

## **CROP PROTECTION PROGRAMME**

**Dissemination of improved *Phaseolus* bean varieties in  
Tanzania**

**R 8415, ZA0647**

## **FINAL TECHNICAL REPORT**

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## **Executive Summary**

The Southern Highlands of Tanzania is a major bean-growing area and the crop contributes to food security and income generation. The sustainability of both of these requires that farmers have access to seed of improved bean varieties. The purpose of the project was to provide farmers with seed of improved varieties, among them one that was developed by an earlier phase of the project [Urafiki]. Seed distribution was supported by an information campaign and the project assessed the ability of farmers to access both new bean seed and the supporting technical information.

Seed of Urafiki was distributed for evaluation to farmers in 5 Districts in 3 regions of the Southern Highlands. It was reported to be popular because of its high yield potential, drought tolerance and marketability. Further seed distribution focused on 3 Districts where drought tolerance was an important attribute for new bean varieties. The distribution network included District Councils, schools, prisons, NGOs and community-based organisations. Around 300,000 people now have access to seed of Urafiki through this network.

Laminated information sheets were produced for all the current improved varieties from Uyole. The follow-up survey of information systems showed that this format was very accessible to farmers. However, farmers still reported that they found it difficult to get the information they required. Not all the village Information Centres [administered under local government] function properly and there is poor linkage with the Zonal Communication Centres which are administered under the Ministry of Agriculture [MAFS].

A survey of seed supply systems found that while there was a wide range of government and private sector organisations involved, their activities were uncoordinated and their role undefined. ARI Uyole was the sole source of Foundation seed and is unable to meet the demand. Greater co-ordination of the stakeholders in the seed supply chain is required and more new varieties need to be developed more quickly to make commercial seed production viable, as demand from farmers falls-off rapidly after the initial acquisition of a new variety.

The project has contributed to poverty reduction and enhanced the ability of smallholders to participate in commercial farming through making available a high-yielding and marketable bean variety. Constraints in information delivery and seed supply systems have been identified.

## **Background**

This project is funded by DFID-CPP for the period 01 January 2005 – 31 December 2005, to complete the promotional phase of a variety improvement project funded by CPP from 2000 – 2003 [R7569]. Based on researchers' knowledge of the need for disease resistance to achieve higher yields under farmers conditions, and the seed type, cooking and eating qualities required by farmers and consumers, crosses were made to improve disease resistance and other qualities of the popular cv. Kabanima. Kabanima was a selection from material collected in Uganda and was the first improved variety to be released from the Uyole bean improvement programme in 1980.

Under project R7569 initial crosses were made between Canadian Wonder and a local variety 'Small Masasu' and between Canadian Wonder and selection 5060/6 from Kabanima. The progeny were screened at HRI for disease resistance and returned to Tanzania [Uyole] for field testing. Eight of the most

promising lines were selected and after further evaluation on-farm, data on only one of these was submitted to the variety release committee. The line 7068/2 was released as the variety 'Urafiki' in 2003. This line was derived from the Kabanima cross. Some of the other 'NRI' lines have been retained for use in the breeding programme.

Project R7569 ended in 2003, just as the on-farm evaluation was being completed. Lack of funding has limited the ability of the Uyole bean programme to promote and disseminate the new variety. Seed production for self-pollinated crops is not supported by private sector seed companies, so that Uyole is the only source of foundation seed. Certified seed is not available, so that subsequent multiplication and distribution takes place via NGOs, community organisations and farmer to farmer. The aim of the present project was to multiply and then distribute cv. Urafiki in three regions of the Southern Highlands of Tanzania and to evaluate the distribution process and the need for information in support of the variety improvement programme.

### **Project Purpose**

The purpose of the project was to improve food security and income-generating activity of smallholders through making available to them a high-yielding bean variety with high market potential. Access to technical information and to seed of improved bean varieties was assessed.

This was done by distributing the variety through a combination of government agencies, NGOs and Community-based organisations. Distribution of improved bean varieties was supported by an information campaign.

### **Research activities**

Research activities were all carried out in the Southern Highlands of Tanzania which is a major production area for *Phaseolus* bean. The main collaborative partner was Uyole Agricultural Research Institute which is a Zonal Centre for the Southern Highlands but, also one of three national centres for bean breeding and the main centre of bean breeding for highland ecologies. Research on information and communication systems was carried out by Reading University, Department of Agricultural Extension, supported in Tanzania by the Farmer's Education Unit in the Ministry of Agriculture. Studies on bean seed systems were conducted by the Southern Africa Bean Research Network [SABRN] that is managed by CIAT from Chitedzi Research Station in Malawi. The involvement of the network also ensures wider dissemination of project outputs.

The research was divided into four broad categories. First the evaluation and promotion of the bean variety 'Urafiki' that was developed under previous CPP funding. Here we have presented on-farm trial data and conducted an M & E activity of bean variety adoption. Secondly, farmer's access to information on beans and bean growing technologies was assessed by survey. Thirdly, a survey of bean seed systems in southern Tanzania was conducted by CIAT and ARI Uyole, to review the strengths and weaknesses of the present system. Fourthly, in order to make the findings from a PhD programme on bean biodiversity that was funded by an earlier CPP project, more widely available, a paper was produced from the thesis. In addition, a workshop was held in Mbeya to present our findings on information systems and obtain feedback from farmers on their experiences with 'Urafiki' and access to information on improved bean varieties.

## Outputs

### OUTPUT 1: New bean variety disseminated.

#### On-farm evaluation and multiplication of improved bean varieties.

Participatory evaluation of the new variety 'Urafiki' was completed in 2003 and results used to support the proposal to the variety release committee [Full results in Appendix I]. From 2004 when the collaborative link with Uyole was re-established, the project moved to multiplication and dissemination phase.

Results tables presented in Appendix I represent work that was carried out with the 'NRI' lines developed in project R7569. Some of these results were not yet available in time for the FTR in 2003. On the basis of these results presented, the 'NRI' line 7068/2 was accepted as a new variety by the variety release committee.

Urafiki has retained the seed colour of its Canadian wonder parent [Fig.1], it is high-yielding and shows some drought tolerance. Although it may not look very disease resistant based on severity scores [Table 1], it has the capacity for rapid recovery when conditions become less favourable for the diseases such as ALS and Anthracnose.

Urafiki has been distributed in 5 districts in 3 Regions of the Southern Highlands Zone. Around 350 farmers in 32 villages now have the variety [Table 2]. This distribution has occurred through District Councils, NGOs, prison farms and schools [Table 3], in addition to seed received by farmers participating in Uyole on-farm variety evaluation trials.

**Fig.1. Seed of Urafiki and more recent re-Selections displayed at the workshop**



**Table 1. Full Description of NRI 7068/2 released in 2003 as the variety 'Urafiki':**

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ORIGIN	Progeny from crosses made in UK and selected by D. Teverson.
PEDIGREE	Kabanima x Canadian Wonder
GROWTH HABIT	Determinate, bushy, many branches
FLOWER COLOUR	Pink
SEED DESCRIPTION	Medium, Dark red kidney
DROUGHT	Tolerant
DISEASES	Susceptible but recovers rapidly
POINTS OF MERIT	Good yields with some drought tolerance, acceptable seed type, palatable with good cooking qualities.

**Table 2. Distribution of 'Urafiki' [or 'NRI'] for on-farm multiplication and dissemination**

Season	Region District	Village	No of	Farmers	
2001/02	Iringa	Njombe	Lyadebwe	10	
2002/03	Rukwa	Nkansi	Kataui	8	
			Ntatumbila	8	
			Swanga Rural	Matanga	8
			Matae	8	
2003/04		Swanga Rural	Ntatumbila	5	
			Kataui	5	
			Matanga	5	
			Matae	5	
			Laela	5	
			Illenje	5	
2004/05	Nkansi		Kale	15	
			Ntalamila	10	
			Mashete	10	
			Mkole	10	
			Katani	9	
	Swanga Rural		Mwazye	10	
			Kifone	13	
			Kezimbe	25	
			Mshami	10	
			Kahuka	20	

2002/03	Mbeya	Mbozi	Mbimba	5
2004/05		Mbarahu	Simike	54
			Mahungo	46
			Azimio	46
		Mbozi	Shilanga	20
			Mbozi	9
			Ichesa	8
			Hatebele	21
			Msamyila	15
			Old Vwawa	15
	Illembo	15		

**Table 3. Institutions and organisations to which seed of 'Urafiki' was given in 2003/04 and 2004/05**

Region	District	Organisations
Rukwa	Nkansi	Mashete Prison Kate Catholic Mission
	Swanga rural	Laela Agricultural Centre Kautawa Traders Caritas NGO
Mbeya	Mbarau	Simike Primary school Simike Health Centre
	Mbozi	Mbimba Primary School ADP
	Ileje	ADP VECCO

#### *Follow-up of on-farm multiplication*

It was decided by the Uyole bean programme that in order to be consistent with the target areas of previous CPP-funded bean projects in the Southern Highlands [including the IPM project], promotion of Urafiki should begin in the three districts of Rukwa Region, together with Mbozi District of Mbeya Region and Njombe District of Iringa Region.

During the variety evaluation phase from 2001, when the 'NRI' lines were being evaluated on-farm, farmers were encouraged to retain seed of any varieties or lines that they liked. A follow-up of this in Nkansi District of Rukwa Region in 2003/04 [Uyole Annual Report, 2004], showed that Urafiki had been retained by farmers in most of the villages where it had been introduced [Table 4] and by several farmers in Njombe District [Table 5].

**Table 4. Improved bean varieties grown by farmers in a random selection of villages in Nkansi District of Rukwa Region by February 2004**

Village	Bean varieties recorded
Nantumbila	Uyole 94, Uyole 96, Uyole 98, Bilfa 8, Wanja
Katani	Uyole 03, Uyole 98, Uyole 96, Uyole sugar, Wanja, Urafiki
Kantawa	Uyole 03, Uyole 98, Bilfa 16, Wanja, Urafiki
Kipandi	Uyole 03, Uyole 96, MG38, Wanja
Kasu	Uyole 03, Uyole 98, Uyole 96, Uyole 94, Uyole 84, Uyole sugar, Kablanketi, Cal 143, Wanja, Sinon
Kalundi	Uyole 98, Uyole 84, Kablanketi, Bilfa 8, Wanja
Myunga	Uyole 98, uyole, 96, Uyole 94, TM 27 J1J2, Wanja
Matai	Uyole 98, Uyole 96, Bilfa 16, Bilfa 14, Wanja, Urafiki
Matanga	Uyole 03, Uyole 98, Uyole 96, Kabanima, Wanja
Msanzi	Uyole 98, Uyole 96, Uyole 84, Uyole Sugar, Kablanketi

**Table 5. Summary of results in contact and non-contact villages In Rukwa**

Variety	No. of villages growing this variety	
	Contact village [N= 10]	Non-contact village [N = 2]
Uyole 03	5	0
Uyole 98	9	2
Uyole 96	8	1
Uyole 94	3	0
Uyole 84	3	1
Uyole sugar	3	0
Bilfa	4	2
Wanja	9	2
Urafiki	3	0
Kabanima	1	0
Kablanketi	3	1

New varieties are usually added to the farmers' collection of landraces and may be grown as part of a mixture or, grown separately if there is an established

market for the variety. Varieties are retained for a number of reasons such as high yield, drought tolerance, because there is a good market or it has particular culinary qualities. Villagers reported that Urafiki was their highest yielding variety and also showed good tolerance to drought [Table 6]. We are therefore promoting the variety in some of the drier areas of the SH.

**Table 6. Reasons given for growing the improved varieties**

Variety	Main reasons for growing
Uyole 03	High yield, disease tolerant, good distant market
Uyole 98	High yield, good taste, fast cooking, good local market
Uyole 96	High yield, good demand in Tunduma
Wanja	Very early, good yield, good market both local and distant
Urafiki	Highest yield, drought tolerant, good taste and seed quality.
Bilfa 8	Yield, taste and market
Bilfa 14	As Bilfa 8
Bilfa 16	As Bilfa 8
Sinon cross	good seed size and may be resistant to Bean fly
Kabanima	Yield, disease resistance, good distant market

A follow-up of bean varieties grown by farmers groups was made in April 2005 in two villages and the results are presented as case studies:

**Case Study 1: Mbozi District, Ilomba village, Pendo Womens Production Group**  
 The main distribution channels for bean seed in Mbozi District are the office of the District Agricultural & Livestock Officer [DALDO] and the NGO, the Agricultural Development Project [ADP]. At the DALDOs office we met the village extension Officer, Mrs Kazi who is responsible for 7 villages. Each of these has a crop production group. About 2.5 kg of seed of each of several varieties, including Urafiki, were delivered to Mrs Kazi in November, to supply each of the production groups. A seminar was organised for the leaders of the production groups to inform them on planting and management of the bean varieties. They collected the seed at this time and about 250g of each variety were given to each farmer in the group. After this initial free distribution of seed farmers groups are expected to multiply and distribute it themselves. We went to Ilomba village and talked to the Pendo Womens Production Group. From their 2.5 kg of each variety they had produced 10 kg of seed from the November planting. Some of this seed had been consumed, sold or given to friends and neighbours and the rest was planted in March. As the rains finish early in this area, most of the planting was done in the valley bottom where the beds could be watered.



The Pendo Group told us that Urafiki is well liked because of its good cooking and taste qualities and the leaves are also good. They consider its disease reaction to be 'normal'. When asked which was their preferred improved variety, they were unanimous in saying it was Uyole 98. The first reason they gave for this was that its leaves were very tender, the beans tasted good and the cooking time was short. They particularly liked the yellow bean colour and this type was highly demanded on the local market. There are two local varieties with yellow seed and similar quality characters, particularly 'Kigoma'. They said the market demand for Kigoma is greater than for U98, but they agreed that the problem was that yield was very low compared to the improved variety, U98.

#### Case Study 2: Njombe district – Lyadebwe village Farmers group

Lyadebwe is one of the project's contact villages in Njombe District, located in a dry area, very sandy soils and only one cropping season from November to April. The main food crop system is maize beans and the main cash crop is sunflower which is commonly intercropped with maize. The village also grows cassava, sweet potato and cowpea. Beans are grown both for home consumption and for market in nearby Makambako.

We reported to the District Extension Office and the Ward Extension Officer, Mr Maliafu accompanied us to the village. Seed of improved bean varieties, including Urafiki, was distributed directly by the bean programme in 2002 and the village was not visited in 2004. Seed [5 kg each of 5 varieties] was issued to the farmer group of 7 persons, mainly women, who planted as a group in the first year. Subsequently they were all able to take some seed from the harvest of around 35 kg – approx 5kg of each variety to each member of the group. The crop had already been harvested during my visit but this enabled us to see and discuss the seed.

One of the group, Mrs Salingo, had harvested around 240 kg of beans this year, of which 40 kg was of Urafiki, so she had increased her seed stock by around x 8 - 10 since the first harvest in April 2003 [2 seasons]. Over the two years she has sold seed to 10 neighbours and this year she sold about half her harvest and will retain 40 kg for planting, with the rest being consumed. Forty kg should be sufficient to plant about 0.5 ha. According to Mrs Salingo, everyone in the village now has at least small amounts of the improved varieties.

The five improved varieties Mrs Salingo showed us were Wanjo, Uyole 98, Uyole 96, Sinon and Urafiki [referred to as 'NRI']. When asked which variety was preferred, the immediate response was Wanja, because of its yield and marketability. This contrasts with the response to the same question by the Mbozi group who were more concerned with culinary characteristics. She explained this by saying that she grew the improved varieties for market, but kept her own mixtures for home consumption [see Fig.2]. The current farm-gate price in Lyadebwe was 5000 Ts for 20 kg, but this apparently goes up to as much as 10,000 Ts at planting time when seed is scarce. 'Urafiki' she said was the most drought tolerant and had the best leaves for eating. The variety that gave the best soup was Uyole 98. Mrs Salingo and her neighbour were able to show us several different mixtures of local varieties. Normally she mixes the seed at harvest but may separate certain types in order to get a better price. One of the local

varieties was a small black seeded type which she said was very drought tolerant and disease resistant.



**Fig.2. Mrs Salingo's separated Varieties [top] and land race Mixtures [bottom]**

*The role of NGOs in seed distribution*

Local and international NGOs are vital to the success of the present approach to seed dissemination. NGOs have the local networks and farmers groups through which to distribute seed and are often able to fund their own information campaigns. The main draw-back of dependence on NGOs is that they are dependent on donor-support and do not maintain a permanent presence. The Bean Programme at Uyole has distributed seed in 2005 through the Agricultural Development Project [ADP], VECO-Tanzania, Lutheran Church and CARITAS

ADP Mbozi Trust Fund, had purchased seed from Uyole to give to their participating farmers groups. The seed is given free as a loan on the basis that they return the same amount to ADP at harvest. They gave seed to 20 groups last season and the varieties included Urafiki. ADP also confirmed that U98 was the most popular because of its similarity to 'Kigoma'. The other popular improved variety was 'Wanja'. ADP provide training to farmers on best practice in crop management and liaise with Uyole on extension information.

#### *Production of Foundation Seed of 'Urafiki' in 2005*

Once it was known that there was a possibility that CPP might provide further funding for the work with Urafiki, about 0.5 ha of the variety was multiplied at Uyole for distribution to farmers through NGOs in November 2004. [Some of these costs had to be recovered from the budget of the 2005 CPP project]. November/December is the main planting time for the smallholder crop, although in some areas a second crop can be planted in February/March and a few areas are able to plant a third crop in June on residual moisture, but this normally requires irrigation to succeed.

About 0.5 ha of Urafiki was planted at Uyole in March 2005 which will provide seed for smallholders in November. There is still insufficient seed and uncertain demand for larger-scale seed production to be carried out on the Uyole farm at the level of Foundation Seed. The relatively small area of multiplication planted in 2005 is still administered under the bean breeding programme and should still be classified as 'Breeder Seed'.

The Uyole farm produces Certified [Foundation?] Seed for sale to farmers and NGOs. This year 40 ha of seed multiplication has been grown by the farm. Certified seed of the Uyole varieties U94, U96, U98, U03 and Wanja, will be available for purchase for the November planting season. It costs around 530,000 Ts/ha [ £260] to produce certified seed. From the 400 - 600 kg of foundation seed of Urafiki that the Bean programme will harvest in June 2005, 200 - 300 kg will be given to the farm for the production of certified seed in February 2006, which will be available for purchase for the November 2006 planting season. By this time it is hoped that the on-farm activities and the information campaign will have created demand for Urafiki.

Seed is sold at 600 Ts/kg and this has proved sufficient to stimulate demand, while allowing the seed multiplication operation to be sustainable financially. [Beans sell on the market as produce for 400 Ts/kg for mixed seed and 500/kg for pure seed of recognised varieties. Two hundred kg will plant 2.5 – 3.0 ha from which it should be possible to harvest up to 6000 kg of seed. The remaining 200 kg of foundation seed from the Bean Programme harvest of June 2005 will be distributed to villages for on-farm multiplication.

The Uyole farm seems to be able to meet the immediate demand to purchase improved seed with about 8 ha planted of each of the most popular Uyole varieties, equivalent to a production of 12 – 16000 kg of seed [total seed multiplication = 40ha; sufficient to plant around 860 ha].

There is not much potential for the Uyole seed multiplication operation to expand beyond 40 ha each year because, as a Government Research Institute, they are prohibited from commercial activity and would be unable to seek a bank loan to plant the seed plots in the absence of donor funding. Furthermore it is a commercially risky business as demand for each of the improved varieties is difficult to predict and changes each year. Around half of the harvest is processed as seed grade initially and the rest only when demand requires it. Any surplus is sold as produce once the planting season has commenced. For the previous harvest there was no surplus of U96 for instance. The official view is that allowing Government Research Institutes to become certified seed farms would act as a disincentive for the private sector.

#### *On-going breeding work with 'NRI' lines*

Although only one of the lines developed in the earlier CPP project was considered sufficiently improved over existing varieties to warrant release as a variety, several of the 'NRI' lines have been used in crossing programme with Uyole 96 due to their high-yield potential. Some of these are now in progeny row testing at Uyole

#### *Adoption of earlier Uyole bean varieties*

An evaluation of the adoption of improved bean varieties in the SH was funded by the Southern Africa Bean Research Network [SABRN] in 2002. More than 500 farmers in 44 villages were included in the survey, conducted in areas where bean promotional activities had been carried out since 1999. The estimated adoption expressed as a percentage of farmers in the survey was 40% for Uyole 96 in Njombe and 36% was the same variety in Mbeya District. These are very high adoption rates for a variety five years after its release. Even Uyole 98, the most recently released variety at the time of the survey, had reached 36% of households sampled in Njombe. Of the varieties released much earlier Kabanima [1980] reached 54% of farmers in Nkasi, while Uyole 84 [1984] was being grown by 48% of households sampled in Sumbawanga. For some reason not apparent to me, the report concludes that adoption rates were low. Thirty percent is normally regarded as a successful adoption rate for improved varieties of self-pollinated crops. It seems to me that in the survey areas at least, adoption of improved varieties has been excellent and more should be documented about the promotional approach that was adopted, including the overall cost.

#### *Comments on adoption strategy*

While it is possible to suggest theoretical ways to improve adoption of improved bean varieties, in practice I doubt if there is much more that could be done. There are two limiting factors: On the demand side, the requirement is the availability of varieties for which there is high market demand. However, in the absence of seed loss due to drought and hunger, farmers will only purchase seed of self-pollinated crops once, thereafter retaining their own seed. Bean farmers in the Southern Highlands possess their own seed mixtures of local varieties with a diverse genepool. In general these meet their culinary needs. The demand for improved varieties is mainly for market. On the supply side, the limiting factor is the rate at which seed can be multiplied at Uyole, then the need to balance demand and supply and to remain self-financing. The rate of seed multiplication and spread of new varieties within the community is slow, as each farmer wants to build-up his own stock before passing seed on and, at each stage, seed is lost to local consumption and market sales. The rate of informal seed multiplication is difficult to influence but the best approach may be to ensure that seed is distributed in small amounts to as many farmers as possible. Follow-up is required after some time, to check that the varieties are still in circulation and repeat distribution may be needed. However, the limiting factor is usually the scale of the certified seed operation at Uyole.

#### Assessment of seed distribution networks and role of private sector seed suppliers and bean buyers/traders.

This study identified bean seed supply chains and characterized the actors involved including the role of government extension. The study also assessed sources of farmer seeds of new varieties to identify gaps in seed supply chains

and to suggest areas of intervention [The full report can be read in Appendix 3 – only available in electronic version].

The study was conducted in Mbeya, Mbozi and Mbarali districts in Mbeya region, Sumbawanga and Nkasi districts in Rukwa region and Njombe district in Iringa region. It was conducted by staff from Agricultural Research Institute (ARI) Uyole, CIAT/SABRN and Sokoine University of Agriculture (SUA). Purposive sampling procedure was used to select sites (regions, districts and villages) and farmers who grow beans and work with ARI- Uyole BBP directly and or with other partners. Farmers were randomly selected. The study used individual structured questionnaire to interview partner organizations, farmers, traders, and government extension staff.

The study established seed supply chains of improved bean varieties with its key actors which included ARI -Uyole, service providers, farmers and trader [see Table 7]. Seed grades used in the chain are breeders, foundation, certified and farmer served seed. ARI -Uyole Bean Breeding Programme [BBP] produces breeders and foundation seeds for use in on farm work and for sale, while ARI Uyole farm operation (FO) produces certified seed for sale.

The study found that although there are several organisations involved in seed distribution, the current seed supply and dissemination chains do not meet the requirement of the Zone. ARI Uyole can not produce sufficient foundation and certified seeds due to insufficient resources because seed requirements for this vast zone is enormous.

Other actors have not been able to supply sufficient amount of seeds mainly because seed production and dissemination is not their primary mandate. The areas of their primary support are wide so they have less time and expertise to support farmer seed production. Agricultural Sector Program Support (ASPS) has few Quality Declared Seed (QDS) producers whose contribution is very low.

Government extension staff is not directly working with bean seed partners which leave limited or no expertise in seed production. Also, in some areas, seed of new varieties were not readily accepted because they were perceived to be not well adapted to local growing conditions or do not meet other requirements to satisfy farmers and/or traders. The Evangelical Lutheran Church of Tanzania (ELCT) in Mlool for instance, aims to improve livelihood of its members have been collecting foundation seed from ARI- Uyole BBP on a loan bases and providing seed to farmers on loan. Although the church seems efficient, it cannot serve a large community.

Possible solutions to alleviate seed shortage are to decentralize the production of foundation and certified seed to regions and districts and establish seed production as a business by farmers for effective seed business staff and farmer training is recommended.

Research is advised to release varieties that are adapted to meet the varied agro-ecological conditions of the region and which are accepted by farmers and traders and that these users be involved in all stages of evaluation. The released varieties should also be promoted more widely using all stakeholders and pathways available.

**Table 7: Sources of improved bean seed varieties among farmers under partner organizations**

Source	U94 N = 21	U96 N=58	U98 N=40	U03 N=23	U04 N=3	Wanja N=34	Urafiki N=20	Bilfa N=16	U90 N=5	U84 N=7	Kabanima N=17	CALI43 N=4	Rosekoko N=1
ARI Uyole	28.6	48.3	35.5	39.1	33.3	58.8	65	25	-	42.9	52.9	100	-
Caritas -Njombe	28.6	1.7	-	-	-		-	12.5	-	-	-	-	100
ADP Mbozi	19	8.6	7.5	-	-	20.6	-	-	-	-	-	-	-
Hima	19	15.5	-	-	-		-	-	100	57.1	23.5	-	-
Lutheran Church	-	6.9	7.5	13	-		10	-	-	-	-	-	-
Laela	-	1.7	25	43.5	67.7	29.4	35	68.8	-	-	23.5	-	-
Caritas-Mbeya	-	10.3	15	-	-	17.6	-	-	-	-	-	-	-
ASPS	-	3.4	-	-	-		-	-	-	-	-	-	-
VEO	4.8	1.7	2.5	-	-		-	-	-	-	-	-	-
Market	-	1.7	-	-	-	2.9	-	-	-	-	-	-	-
Fellow farmers	-	-	2.5	-	-		-	-	-	-	-	-	-
District extension office	-	-	-	4.3	-		5	-	-	-	-	-	

### *Role of research in seed supply*

The mandate of the ARI-Uyole Bean Breeding Programme [BBP] programme was to develop new acceptable bean varieties and maintain breeders' seed. The strategy is to offer farmers a broad range of improved varieties for farmers to maintain biodiversity. The ARI- Uyole BBP has gone beyond their expectations to fill in gaps in foundation seed production, promotion of improved varieties and building farmers' capacity. The added responsibilities, which were also expectations of donor-funded projects, tended to over stretch the ARI- Uyole BBP. For example, currently it is only the ARI- Uyole BBP that produces foundation bean seed which feed into the certified bean seed programme at ARI-Uyole Farm, as such this is the only source of start-up material for improved bean varieties in the SHZ. It is reported that the total bean production in the SHZ is 450000 mt (Ref), which translate to 450000 mt of farmer seed. To get this quantity of farmer seed in improved varieties ARI-Uyole should produce 4,500 mt of foundation /certified seed, which is a huge task that ARI-Uyole alone cannot fulfill. The major limiting factor has been the lack of adequate resources (infrastructure, personnel and financial). In addition, more partners need to be involved, including the Directorate of Crops Development, which has to take the central role and have a policy that is committed to get seeds of improved varieties to farmers. This might require a clear policy to indicate the roles and responsibilities of the departments and partners in the seed production and dissemination chain. The policy should also advocate decentralized seed systems where various stakeholders including private sector, NGOs CBO FBOs and farmers can participate in the seed production and dissemination processes.

Although Research is filling in the gaps in seed supply with extension as collaborators, the extension role in seed development and dissemination is still limited. This study found that extension staff understood better their normative roles in organizing farmers and promotion of new varieties, but their actual responsibilities to get involved in seed production and seed dissemination were not clear. It is important to note here that in Tanzania, it is the Department of Crops Development, which includes the Department of Extension that releases new crop varieties, but it is the Department of Research that is responsible for plant breeding. There are no clear mechanisms to ensure that required quantities of foundation and certified seed of the new varieties are made available.

The mechanisms for seed dissemination has not been adequate to reach sufficient number of farmers in the SHZ. The Bean Programme only covered a few districts, targeting pilot areas. There is a need to scale-up the dissemination process to cover other areas in the SHZ. The innovative seed system which is used by ARI-Uyole enabled them to produce foundation seed in a sustainable manner, because it is a cost recovery system, and that money goes into the seed revolving-fund. However, some farmers and other stakeholders particularly those from distant places found that the purchase of seed directly from ARI-Uyole was expensive, if they bought in small quantities. This also emphasized the need for decentralized seed systems.

ARI-Uyole is also using different mechanisms to promote and disseminate information on improved bean varieties. These include leaflets, posters, radio programmes, seed displays, seed and live plant samples at Nane-Nane national agricultural shows and the WFD.

Although ARI- Uyole BBP is doing a good job in involving farmers in on-farm variety evaluation, their experiences in working directly with farmers indicated

that changing farmers' attitudes to adopt improved varieties was a major challenge. This was because farmers did not consider seed supply and dissemination as part of their core responsibility, which limited the seed dissemination to wider community. Similarly, the ARI- Uyole faced major challenges with collaborating partners in the seed supply processes. This was because for many partner organizations, seed supply was not their mandate, but they assumed responsibility to fill the gap. All these, led to poorly coordinated activities, and limited seed production and publicity of the new bean varieties.

#### *Role of service providers in seed supply*

Service providers played a major role in supplying seed to farmers. Some of the service providers for instance, ELCT and Laela Agricultural Centre, had stimulated demand for improved bean seed for some varieties to the extent that demand had surpassed the supply. It is however, noteworthy that once farmers have seed of new varieties in their farmers' seed systems, the demand for such varieties goes down. One good example is the lesson extracted from LAC on U84 and Kabanima. In Rukwa, U84 and Kabanima were disseminated by ARI- Uyole from the late 1980s. When LAC started their bean seed dissemination programme, they included these two varieties among others. They then became discouraged because farmers did not buy seeds of U84 and Kabanima, but moved on to U96 and U98. This led them to stop U84 and Kabanima, but farmers were still growing these varieties and they were popular in the communities – “the power of farmers' seed systems”. Therefore there is a need for diversification if seed multiplication is to cover its costs – “One cannot build a seed enterprise based on a single variety” particularly for self-pollinated crops.

From this study we found that farmers, particularly under partner organizations, had accessed most of the new varieties from ARI-Uyole. However, some varieties (U96 and U98) were derived from a greater number of sources (partner organizations and fellow farmers). These varieties ranked highest in terms of number of farmers who had produced seed. Farmers' preferences for these varieties were not only due to their adaptability to different environments, but also their market potential. Hence, many partners, found it easier to facilitate dissemination of these varieties.

Only few partners had their own trained extension staff that could provide proper support for seed production initiatives. These included CARITAS-Mbeya and ASPS. Others relied on general agriculturalists who had other responsibilities and could not cover the seed aspects in full, because they were over stretched. For example, the LAC extension officer who was involved in seed interventions also had other obligations to deliver within Laela Parish, which covered 25 villages. This made follow-up on bean multiplication activities rather difficult. Other partner organizations relied on government extension staff that provided backstopping in general crop production and management practices. In general, the government extension staff were not adequate to meet their own staff requirement - one village extension worker per village. They also lacked capacity and resources to provide proper extension support in farmer seed production initiatives. Although government extension staff complained that they had no resources to support seed dissemination, our analysis however, indicated that there was lack of commitment of extension staff in the seed supply chain. In addition, some farmers did not understand the role of extension staff and such that they did not even appreciate their interventions, as such they were unable to demand services from them. They don't have well defined roles and responsibilities in the



seed supply chain and no targets to deliver. There is need to more clearly define the roles and responsibilities of extension staff in the seed supply chain.

The participatory variety selection (PVS) process is a novel idea that led to the identification of potential bean varieties that met farmers' selection criteria. However, often these PVS processes are conducted by a limited number of farmers in localized pilot sites. Sometimes these pilot sites may not be representative of all sites in the production environment. There is need to have more farmers involved and possibly more sites. For example, the experiences from CARITAS-Njombe showed that the varieties that were selected by a few farmers in the pilot sites were not accepted by other farmers who did not participate in the initial evaluation process. This implied that selections made by a smaller group of farmers did not represent the choices of other farmers in the communities where CARITAS-Njombe operated.

There were considerable variations in the strategies and operational arrangements of the intermediary partners with extension staff in the seed supply chains. Most of the organizations were either part of or did involve government extension staff at grass-root level in their operations. Some programmes were well structured such that they had exit strategies for continuation of the activities after the programme lifespan. One good example was the Agricultural Sector Programme Support in Iringa, which had trained staff and farmers to continue to produce QDS. Others like 'Hifadhi ya Mazingira', also in Iringa but whose programme was not well designed to the extent that the partners were not able to continue with the seed production operations after the programme had ended. These two programmes were both funded through bilateral support between DANIDA and the Government of Tanzania, and they operated under the Directorate of Crops Development (DCD). Both of them had adequate resources to support seed multiplication by farmers, but ASPS had more capacity development programmes that empowered farmers and service providers, which was a good exit strategy. HIMA possibly did not have a proper exit strategy, hence failed to continue after the programme ended. The interviewed extension staff perceived that their failure to continue with the interventions was due lack of transport and funding. Based on the fact extension staff in these two programmes worked under the same Ministry, lack of resources could not be the major factor. Possibly lack of commitment and unnecessary expectations could be the major reason.

With some of ARI-Uyole's partner organisations, the working relationship was found to be reliable and sustainable to support the on-going seed interventions. For example, ELCT-Mlowo, has been effective in supplying seed to different communities they work with, and even to farmers working with other church organisations, for instance Anglican – Mbozi. They have also repaid most of their seed loans from the ARI- Uyole. This calls for proper mechanisms by the ARI-Uyole BBP to effectively capitalize on and actively involve faith based organizations (FBOs) and use their opportunities to sensitize communities where they work to form groups for seed, grain and marketing of beans. For some partners, there was lack of clear working relationship, for instance, ARI- Uyole BBP with CARITAS-Njombe. Generally, a lack of clear working relationships among partners has also contributed to limited/constrained sharing of information and experiences on seed interventions among partner organizations, and their effectiveness to deliver seed technologies to farmers.

*Role of farmers in seed supply*

Farmers appreciated the skills and knowledge they gained from ASPS seed production programme, which empowered them to multiply and sell seed to other farmers in the communities. However, they found the isolation distance for seed production as a major challenge to farmers involved in the production of QDS. This should not be a constraint because as a self-pollinated crop, beans do not require a wider isolation distance. This implied that farmers and/or extension staff were not adequately trained on the appropriate requirements for bean seed production. Another example, which is similar, was captured among farmers in Njombe and Mbozi districts who did not know that bean seed is a self-pollinated crop and that their seed could be recycled.

Despite the fact that many varieties had been released by the ARI-Uyole BBP, many farmers, including ones from the villages that were contacted through partner organizations, or had direct contact with the ARI-Uyole BBP, and the non-contact farmers, did not access the varieties in the SHZ. In some villages, for instance, Igenge (Iringa), farmers from the non-contact villages did not know where to source seed of improved bean varieties – which is expected. However, unexpectedly, the pattern was similar in the contact villages, implying that the circulation of seed and its information was limited. We expected that contact farmers could have circulated the seed they had accessed from the ARI-Uyole to fellow farmers. This implied that there was limited farmer-to-farmer dissemination of improved bean varieties. Possibly this was due to farmers' tendency to be conservative with new varieties – not willing to share.

Equally, the purchase of small quantities of seed by farmers was found not to be adequate for further dissemination or even for their own use. This could be another factor for limited farmer-farmer seed exchange. Even if they had harvested enough, they would have sold it as grain soon after harvest because many of them are not empowered to keep their harvest and sell it as seed during the planting season. As a result, some of these farmers were continuously returning to ARI-Uyole to buy the seed. This calls for more partners who are committed to seed production and dissemination and to scale-up the positive lessons generated from the current initiatives in the pilot sites. Participatory stakeholders planning for implementation of the seed systems would be an important empowering tool for them to take seed production and dissemination as their mandate. Their roles and responsibilities need to be spelt-out clearly.

The Bean Programme has used different methods such as PVS, demonstrations and promotions to persuade the farmers they worked with to actively participate in the seed dissemination. Despite these efforts, this study found that farmers, particularly in the wider communities, were not actively involved in the seed interventions. Farmers from ARI-Uyole BBP contact villages were not inspired to take seed dissemination as a business. Some farmers also lack initiative to look for seed sources of new bean varieties – partly because bean crop could be recycled and they did not see the importance of buying new seed every season. There is still a need to sensitize and empower farmers to be more proactive in demanding improved bean varieties and also for them to be able to promote seed of improved bean varieties. This would also need to involve other stakeholders along the seed supply chains, which are consumers and traders.

Increased farmers' access to improved varieties depends on their market/trade potential. Currently, traders in the SHZ play a significant role in disseminating improved varieties as they trade within and without the zone, and to neighbouring countries (Malawi, Zambia, D.R. Congo, and Kenya). These traders were in two categories. One group was of small-scale traders who bought grain directly from

farmers and sold their commodity to consumers or to medium-scale traders. These usually did not have storage facilities. The other group was the medium-scale traders who bought their commodities, either directly from farmers or, through small-scale traders and stored them for resale during the season when the supply was lean or moved to distant towns and cities.

#### *Conclusions from seed supply survey*

The study identified 3 functional bean seed supply chains through which seeds of new bean varieties moved from ARI-Uyole BBP to farmers. The first category used free breeders' seed as part of on-farm testing in the variety development process. The second one used foundation seed of approved varieties which individuals or partner organizations bought or loaned directly from ARI- Uyole BBP. The last one used certified seed which was procured from the ARI-Uyole Farm Operation. Although, the seed supply chains were functional, the roles of partners were not clearly defined. For example ARI-Uyole BBP, had a clear mandate of developing acceptable bean varieties, which led to the release of several improved bean varieties and it was able to produce breeders' seed for those varieties. However, because there was a gap in provision of foundation and certified seed, ARI- Uyole BBP and the ARI-Uyole Farm Operations had assumed such responsibilities. This is a commendable intervention, but their capacity is very limited to service the vast SHZ.

The intermediary partners (government extension, NGOs, FBOs) were playing a major role in dissemination of improved bean varieties in the seed supply chains. Their roles and responsibilities in the seed chains were however not very clear. The government extension did partly understand their roles, but fell short of understanding their mandate to ensure that farmers' get access to seeds of improved varieties. The other partners had different mandates, but did get drawn into seed intervention issues, by default, as well-wishers, working directly with farmers in the communities. They had no clear defined mandate and their role in the seed supply chains was simply, to fill in the gap, because farmers needed such services.

Farmers make an important link in the seed supply chains, and seem to be involved all along the chains. The levels of involvement however, varied with partners depending on the way their interventions were structured. Many partners involved farmers partially, except ASPS, where farmers were empowered to produce their own seeds – QDS. It was also observed in general, that farmers were not proactive to make demands from service providers for services that would make a difference in their livelihoods. Most of them waited to be offered a service, an attitude which slows down progress in development. Although it was clear that the farmer seed system plays an important role in the seed supply chain, it was noted that when the varieties were very new and their seeds were limited, the flow of new varieties from farmer-to-farmer was slow. This was observed from both, farmers in contact villages through partner organizations as well as ARI- Uyole BBP partner villages.

Traders were involved in the bean seed supply chains and these were of different categories. Some traders played multiple roles, to produce and sell as seed. These included ARI-Uyole ARI- Uyole BBP (foundation), ARI-Uyole FO (certified), Farmer-seed traders under ASPS (QDS) and LAC (farmer seed). The other traders marketed grain beans (farmer seed) which farmers also used as seed during planting time.

### *Recommendations on seed supply*

1. There is a need to set a policy which could allow the decentralization of foundation seed multiplication to make seed easily accessible to farmers. Partners including farmers must become more involved.
2. There is a need to sensitize partners to ensure effective collaboration with government extension staff in seed production and dissemination, to adequately involve many farmers in seed production.
3. Deliberate efforts should be made to find appropriate mechanisms to involve traders in all process/stages of bean production, multiplication and dissemination so as the released varieties are accepted.
4. Farmers, extension staff and other service providers should be sensitized and organized to produce seed in a sustainable way for them to continue with seed interventions on their own after the projects have been phased-out.
5. Research must increase the rate of variety development to create diversity and they should be marketable and palatable with high nutritional quality.
6. Farmers should be empowered to take seed multiplication and dissemination as an agro-enterprise.
7. All partner organizations should make more effort to increase awareness to farmers of the benefits of improved bean varieties by using various promotional materials.

Two other working papers were produced under this output. WP/2 [Appendix 5] was a review of bean breeding in Tanzania accepted by Euphytica and WP/3 [Appendix 6] was a review of seed systems for smallholder crops.

## **OUTPUT 2: Agricultural communication systems evaluated for promotion of bean varieties and production technologies:**

Based on experiences from the previous project, it was concluded that there was a demand for simple information in a durable form on the attributes of the improved varieties available. The project funded the design and production of A4 information sheets about Urafiki and some of the other varieties. These sheets were laminated to provide a durable output and distributed to extension and farmers groups before the survey was undertaken.

A radio programme was also made and broadcast about new bean varieties from Uyole in general and about Urafiki in particular.

A survey was undertaken by Chris Garforth [Reading University] to find out if bean farmers had received the information sheets, or has access to other sources of information on beans. Also, to determine the information needs and constraints in getting information about new bean varieties to farmers groups. [The full report is presented as a Working Paper in Appendix 2]

### Bean Information sheets

The information sheets [Fig.3.] provoked a lot of interest and discussion. Their display at Lyadabwe seemed particularly effective: they are on their own – i.e. not surrounded by other posters or notices – and cannot be missed by anyone approaching the door of the village office. Literacy rates in rural Tanzania are relatively high and there is real demand for printed information. The lamination makes them robust when passed from hand to hand. Farmers said they particularly like the photographs of the seeds: visual appearance is an initial criterion farmers use to assess whether an unfamiliar variety is of potential interest. For this reason, the photographs should perhaps be larger, without too much potentially confusing superimposition of images. The very act of passing these sheets around a group for their scrutiny can stimulate requests for specific varieties.

As with much print material, it is easier to find copies of the information sheets in District and Divisional offices than in the village; and they are more likely to be found in the village office than in farmers' homes. Only when print material is available in large quantities, or when farmers have an opportunity to buy it, will it become readily available at village and household level. Evidence that farmers are willing to pay for print material related to beans comes from ARI Uyole's experience of selling leaflets about bean production at the NaneNane show in Mbeya.

### Radio broadcast

Several farmers, unprompted, mentioned radio as a source of information on beans. Others when prompted added it to their lists. Some mentioned specifically that they had heard of 'Urafiki' on the radio. It is well established in mass communication theory that one of the functions of radio and other mass media is to "set the agenda" for local discussion. In the present context, it seems that radio is helping to create a basic level of interest in Uyole varieties in communities which have not been directly involved in the bean programme, and that is stimulating them to find out more. In some communities, however, radio was not seen as an important source either because few households have radios or because they do not regard agricultural information on the radio as relevant to

them. The availability and cost of batteries is sometimes an impediment to wider use of radio in more remote areas.



**Fig.3. Bean variety information sheets**

#### Main points arising from the survey

Several points emerge from the village level findings. There is a strong demand for information about new varieties and associated husbandry practices. Different sources and channels of communication complement one another. Key individuals can play catalytic roles within the information system.

The bean programme's strategy of introducing new varieties through on-farm trials, open days, NGOs and extension officers matches well the farmers' preference to assess new varieties by visual inspection of the seed and their performance in the field. Organised groups play a pivotal role in the information system, but may also restrict the flow of information in some situations. These points are discussed in the following paragraphs.

The demand for information was evident in all our discussions with farmers. The main categories of information they seek are related to new varieties, markets and control of pests and diseases. They are particularly keen to hear of varieties that will give high yield, tolerate drought and fetch a good price in the market. Disease resistance was not prominent in farmers' lists of important or attractive characteristics: the impression given is that all beans are equally susceptible and control measures must be taken. This interest in hearing about new varieties is not only found in the groups which have a history of involvement or contact with

the beans programme at ARI Uyole: it is widespread among farmers and seems particularly important for those growing beans specifically to sell.

Information flow within villages seems fragmented. When information arrives in a village it does not necessarily or automatically flow to everyone in the village. Even when a variety has been in a village for four years, many farmers may not know of it (at least, by name). This is because information flow and communication take place within social networks: people who are not connected either directly or indirectly with someone who is using a new variety may well not hear about it. For the same reason, information can flow between villages through kinship and social ties. However, if we rely solely on these “natural” social flows of information, the process of dissemination will be slow. Part of the task of extension is to speed up the process by helping information move in new ways and to places that will not easily be reached through normal processes of social interaction.

The role of farmer groups here is important. They are a cost-effective means of interaction between scientists, or extension, and farmers. But more than that, they offer an environment of mutual support and learning. Some groups choose to grow new varieties as a group activity, on a single plot of land which then becomes a learning site for the group members and a means of creating awareness and interest among other farmers in the village. Several non-group members mentioned the groups in their village (or indeed in neighbouring villages) as one of their sources of information on beans and bean production. However, groups can also become “closed” networks with little of their acquired knowledge passing beyond the group to others. This is more likely to happen when the group is based in a particular local institution (e.g. a church) and so is not open to non-members of that institution. But it can also be a reflection of local politics and social tensions which have nothing to do with the beans themselves.

If groups are important, so are individuals. The work of the contact farmer in Mbosi District, for example, is a key factor in the spread of improved varieties beyond the on-farm trial villages. He is not a contact farmer in the T&V sense; he is someone whose enthusiasm for improving local farming systems and people’s livelihoods, and his ability as a communicator, brought him to the attention of the District extension team and of Uyole scientists. Although he is now compensated for the time he spends away from his farm contributing to the promotion and dissemination of improved beans, the underlying ethos is one of volunteerism. Farmers in the Mbosi villages frequently mentioned him as an important source of information as well as a means of access to seed from ARI Uyole.

Farmers’ decisions whether to adopt a new variety of bean are based on their own assessment of the variety in the local environment. Therefore the most important information and knowledge about the variety comes from observing its performance on one’s own land. While information on the radio, in the information sheets, from friends and neighbours, extension officers, NGOs and scientists can arouse interest in the variety, it is crucial that sufficient seed is available so that as many farmers as possible can try it. This does not mean handing out free trial packs: all the farmers we spoke with said that they are ready to pay for new varieties and indeed those who have had seed already, apart from those receiving it for use in on-farm trials, have paid. Stimulating interest in the variety has to go hand in hand with increasing the availability of seed.

This raises the distinction between *information* – i.e. what someone else tells me – and *knowledge* – i.e. what I know to be true. An extension officer might tell a

farmer that a particular variety is drought tolerant or disease resistant. Only when the farmer has tried it out will she/he “know” whether it has either of those characteristics in the particular circumstances of her/his own farm.

Where Urafiki has been around for longer, a market has developed specifically for that variety (e.g. Lyadebwe). So statements in other villages that it is not marketable need not be taken as a serious constraint to further and widespread uptake of the variety. Earlier Uyole varieties have by now found a place in the market: Uyole 96 and 98, for example, can be bought in the market (though farmers are reluctant to use this for seed because they suspect – or can see for themselves – that the beans have been mixed with other less preferred varieties).

One strong message that comes through the discussions with farmers is the high regard they have for the beans programme and for ARI Uyole. It is valued as a source of useful information, as well as of seed of high quality. This credibility as an institution which seeks to serve the interests of farmers by providing planting material and objective information of high quality is an important attribute of a research institute and one that should not be jeopardised by short term constraints of funding and staffing.

#### Conclusions form the survey

- Farmers acquire information about beans and bean production from several different sources, which complement one another. Farmers’ knowledge about varieties, however, comes from trying them out on their own farms. There is a general awareness, probably stimulated partly by radio but also by communication within and between villages, that there are new varieties around that are worth trying out.
- There is also a widespread feeling that they need access to more information – particularly about markets and the control of pests and diseases. ARI Uyole occupies an important position within the bean information system in the Southern Highlands. For most farmers, however, this is not through direct contact with Uyole but through membership of village level groups and via individuals and organisations who act as intermediaries. In this way, the bean programme can maximise its impact on farmers.
- At intra- and inter-village level, information flow is somewhat fragmented: a challenge for extension, NGOs and the mass media is how to overcome this fragmentation and facilitate a more efficient flow of information within and between villages.

#### Workshop

The workshop was opened by the Regional Agricultural Advisor and attended by representatives of all the stakeholders involved in bean research, extension, production as well as seed traders [Fig.4.]. About 15 lead farmers from project contact villages attended and took an active part. The meeting began with formal presentations from project members on aspects of activities and outputs of the bean promotion project. [The full Proceedings can be read in Appendix 4]

Mary Sebeye gave an overview of the role of the Farmers Education Unit [FEU] and this was followed by presentations from farmers and the extension service. In the afternoon participants split into three groups – farmers, extension, traders and



NGOs, research, to consider the strengths and weaknesses of present seed systems for beans, to identify solutions for the problems identified and to end with a set of resolutions [see attached programme]. Presentations by English speakers were translated into Kiswahili. All other presentations were delivered in Kiswahili which was translated into English for the benefit of non-Swahili speakers. The closing summary of the meeting and its achievements was given by a representative from the NGO, CARITAS.



**Fig. 4. Participants at the bean dissemination workshop 26 September 2005**

One of the most interesting things to be said at the meeting was that while in many areas of the SH, maize used to be an important cash crop, the high price of fertiliser has persuaded farmers that it is better to grow beans and use the money from selling them to buy maize!

One problem in establishing a co-ordinated National Policy for the dissemination of information on agricultural technologies was apparent from Ms Sebeye's presentation. That is the poor linkages between the information cascade within the Ministry of Agriculture and food Security and information flow in the District Extension Service that comes under local government. The Zonal Communication Centres based at Zonal Research Centres are part of the Ministry system under the FEU but the village Information Centres, most of which are starved of resources belong to the local government system

The main resolutions from the workshop focused around the need for wider coverage and participation of on-farm testing of new lines from the Uyole programme and the present inadequacy of extension support.

During the intervals, participants were able to view bean seed and extension literature. Three farmers groups brought samples of their own seeds for display and exchange.

There was widespread support for and appreciation of the role of Uyole in developing new bean varieties and supporting technologies for smallholders.

As a response to the Workshop, more of var. Urafiki was disseminated in 6 villages in Rukwa region, 3 villages in Chunya district, Mbeya region and in Njombe district. CARITAS Mbeya and ADP Isangati who attended the Workshop also bought the variety from Uyole for further seed multiplication and distribution to farmers in 2006.

### **OUTPUT 3: Knowledge on socioeconomics of biodiversity conservation disseminated**

There was a single activity under this output – to produce a paper on bean diversity in order to more widely disseminate research findings under an earlier CPP project.

A paper was written on socio-economic determinants conservation of bean biodiversity, by Dr Bisanda who was the PhD student on R7942 and who now works in the Ministry of Agriculture in Dar es Salaam. Jill Lenne who was involved in earlier phases of the project at its inception, agreed to work with Dr Bisanda to take the paper to publication. The draft paper was completed as a Working Paper [Appendix 7] in September-*Management and utilization of Phaseolus bean diversity in the Southern Highlands of Tanzania. 1. Socio-economic factors*. The manuscript was submitted for publication in January 2006.

A study made of management and utilization of *Phaseolus* bean diversity by farmers in the Southern Highlands Zone (SHZ) of Tanzania. The main objective of the study was to establish the socio-economic factors that are linked to bean diversity, i.e. the number of bean types that are grown by 180 farm households, in 25 selected locations in the SHZ. Based on local names and bean type, 345 distinct bean types were recognized, however, phenotypically identical beans were found to have several names within and between communities and cultures. After reclassification, 15 seed phenotypes were identified and among these, six bean types only were found to be widely grown: *Kablanketi*, *Kabanima*, *Kigoma*, *Njano*, *Masusu* and *Msafiri* types.

Proximity to markets, wealth and household size have significant influence on the decision to manage and use bean diversity [Tables 8 and 9]. Joint decision making between women and men in the household results in management and use of maximum bean diversity. The long-term effect of improved transportation and market opportunities is likely to be a reduction in bean diversity. Wealthier farmers with oxen, large land area and large families, tend to keep more bean diversity than poorer farmers

**Table 8. Socio-economic factors affecting bean diversity: Chi-Square results**

<b>Socio-economic variables</b>	<b>Chi-square value</b>	<b>df</b>
Age of household head	2.198	2

Amount of land under cultivation	7.916 <sup>1</sup>	4
Cattle ownership	0.298	2
Education of decision maker	1.845	2
Education of household head	0.442	2
Family size	5.737 <sup>1</sup>	2
Gender of decision maker	1.696	6
Gender of household head	6.371 <sup>2</sup>	2
Hiring labour	1.047	2
Labour size	1.354	4
Number of cattle owned	3.261	2
Ownership of oxen	4.627 <sup>2</sup>	2
Proximity to crop markets	7.140 <sup>2</sup>	2

<sup>1</sup> Significant at p= 0.10 level. <sup>2</sup>Significant at p= 0.05 level; df= degrees of freedom.

**Table 9. Socio-economic variables, percent of households and the corresponding number of bean types they grow (n= 180).**

Socio-economic variables	Number of bean types grown			Sample size
	1 to 5	6 to 10	Above 10	
Male headed households	25	37	38	160
Don't own a pair of oxen	23	45	31	119
Large households <sup>1</sup>	27	32	41	102
Remote villages <sup>2</sup>	15	47	38	90
Accessible villages	32	35	33	90
Small households	21	50	29	78
Medium cultivated land area	19	50	31	70
Large land area	26	29	45	65
Own a pair of oxen	26	29	42	61
Small cultivated land area <sup>3</sup>	31	40	29	45
Female headed	20	65	15	20

<sup>1</sup> 1 to 5 is a small family and above five is a large family

<sup>2</sup> Remote and accessible markets relates to accessibility to markets

<sup>3</sup> 0.4 to 2 = small; 2.1 to 4 = medium and above 4ha large land area

## **Dissemination Outputs**

### Peer Reviewed Journal Papers:

HILLOCKS, R.J., MADATA, C.S., CHIRWA, R., MINJA, E. AND MSOLLA, S. (2006) Bean improvement in Tanzania 1959 – 2005. *Euphytica* [Accepted January 2006].

BISANDA, S.Z., LENNE, J. and HILLOCKS, R. J. (2006) Management and utilization of *Phaseolus* bean diversity in the Southern Highlands of Tanzania. 1. Socio-economic factors [Submitted to 'Biodiversity & Conservation' in January 2006].

### Conference Papers and Workshop Proceedings:

MADATA, C. D. [ed.] (2006) *Seed Distribution and Supporting Information Systems for Phaseolus beans in the Southern Highlands of Tanzania*. Report of a Stakeholders Workshop Held in Mbeya on 26<sup>th</sup> September 2005. ARI Uyole, Mbeya, Tanzania, 43 pp. English and Kiswahili. [Unpublished Workshop Proceedings].

### Internal Reports and Working Papers:

HILLOCKS, R.J. (2005) Report of a visit to Tanzania to assess progress in the multiplication and distribution of improved bean varieties in the Southern Highlands, 23 April – 01 May 2005. Natural Resources Institute (NRI), Chatham, UK, 5 pp. [BTOR]

HILLOCKS, R.J. (2005) Report of a visit to Tanzania to participate in workshop on seed distribution and supporting information systems for *Phaseolus* bean in the Southern Highlands of Tanzania, 22 – 30 September 2005. Natural Resources Institute (NRI), Chatham, UK, 3 pp. [BTOR]

GARFORTH, C.J. (2005) Farmers' bean information systems in the Southern Highlands of Tanzania. Working Paper A1150/1, Natural Resources Institute (NRI), Chatham, UK, 17 pp. [Working Paper]

HILLOCKS, R.J. (2005) Seed supply systems for self-pollinated crops in sub-Saharan Africa with special reference to Tanzania. Working Paper A1045/2, Natural Resources Institute (NRI), Chatham, UK, 8 pp. [Working Paper]

MADATA, C. S. and CHIRWA, R (2006) Assessment of seed supply and dissemination chains of improved bean varieties in the Southern Highlands of Tanzania. CIAT-Malawi [SABRN]/ARI Uyole, Mbeya, Tanzania, 35 pp.[Report]

### Other dissemination

UARI (2005) Descriptions of improved bean varieties. Uyole Agricultural Research Institute, Mbeya, Tanzania. [Information Sheet] 6 sheets 500 copies of each.

Appendices to the FTR [available only with electronic version of the FTR]

Appendix 1. Evaluation data for approval of 'Urafiki' as an officially released variety.

Appendix II. Garforth report on communication systems

Appendix III. CIAT report on bean dissemination

Appendix IV. Workshop proceeding Uyole

Appendix V. WP1 – Bean improvement in Tanzania 1959 - 2005

Appendix VI. WP2 – Seed systems for self-pollinated crops in sub-Saharan Africa

Appendix VII. WP3 – Socio-economic, agronomic and environmental factors influencing bean diversity in the Southern Highlands of Tanzania

### **Contribution of Outputs to developmental impact**

*How is the knowledge promoted benefiting the poor?*

Beans are the second most important food crop after maize in the southern highlands and in many other parts of Tanzania and the region. Bean production per capita has fallen over the last 20 years and production increases are required to meet the growing urban population. Smallholders in rural areas can meet this need if they have access to high-yielding varieties that meet market requirements, especially those that can perform well under adverse conditions such as drought. The project and predecessors has developed and disseminated a new variety that meets some of these requirements.

Our research in this and earlier projects, has addressed three problems:

1. How to develop bean varieties that meet farmers needs and consumer demand.
2. How to get new bean varieties quickly to as many households as possible.
3. How to produce and disseminate supporting information in a form most suitable to the needs of smallholders

The previous project developed a bean variety that was designed to meet grower and consumer demands. This variety was evaluated on-farm before release. It has proved to be popular and is gaining in market demand.

The Uyole farm remains the sole source of Foundation Seed of beans in the Southern highlands. Pathways have been developed to disseminate new varieties in the early stages using NGOs, extension and direct to farmers. It seems to take about 3 years for a new variety to become widely known and for market demand to be created. After this time if the variety is popular demand becomes self-generating. Farmers have been given small amounts of seed and we have found that they will rapidly multiply the seed themselves if there is market demand.

In response to demand from contact farmers, the project produced simple but durable information sheets for each of the improved bean varieties. These proved to be popular where they were distributed. The main problem identified is that village information centres have not been properly set-up in all villages and where they have been set-up, they are still not well supplied with information from either extension or the research system. More national, regional and district co-ordination is required.

*What coverage has been achieved (numbers of farmers, institutions and production areas adopting the technology).*

The issue of bean seed production is continent-wide but we were able to address it only in the Southern Highlands of Tanzania. Three districts were particularly targeted as being suitable for the new bean variety 'Urafiki'. Six villages were used by Uyole for direct distribution and testing of seed but many more received seed through NGOs, district Extension Offices and Community-based organisations. A total population of around 300,000 - 500,000 people now have access to 'Urafiki' through contact villages, farmer-farmer exchange of seed and NGO-supported multiplication schemes.

*What is the potential for wider scale impact.*

Over time the population that will use Urafiki will expand to over 1 million. It is only from 2006 that Urafiki will be produced on a large scale on the Uyole farm as Foundation Seed. The variety is also available for evaluation in other parts of Tanzania where its drought tolerance will make it an attractive option.

The research has highlighted deficiencies in the information system and problems in seed production and distribution for self-pollinated legume crops. This is a continent-wide problem.

*Wider policy Issues highlighted by the research:*

The information chain for agricultural technologies is dysfunctional for three main reasons – lack of funding, inadequate national co-ordination since zonal devolution and perhaps most importantly, because Zonal Communication Centres located at the NARIs come under MAFS, while Village Information Centres are a Local Government resource.

NARIs are prevented by law from entering into commercial seed production. This assumes that to do so would discourage private sector investment. However, this needs to be reviewed as there is little evidence that the private sector will be willing to invest in seed production for self-pollinated legumes.

*What follow up action/research is necessary to promote the findings of the work to achieve their development benefit?*

Our research has shown that there is still limited access in the villages, to information about new varieties and other agricultural innovation. There is a need for further research aimed at improving the development of information media and the systems for delivering it to the end-users. The research is relevant to the whole region although the present systems for dissemination of agricultural information differ between countries. What is required is a comparative study in Kenya, Tanzania and Uganda of the strengths and weaknesses of the different systems. In Tanzania decentralisation has fragmented the national information system and the

Farmers Education Unit under the MAFS does not seem to have a national strategy which takes account of zonal devolution. Furthermore, Extension still comes under local government as do the village information centres, whereas, Zonal Communication Centres come under MAFS. This dichotomy breaks the link in the information chain. In Uganda, extension has been partly privatised and the NARS are disintegrating due to lack of funds, so where are information needs now identified and how are they met – where to ‘service providers’ obtain high quality information? In Kenya

## PROJECT LOGFRAME

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<b>Goal</b>			
Benefits for poor people generated by application of new knowledge on crop protection to cultivation of herbaceous crops in hillsides production systems.	To be completed by CPP Programme Manager	To be completed by CPP Programme Manager	To be completed by CPP Programme Manager
<b>Purpose</b>			
Benefits for poor people generated by application of new knowledge on crop protection to cultivation of beans in the southern highlands of Tanzania	To be completed by CPP Programme Manager	To be completed by CPP Programme Manager	To be completed by CPP Programme Manager
<b>Outputs</b>			
1. New bean variety disseminated	Survey completed by April 2005.	Survey report and report submitted to Farmers Education Unit in the Min of Ag.  FTR	Logistic support from ARI Uyole  Cooperation with extension service and Central and Zonal communication Centres.
2. Agricultural communication systems evaluated for promotion of bean varieties and production technologies	Foundation seed produced and distributed to community multiplication sites by September 2005 in order to multiply ‘urafiki’ in villages during the 05/06 season.	Community multiplication set – up in at least 5 villages.  CPP progress reports	Logistic support from ARI Uyole  Reasonable standard of crop management in villages
3. Knowledge on socioeconomics of biodiversity conservation disseminated	Paper ready for submission by June 2005	Paper manuscript	
<b>Activities</b>	<b>Inputs</b>	<b>Means of Verification</b>	<b>Important Assumptions</b>
1.1. On-farm evaluation and multiplication of improved bean varieties		BTORs  CPP progress reports	Enthusiasm from private sector .
1.2. Assessment of seed distribution networks and role of private sector seed suppliers		Project report	Weather conditions and pests do not adversely affect bean crops

2.1. Monitoring and evaluation of awareness of new variety in target villages and impact of various communication media developed by the bean projects		CPP progress report	Transport available
2.2. Evaluation of the process of information dissemination from research through extension to the farmer.		Reading University report	
3.1 Paper on biodiversity produced.		Paper submitted	Paper accepted for publication

Note: Outputs should be numbered 1, 2, 3, *etc.* Activities should relate to these outputs and be numbered 1.1, 1.2, ...2.1, 2.2, ....*etc.*