each agenda, in an attempt to come up with plans of action on each one of the major items in the agenda. The following is a summary of what was discussed and agreed upon under each agenda.

### **1. Reviving maize cultivar demonstrations/promotion in the zone.**

It was noted that dissemination of maize production technology had been stopped since 1998 in Rukwa region. In Ruvuma region the last maize cultivar demonstrations were carried out during the 2000/2001 season. Rukwa region was seen to be the most disadvantaged part of the zone in terms of access to information/technology on modern maize production from ARI-Uyole. The Regional Agricultural Advisor for Ruvuma stressed the need for ARI-Uyole to resume maize cultivar demonstrations in the region, since the new maize hybrid, UH6303 was not yet known to farmers in the area. Following this revelation, the chairman felt that there was a need to address this concern and that this situation presented a good opportunity for collaboration among relevant stakeholders in fulfilling the desire of the two regions for current information/technology in maize production. There was unanimous agreement among members that these two regions receive renewed emphasis as far as maize cultivar promotion activities are concerned.

### **2. Collaboration among stakeholders in promoting maize production technologies.**

It was observed that maize promotion activities had to be carried out in close collaboration between Research and Extension on the one hand and the Private Sector on the other for optimum benefit of the farming communities. Through this approach, stakeholders would find themselves at almost the same level of awareness and understanding about key issues related to technology development and dissemination, thereby sparing the farming communities from inconsistent and distorted information coming from different sources. Sharing of costs was seen as another advantage of carrying out these activities through collaboration among stakeholders. The chairman observed that the private sector was a big beneficiary in these promotional activities, because this effort had the potential of translating into increased certified seed sales for the benefit of seed producing and marketing enterprises. There was unanimous agreement among

participants that it was in the interest and benefit of all relevant stakeholders to initiate promotional activities that reflect meaningful collaboration for the benefit of our farmers.

### **3. The role for Highland Seed Growers Ltd as a private sector partner in maize promotion/technology dissemination in the Southern Highlands zone.**

The chairman started by congratulating Highland Seed Growers Ltd (HSG) for taking up the initiative of reviving the local seed industry as reflected in the commitment shown so far in producing and distributing Uyole-bred improved maize cultivars. He hailed this move, saying that it was very positive strategy, since the local seed industry had been in disarray since the demise of TANSEED, a national seed company which had the monopoly of seed production and marketing from 1973, until its collapse in 2001. He noted that Mbegu Technologies Inc. was the only other local seed company which had shown commitment and interest in collaborating with ARI-Uyole in pushing marketable agricultural research products to farmers. Having said that, the chairman called upon all members to offer suggestions on how best the public sector could collaborate with HSG in matters pertaining to promotion and dissemination of maize production technology in the Southern Highlands of Tanzania. The chairman also wanted to find out if HSG had any plans and strategies whose execution could be carried out in a collaborative approach for the benefit of farmers in the SH zone. Following a lengthy discussion among members about the above agenda, the following issues came up.

1. Members from the extension service noted that HSG was a new private seed company and that it was not yet well known among stakeholders. This situation was seen to constitute a threat to the company's seed production and marketing strategies unless there was an effort for self promotion across the zone well ahead of the peak seed requirement period which normally commences in November.

2. In response, the HSG director said that he was in the process of preparing a report highlighting, among other things, the steps his company had gone through since it was formed in November, 2000 in building up the enterprise. In addition, he said that he would include in the report, plans and strategies for seed production, processing and distribution for the 2005/06 season, so as to update relevant stakeholders on the current status of HSG and its future plans. He promised the chairman that the report would be ready for distribution before the end of the year 2005, and that copies of this document would be made available to Regional Agriculture Advisors and District Agricultural and Livestock Officers in the four regions comprising the SH. In addition, he indicated that HSG would develop a brochure (reflecting the HSG company profile), to be distributed to various stakeholders, including farmers through their stockists, when they come for purchase of certified seed.

He welcomed the idea of collaboration between the public and private sector on maize cultivar promotion strategies, noting that this was the most appropriate approach and that HSG would fully cooperate with the public sector in this endeavour, for the benefit of farmers in the SH zone. Turning to the problem of seed shortage, about which farmers have complained for the last two seasons, the director indicated that HSG had already set up plans to produce at least 500 metric tons of certified UH615 seed maize, and up to 100 metric tons of the new hybrid, UH6303.

3. A challenge was thrown at the director from the District Extension Officer from Rukwa region who wanted to know if his company was ready to jointly participate in setting up demonstration trials in Rukwa region during the 2005/06 season. The director indicated that he was ready to fully participate in this joint effort and that HSG would contribute towards the costs of running those demonstrations, including preparations for a field day at selected locations in the region. Following this spirit of cooperation from HSG, the Regional Agriculture Advisor was excited and he also requested the same type of cooperation from the director of HSG. At this stage the HSG director stated that he was ready to meet up to 50% of the costs involved in running 12 demonstration/promotion plots, six of them in Rukwa and the rest in Ruvuma region.

Following the above discussion, the chairman summed up the issues that came up for discussion, requesting all stakeholders to immediately start implementing all the activities which they had committed themselves to doing. He thanked all participants for their attentive and active contribution during the meeting, saying that he was hopeful that all that was agreed among them would be acted upon promptly and with full commitment. There was no other agenda or any other business to discuss, therefore, the chairman, at 6.15 p.m., declared the meeting closed.