CROP PROTECTION PROGRAMME

Participatory Promotion of Disease Resistant and Farmer Acceptable *Phaseolus* Beans in the Southern Highlands of Tanzania

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FINAL TECHNICAL REPORT

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D M Teverson

Natural Resources Institute

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List of Project Partners

Participatory Promotion of Disease Resistant and Farmer Acceptable *Phaseolus* Beans in the Southern Highlands of Tanzania

R Number	R 7569
Report compiled by	Dr D M Teverson
CPP Production System	Hillsides

Lead Institution:

Natural Resources Institute, University of Greenwich

Dr D M Teverson
Dr N J Hayden
Mr R Lamboll

Collaborating Institutions and Scientists:

The University of Reading

Professor C Garforth
Dr B Asseid
Dr K Green

Uyole Agricultural Research Institute

Dr C Madata
Dr S Bisanda

Technicians:

Mr Obeth Mwakilindile
Mr Hatibu I. Zubeiri
Mr Francis Mosses
Mr W. G. Kawiche

Research-Extension Liaison Officer:
Mr Kiranga

Extension Officers:

Mrs. Kimboi (Mbozi district)
Mr. Kimaro (Njombe district)
Mr. Magina Tala (Nkansi district)
Mr. U.Msomba "
Mr. P. Qollo "
Mr. M. Haule (Sumbawaga)
Mr. V. Ngunsi "
Mr. M. Masebe "

Farmers:

(i) Issa Mkumbwa, Lucas Kamwela, Joyce Chuvaka, Kenneth Mapunda, Nambutwa Tumalege and Ifungo Primary School
(Mbozi District for 2001/02 and 2002/03 seasons).

(ii) Mario Mgheni, Mrs. Talita Nduye, Mrs. Rehema Msigwa,
Mrs Rahema Kidumba, Mrs. Elizabeth Mabena, Mrs. Magdalena Ntokama, Peter Msigwa,
E. Kilama, Pereja Mgeni and Batwel Mgeni
(Njombe district for 2001/02 and 2002/03 seasons).

(iii) Vermund Fwala, Konradi Msagala, Ausebio Kastiko, Graciana Zema
(F), Philipo Kayomvyo, Charles Pondamali, Alphonce Nkokolo and A. Kollo.

Collaboration with IPM Project

Dr D Kibungo

Horticulture Research International

Dr J D Taylor
Mrs B Everett

Executive Summary

Agriculture and related activities provide the main livelihood for an estimated 80% of the 7.4 million population of the southern highlands of Tanzania, with maize and beans being the most important crops grown. Beans have an important part to play, providing important protein nutrition in an area where meat is a rare luxury. They are increasingly important as a cash crop as well as providing essential household food security, enhancing the sustainable livelihoods of increasing numbers of smallholder farmers and their families.

The purpose of the project was to develop and promote the best disease resistant and farmer acceptable bean varieties to poor farmers, in a participatory manner, through appropriate seed uptake pathways in the southern highlands of Tanzania.

Diseases are second only to low soil fertility as a constraint to bean production. Previous CPP-funded studies (R6651) identified disease resistance in local bean mixtures, which have been crossed with seed types showing farmers' quality characteristics, which are also suitable for marketing. Complementary to this bean material was the knowledge of farmers' management of bean genetic resources in the southern highlands of Tanzania; the major output of project R6670.

From a starting point of often less than ten seeds each of thirty-two lines, from two separate crosses, simultaneous participatory farmer and researcher selection has identified the best two seed lines for promotion and dissemination. These will be combined to produce the final variety for release to farmers. The material has been thoroughly tested, initially in glasshouse trials with a range of isolates and diseases in the UK and then on-farm and on-station in the southern highlands of Tanzania. Furthermore, it has been multiplied over several seasons to produce enough clean seed to satisfy consumer demand when the new variety is released after its presentation to the Tanzanian Seed Release Committee in November 2003.

Disease resistance is a prerequisite for crop survival in the severe conditions of the southern highlands, but farmers are so used to the crop losses caused by diseases that often this is seen as the 'norm' and the deleterious effects of diseases are not appreciated. Quality characteristics such as taste, cooking qualities, appearance and storage characteristics (both dried and after cooking) are often of more immediate importance to farmers, and if the crop is to be sold, marketability.

Having identified suitable bean material, it was necessary to find the best method of disseminating it to farmers. Previous studies had shown that farmer uptake of new varieties is often very low. It was therefore necessary to identify and characterise seed uptake pathways and distribution channels. This involved analysis and documentation of access to, and use of, sources and channels of agricultural information by different categories of farmers, for example wealthy and poor, men and women farmers. The most effective means of promotion was identified and appropriate promotional material produced and disseminated. Finally, an impact study was conducted, to evaluate the effectiveness of project activities within the limited timeframe of the project.

The DFID goals of promoting sustainable livelihoods and protecting and improving the natural and physical environment have been addressed. DFID aims to improve and strengthen the sustainability of the livelihoods of poor people. This project has explored these themes within the context of participatory selection of disease resistant germplasm which will enhance the agrobiodiversity of farmers' crop genepools, increase choice and enhance sustainability, whilst reducing pesticide usage and therefore protecting the environment.

Background

Beans are grown widely in East Africa and, within the region, Tanzania is one of the largest producers. The importance of beans in Tanzania is not only expressed by the large area grown, but also by their role in the fight against protein-calorie malnutrition in a country where 51% of the population live below the poverty line (CIA, 1999). Without beans, protein malnutrition would be prevalent in the region as meat is a rare luxury for the majority of people in rural and many urban areas. The average protein content of beans (22.1%) is far more than that of other staple foods (Karel *et al.*, 1976). *Phaseolus* beans are consumed fresh or dried and bean leaves are used as a popular 'relish'.

Tanzania is one of the poorest countries in the world. The economy is heavily dependent on agriculture, which accounts for 56% of GDP, provides 85% of exports and employs 90% of the workforce (CIA, 1999). Beans are grown mainly for household consumption and usually by women, therefore an improvement in such a staple subsistence commodity as beans will have an important impact on the household and local economy. In the southern highlands of Tanzania, women farmers sell beans in local markets to buy other food and household items. They are also engaged in the marketing of beans to urban centres, often through 'middle-men' and traders from as far afield as Dar es Salaam, Zambia and Malawi. There is an increasing interest in bean production to supply both local and international markets.

Beans were traditionally grown at mid-altitudes, but production has more recently extended into marginal areas. At high altitudes, where conditions are cool and wet, *Phaseolus* beans have to some extent replaced garden peas (*Pisum sativum*). In lower altitude hot, dry locations, beans are now cultivated in addition to the traditionally-cultivated pigeon peas and cowpeas (Madata, 1999 pers. com.). Diseases, which are the most important constraint to bean production after low soil fertility, are more common in the high altitude marginal areas such as those in the southern highlands of Tanzania. Halo-blight[1] and anthracnose[2] commonly occur at these high altitudes, whereas common blight[3] is more common at lower altitudes. However, occurrence of angular leaf[4] spot is ubiquitous, it causes angular lesions on leaves at plant maturity, defoliation and severe yield loss.

In the southern highlands of Tanzania, beans are typically grown as mixtures of different colour, size and shape which also have different agronomic and culinary characteristics. CPP- and ERP-funded research (R6670 & R6651) has shown that these mixtures are usually a carefully composed selection of local and non-local landraces and, occasionally, released varieties, which complement each other both in growth characteristics and reaction to biotic and abiotic stresses. Farmers are very careful which types of bean are included in their mixtures and will test a new bean type for several seasons, and in different environments, before including it as a component in their mixture(s).

In areas where soils are fertile, diseases are the most important constraint to bean production. Provision of varieties that are adapted to local conditions and resistant to several locally occurring diseases, for inclusion in farmers' bean mixtures, is an opportunity to enhance rather than replace the existing biodiversity present in farmers' mixtures. Provision of disease resistant materials into a system in which there is an understanding of both biological and sociological interactions addresses this major constraint to yield improvement in an acceptable and sustainable manner.

The potential benefits of new varieties will only be realised if they are used by farmers as components of their bean mixtures, in addition to being grown as pure varieties. There is limited experience in east Africa of the successful promotion leading to widespread adoption

[1] Halo-blight – *Pseudomonas savastanoi* pv. *phaseolicola.*
[2] Anthracnose – *Colletotrichum lindemuthianum.*
[3] Common blight – *Xanthomonas campestris* pv. *campestris*
[4] Angular leaf spot – *Phaeoisariopsis griseola.*

of new bean varieties. There is also evidence that farmers acquire genotypes which are new to their own mixtures from both market and non-market sources. However, it is known that new varieties do not automatically spread from researcher-managed, on-farm trials. There has been insufficient information to determine the main constraints to widespread adoption of released varieties, in particular the relative importance of the availability and sources of information and of availability and price of seed. The successful planning and implementation of promotion strategies depends on an understanding of the criteria by which farmers decide which new planting material to acquire, the information they seek in making those decisions, and the sources and channels from which they are able (and prefer) to obtain advice and information. Beans for mixtures are inherently unattractive to the formal private sector seed system because they are bought in very small quantities and farmers replace seed relatively infrequently. There is a need, therefore, to identify and strengthen alternative uptake pathways which promote beans adapted to local biotic and abiotic stresses and which can be incorporated synergistically to maintain and enhance the biodiversity present in farmers' bean mixtures.

Farmers' management of their bean mixtures, in response to both biological and sociological parameters has been studied in detail by the '*In-situ'* bean project (B0104/R6670). Surveys and studies of bean selection criteria in the southern highlands of Tanzania have shown that farmers are experts in manipulating their bean mixtures. They actively look for new materials to increase the diversity of their bean mixtures, from a variety of sources, including both the formal and informal seed sectors (Teverson, 1999, Final Technical report, R6670).

The provision of resistant varieties derived from farmers' landrace mixtures is demand led. Not only have target institutions requested this material, but the farmers themselves, personally, to the principal investigator of the project (BTO report, [July 1999], NRI Visit No. 6591). The purpose of the project is to promote the best disease resistant and farmer acceptable bean genotypes to poor farmers, in a participatory manner, through appropriate seed uptake pathways in Tanzania. Several of the genotypes that were used were the result of screening activities undertaken during project R6671. The project involved farmers at every stage of the process, to give them a sense of involvement and an opportunity to drive the process of variety selection, development and promotion.

The *'In-situ'* project (R6670) involved 23 farmers, from Iringa, Mbeya and Sumbawanga regions of the southern highlands of Tanzania who contributed both their bean mixtures and opinions throughout the 3-year project. They provided an insight into the way that farmers manage their beans, the problems they face, (ranging from diseases to floods and drought) and, when they have managed to produce a crop, the problems of storage pests and marketability. It is only by identifying the farmers' priorities, and working in partnership with them, that acceptable bean varieties can be produced which will be used by the farmers.

CPP programme management, along with other RNRKS programmes, have identified promotion and uptake as key constraints to the achievement of programme purpose, particularly for research outputs which are clearly in the interests of the rural and urban poor. In support of the various programmes, the Socio-Economic Methodologies component of NRSP has commissioned research on ways to improve the communication of RNR research findings and outputs to intermediate and end users, and to facilitate promotion and uptake pathways.

Project Purpose

Production System: Hillsides Production System Purpose 1 - Output B:

Programme Purpose: Promotion of strategies to reduce the impact of pests and stabilise yields of crops in Hillsides systems, for the benefit of poor people.

> *To reduce the impact of diseases and increase production of beans by resource-poor smallholder farmers, by the introduction of acceptable and disease resistant bean types in a sustainable, participatory manner.*

Project Purpose: The purpose of the project is to make available the improved bean varieties resulting from previous CPP-funded research, in ways which will both facilitate informed decision making by farmers and give them access to seed of appropriate, locally-adapted varieties in sufficient quantities to meet demand.

Achievement of this purpose has contributed to the elimination of poverty in rural areas by increasing food security where beans are grown for subsistence and the income of households where beans are grown as a cash crop. In urban areas it will ultimately improve the stability of supply, and therefore prices, of a key component of the staple diet of the urban poor.

The project has achieved it's purpose[5] through activities leading to the delivery of the following:

Output 1. Acceptable, disease resistant bean varieties identified by farmers through participatory screening and assessment.

Output 2. Seed uptake pathways and distribution channels used by and available to resource poor farmers, identified and characterised.

Output 3. Access to and use of sources and channels of agricultural information by different categories of farmers analysed and documented.

Output 4. Selected lines, derived from locally adapted bean mixture components, multiplied in sufficient quantities for on-farm and on-station evaluation. After further selection, seed bulked in appropriate quantities for dissemination to farmers.

Output 5. Farmer selected, disease resistant bean lines approved for release to farmers by Tanzanian Seed Release Committee.

Output 6. Finished bean varieties widely promoted among farmers using appropriate communication strategies.

Output 7. Write-up previous CPP-funded work on beans – Functional Diversity project, R6651 and R5270

[5] Bean varieties developed as part of the project will be submitted to the Tanzanian Seed Release Committee in November 2003.

Research Activities

Output 1. Acceptable, disease resistant bean varieties identified by farmers through participatory screening and assessment.

Activity 1.1 Stakeholders' Workshop / Seed Fair

A stakeholder Workshop and Seed Fair was held at ARI-Uyole, Mbeya Tanzania from 7 – 10 August 2000 entitled 'Increasing Farmer Access to Phaseolus Bean Germplasm in the Southern Highlands of Tanzania'.

The workshop allowed maximum participation, whilst building on the experience of previous initiatives. A total of sixty participants attended the Workshop. The Seed Fair created a great deal of interest at the *Nanenane* Agricultural show in Mbeya. It is very notable that more than half the workshop participants were farmers (31). Twenty-three invitations were sent out, one to each of the farming households who had actively participated in the *'In-situ'* project by donating their beans over a period of three years. These farmers were therefore familiar with the on-going bean research and were very active participants, as shown in the Workshop report, (Appendix 1.1) and the workshop video.

Activity 1.2 Simultaneous farmer participatory and laboratory based screening and evaluation of bean varieties using farmers' performance criteria, including palatability and cooking tests to ensure consumer acceptability

Laboratory and greenhouse based screening was undertaken in the facilities at HRI-Wellesbourne. This activity built on the work of the previous bean projects. The bean crosses were originally made in 1995 from bean mixture components collected in 1991 and screened as part of the activities of R6651.

The bean lines identified for possible promotion in Tanzania were double checked for their resistance to a range of diseases and multiplied under quarantine conditions in polytunnels (Plate 14) for dispatch to Tanzania. Any lines which were not of sufficient standard, or not available in sufficient quantity, were not sent to ARI-Uyole.

The bean material identified for development in this project were as follows:

Kabanima selection (5060/6) x Canadian Wonder F6

5060/6 is a bean mixture component selected from one of several bean mixtures collected from the southern highlands by D Teverson in 1991. It was identified as having very rare resistance to angular leaf spot, a severe and ubiquitous foliar disease of beans in east Africa.

Canadian Wonder was selected as a parent because of it's good size and popular deep red colour. It is susceptible to several diseases. However, the progeny of this cross F6 were selected to combine the phenotypic characteristics of Canadian Wonder with the disease resistance characteristics of 5060/6.

Small Masusu (5084/2) x Canadian Wonder F5

Small Masusu (5084/2) was a selection from a mixture component collected from Mrs Fides Benson[1] of Tukuyu village in 1991. It was found to have almost unique resistance not only to all known races of halo-blight (race non-specific resistance), but also showed resistance to the four races of anthracnose against which it was tested.

Methodology for the screening of bean accessions with isolates of different pathogen varies according to the disease. For instance, halo-blight and anthracnose are inoculated onto the primary bean leaves (although slightly different techniques are used), because they are seedling pathogens. However, angular leaf spot and common bacterial blight are both diseases which occur at plant maturity and therefore mature plants, which take up more space and time, have to be used for inoculations. Full details of inoculation protocols are available as technical outputs of the 'Functional Diversity' project.

Bean disease isolates of five different foliar diseases were carefully selected from the isolate collection stored at HRI-Wellesbourne, most of which was collected by Dr.s Taylor and Teverson, as part of DFID-funded bean research (Table 1.2.1). It was critical to select isolates which represented the pathogenic variation occurring in the southern highlands of Tanzania. Use of pathogenic isolates sourced from elsewhere in the world would have rendered the screening results irrelevant to the situation in the southern highlands of Tanzania. In addition, for halo-blight, anthracnose and angular leaf spot (the most important diseases in the southern highlands) more than one isolate of each disease was included, in order to ensure that results were as robust as possible. In addition, an angular leaf spot isolate sourced from CIAT, Colombia was included, for contrast, as African and South American strains of angular leaf spot are believed to be adapted to different bean types.

Table 1.2.1. Origin and details of isolates used for screening bean material at Horticulture Research International.

Isolate No.	**Disease / Race (HB)**	**Year of collection**	**Host species**	**Country of origin**	**Place of origin**
1299B (NCPPB 4021)	Halo-blight 6	1984	*P.vulgaris*	Tanzania	Uyole, Mbeya
1301B (NCPPB 4018)	Halo-blight 3	1984	*P.vulgaris*	Tanzania	Uyole, Mbeya
3035A	Anthracnose	1992	*P.vulgaris*	Tanzania	Arusha, TZ
3156B	Anthracnose	1992	*P.vulgaris*	Tanzania	Kwai, Lushoto
3547A	Angular leaf spot	1993	*P.vulgaris*	Tanzania	Arusha, TZ
3423	Angular leaf spot	1993	*P.vulgaris*	Colombia	CIAT
3065A	Common bacterial blight	1992	*P.vulgaris*	Tanzania	Lyamungu TZ
1944E	Brown spot	1987	*P.vulgaris*	Rwanda	

[1] Mrs Fides Benson also attended and contributed to the *Nanenane* Project Workshop and Seed Fair in August 2000 (Activity 1.1).

Due to the seasonality in the southern highlands of Tanzania, 2003 field trials will be harvested in June 2003, after the FTR submission. An addendum will be produced analysing both these and the 2002 seasons results together, for 31 July 2003.

Activity 1.3 Field days and farmer exchange visits to involve farmers in the selection process and demonstrate new materials being developed.

Farmer Field Days were conducted during April and May 2003 at two villages, *Mbimba* and *Nkundi.* Fifty-eight farmers and four extension officers attended at *Nkundi*. A Farmer Field Day including participatory varietal assessment is in progress (w/c 12 May 2003) at five different field sites and results will be included in the 31 July addendum of this report.

An example of the matrix ranking conducted with farmers is shown in Appendix 1.3 Table 1.

Output 2. Seed uptake pathways and distribution channels used by and available to resource poor farmers, identified and characterised.

Activity 2.1 Desk study and sample survey to update available information on seed uptake pathways in the southern highlands.

This output was addressed through a review of literature, which was presented at the project inception workshop in August 2000 (Green and Garforth, 2000; Appendix 2.1.1) and through a survey in seven villages in the Southern Highlands in March 2001 (Asseid and Garforth, 2001: Appendix 2.1.2).

In the survey the research team interviewed a ranked set sample of 149 respondents, more or less equally divided into men and women, and representing three wealth groups. The objectives were to provide data for the planning and development of promotion and communication strategies in relation to beans, and to provide baseline data against which the impact of future promotion activities could be assessed. The seven villages were selected purposively to represent the range of agro-ecological and accessibility situations within the Southern Highlands (Appendix 2.1.2).

Output 3. Access to and use of sources and channels of agricultural information by different categories of farmers analysed and documented.

Activity 3.1 Identify sources and channels of agricultural information, and their use by farm households, using a modified version of the RAAKS methodology

The data for this output were gathered through qualitative enquiry in March 2001 in the same villages as the survey for Output 2 (Bakari and Garforth, *ibid*.), using focus groups and information mapping (Appendix 3.1.1). They were supplemented by PRA activities in four villages in July 2002 designed to probe further the role of local government and other institutional structures in the flow of information related to agricultural production and development (Luleka and Garforth, 2002[2]: Appendix 3.1.2).

[2] This output is additional to those planned in the Project Memorandum Form.

Activity 3.2 Promotional strategy planning workshop with stakeholders

Developing a promotion strategy

A meeting was held at ARI Uyole 8-9 November 2001 (Activity 3.2) to develop a promotion strategy (Garforth and Hayden, 2001: Appendix 3.2). The objectives of the meeting were to:

(1) review available information on farmers' sources and uses of information about beans, and on their seed uptake pathways
(2) design a promotion strategy, including identifying audiences, content, communication channels and activities.

Based on the findings from Outputs 2 and 3 and the professional expertise of the researchers, extension personnel, NGOs and farmer representatives at the meeting, appropriate objectives, message content and communication channels were identified for distinct audiences.

Output 4. Selected lines, derived from locally adapted bean mixture components, multiplied in sufficient quantities for on-farm and on-station evaluation. After further selection, seed bulked in appropriate quantities for dissemination to farmers.

Activity 4.1 Implement seed multiplication strategy designed at the project workshop in Year 2.

Seed of several different sister lines from the crosses Kabanima (5060/6) x Canadian Wonder and Small Masusu (5084/5) x Canadian Wonder were multiplied in polytunnels at HRI Wellesbourne, under quarantine conditions, upon project initiation (Plate 14). This was necessary in order to increase seed stocks from quantities of 10 seeds or less, to quantities sufficient for evaluation and multiplication on-station at ARI-Uyole. Two cycles of multiplication were conducted. Each seed was planted singly in a 20cm pot of Levington compost and single seeds of each sister line were cultivated and harvested individually.

Observation for pests and diseases were ongoing, but as the lines had been grown for several generations under quarantine conditions, these were minimal or non-existent. The polytunnels were fitted with insect-proof netting on the sides and black-out curtains, which are required in order to give the short day lengths necessary for these African-adapted beans to flower and produce seed.

Once seed reached Tanzania, it had to fulfil the quarantine requirements of the country. After testing for seed-borne pathogens, including anthracnose, multiplication was allowed at ARI-Uyole under strict supervision, with several visits during the growing season from quarantine inspectors from TPRI, Arusha.

The first multiplication[3] of CPP-lines at ARI-Uyole was conducted during late 2000. The rains were very heavy and the bean lines were subjected to very heavy disease pressure. A second set of seeds was dispatched from HRI in early 2001 to replace much of the seed lost due to the exceptionally heavy rains.

[3] Optimum use was made of the seasonality in the southern highlands of Tanzania to grow several crops of beans per year in order to maximise project outputs; to produce as much disease-free seed and conduct as many on-station and on-farm trials as time and resources allowed. Furthermore, use was also made of glasshouses, residual moisture and artificial irrigation to produce additional crops during the dry season.

When multiplying seed for dissemination to farmers it is vital that the seed is kept free from seed-borne diseases. If care is not taken, it is possible to disseminate new races and strains of seed-borne pathogens, to which local germplasm has no resistance. Thus farmers would be in a much worse position than if no intervention had taken place. It is impossible to breed a bean variety which is resistant to all races and strains of all the diseases to which it may come into contact. Therefore, on-station multiplication is conducted under as near optimal conditions as possible, with additions of fertilisers and pesticides, as necessary to maximise yields of disease-free 'clean' seed.

The agronomic and performance characteristics of the 32 seed lines initially multiplied in the UK were monitored simultaneously with their multiplication in quarantine plots at ARI_Uyole (2000-2001). As a consequence the eight most promising lines were selected. These were sown again in August 2001 at ARI-Uyole to increase seeds for on-station and on-farm trials and for further multiplication. These lines were 3(7078/1)[4], 4(7078/2), 7(7070/2), 4(7071/2), 5(7071/3), (7072B/2), 1(7075/2), 4(7078/2).

The same eight selected lines were multiplied once again at the 0.25ha multiplication plot at ARI-Uyole in mid-March 2002 producing *c.* 200kg of clean seed. This seed was used for both on-farm and on-station variety evaluation and informal seed production. The former was designed to enable farmers to have their own seed available for further planting and taste tests. On-station trials were also conducted with this seed and one or two selected lines have been used as controls (checks) in many collaborative trials[5].

A further cycle of on-station seed multiplication is on-going (at the time of report preparation). Planting was completed in mid-March 2003 and harvesting is expected to take place in June 2003. In May the beans were at post flowering stage. The seed is expected to be disease-free, although yield may be lower that last season due to terminal drought. The seed produced will be used for further testing and seed multiplication both on-farm and on-station, aiming to have enough seed to fulfil requirements when the variety is released post November 2003.

Output 5. Farmer selected, disease resistant bean lines approved for release to farmers by Tanzanian Seed Release Committee.

Activity 5. 1 On-farm trials at a selected range of locations in appropriate agro-ecological zones

On-farm trials have been planted in the following locations:

i) *Njombe* district - *Lyadebwe* village 10 farmers comprising four women and six men
ii) *Mbozi* district – *Mbimba* village comprising one woman, three men and one Primary school.
iii) *Nkansi* district – *Ulinji, Matai Matanga* and *Nkundi* villages (farmer groups for farmer assessments). *Nkundi, Kipandi, Kantawa, Kalundi,* and *Kantawa* Womens group villages (for seed multiplication). Harvesting of these trials and multiplication plots will commence in June 2003 after planting in February / March 2003.

Conclusions from on-farm trials at *Lyadebwe* village (10 farmers) suggested that the farmers rated the selected lines 2 on a scale of 1 – 5; 1 being excellent, (Hayden, 2002).

[4] These lines were Kabanima x Canadian Wonder crosses (Appendix 1.2 for further details).
[5] Lines 7071/3 and 7078/2 were included in the Southern African Regional Evaluation Nursery in SARBRN for SADC countries.

Furthermore, farmers in *Nkundi* district in Rukwa region have increased their own seed, during the dry season (using residual moisture) because they like the project bean material.

Activity 5.2 Multi-site on-station trials to test materials in different agro-ecological zones and to fulfil the requirements of the Tanzanian variety release mechanism.

The NRI variety trial, using local varieties as controls, was planted at the following locations and environmental conditions:

Table 5.2.1 Location and agro-ecological conditions of 2003 on-farm trial sites.

Location	Altitude		Climate		Soil type
Mbimba	1200 m.a.s.l.	low	hot	dry	fertile
Mbozi	1200 m.a.s.l.	low	hot	very short rains	poor soils
Uyole	1798 m.a.s.l.	mid	cool	fair	fair
Nkundi	1900 m.a.s.l.	high	cool	short rains	variable

Harvesting will be conducted in June 2003 and data will be prepared for presentation to the Tanzanian Seed Release Committee in November 2003. Two or more of the NRI lines will be released as part of a mixture of disease resistance genotypes, which is possible because they are both of similar size and colour (identical phenotypes[6]).

Output 6. Finished bean varieties widely promoted among farmers using appropriate communication strategies.

Activity 6.1 Develop, pre-test and modify communication materials in participation with stakeholders
and
Activity 6.2 Implement communication and promotion strategy

[These two activities are considered together in this report]

The main elements of the strategy which have been implemented (Activities 6.1, 6.2) are the continued on-farm trials, demonstration and evaluation with farmers; design, production and distribution of print material (posters and leaflets); and a radio broadcast.

During 2002, the on-farm testing of varieties was expanded to *c.* 300 farmers. On-station farmer assessment of varieties has been ongoing, both at Uyole and at sub-stations. Informal seed multiplication is happening at all on-farm trial sites.

For the *Nanenane* show, (on 8th August 2002 at Mbeya showground), the Uyole team prepared the following materials:

- printed leaflet on bean husbandry: this was sold at TSh 50 per copy; around 700 copies were sold

[6] The mixing of near isogenic lines together is undetectable to the naked eye, as they are both of similar size, shape and colour. However, it means that the novel disease resistance of each seed line can be combined in order to maximise the resistance profile of the final released variety.

- A4 text poster on each released variety, which was displayed together with a sample of the respective bean seeds
- handwritten posters, with colour photographs - including one explaining the nutritional value of beans.

The research team then designed a set of posters and leaflets for wider distribution. The timing of this activity ensured that the materials were available for the World Food Day event in Mbeya on 16th October 2002. Subsequent distribution within the Southern Highlands was co-ordinated by the ARI-Uyole Research-Extension Liaison Officer (RELO) Mr Kiranga, through District and local extension staff, local government and NGOs. There was insufficient time for formal pre-testing: instead, reactions of farmers were canvassed during the follow-up survey in February 2003 (see below).

Activity 6.3 Survey to assess impact of the communication and promotion strategy.

A follow-up survey was conducted in February 2003 to assess the impact of the promotional activities (Bakari and Garforth, 2003: Appendix 6.3). A sample of 106 farmers (57 women and 49 men) in five villages in Njombe and Mudindi Districts was interviewed in February 2003 about their reaction to promotional materials. Focus group discussions were also held in the same villages.

Output 7. Dissemination of knowledge from projects R6651 and R5270 Functional Diversity of *Phaseolus vulgaris* beans in East Africa.

Activity 7.1 *Write up previous CPP-funded work on beans* – Functional Diversity project, R6651 and R5270

When the project PMF was written it was proposed that aspects of the previous CPP-funded project 'Functional Diversity of *Phaseolus* bean mixtures in East Africa, (R6651 and R5270)[7] should be made available to a wider audience, through production of written outputs within the time-scale of this project. The 'Functional Diversity' project was based on a study of farmer bean mixtures and documented information relating to this. There is potential for two peer-reviewed papers from this work, through which knowledge can be presented to the scientific community.

The best means to convey this information to those who stand to gain the most ie, those who rely on beans for their wellbeing and livelihoods, was considered in the wider context of the communication and promotion strategy of the present project. In the *Nanenane* Stakeholder's Workshop (August 2000), participants expressed the need for feed-back of information to stakeholders working a grass-roots level; scientists and farmers living and working in Tanzania, before it's dissemination to the predominantly European scientific community in the form of peer reviewed papers. In response, emphasis has been placed on identifying two scientific fora for presentation of this information (Output 7.1). Additionally, aspects of this work were included in the Promotion Workshop (Garforth and Hayden, November 2000). By this means the information gained in the 'Functional Diversity' project (and also the '*In-situ*' project) has been fed into the promotion strategy.

[7] ***NOT*** 'Dynamic Conservation, Enhancement and Utilisation of Agrobiodiversity *In-situ*: *Phaseolus vulgaris* beans in the southern highlands of Tanzania' R6670 (known as the '*In-situ'* project).

Outputs

<u>Output 1.</u> **Acceptable, disease resistant bean varieties identified by farmers through participatory screening and assessment.**

Activity 1.1 Stakeholders' Workshop / Seed Fair

A *Nanenane* Stakeholder Workshop and Seed Fair was held at ARI-Uyole, Mbeya Tanzania from 7 – 10 August 2000 entitled 'Increasing Farmer Access to Phaseolus Bean Germplasm in the Southern Highlands of Tanzania'.

The challenge for the current project and the workshop in particular was 'How can we make best use of this knowledge and technology to make a contribution to farmer livelihoods in the southern highlands?' This project was designed to develop and promote the best improved, disease-resistant and farmer-acceptable bean varieties to poor farmers through appropriate seed uptake pathways. The workshop presented findings from the 'Functional Diversity'' and '*In situ*' projects and was a means of planning the way forward for promoting knowledge and technology outputs from these bean projects.

The 'Functional Diversity' project (R6651/5270) identified bean landrace mixture components which showed resistance to several selected races of one or more different diseases.

The '*In situ'* project (R6670):

- Provided detailed information on how and why farmers in the southern highlands manage their bean agrobiodiversity;
- Characterised the nature of agrobiodiversity (through farmer perceptions, disease screening and physical features) and identifying trends in bean agro-biodiversity over seasons and through techniques including the construction of time lines, much longer periods of time.
- Provided some background on stakeholders' perceptions of bean agro-biodiversity
- Described the influence of policies and, to some extent, institutions, on bean agro-biodiversity.

Workshop and Seed Fair outputs

1. Exchange of information (and on a limited scale through the Seed Fair, actual seed material) relating to bean germplasm between stakeholders from the Southern Highlands and elsewhere
2. Findings from the 'Functional Diversity' and '*In-situ*' conservation projects presented and implications for the different stakeholders identified, discussed and reported by various stakeholder groups
3. Planning of next steps for farmer-centred bean germplasm research, development and promotion in the Southern Highlands, in particular the workplan for the "promotion" project was agreed (eg. including agreement on timing of and responsibilities for: - multiplication of seeds; survey of information sources and channels, and farmer practice, seed acquisition; planning of communication / promotion strategy; implementing communication / promotion strategy).

The workshop allowed maximum participation, whilst building on the experience of previous initiatives. A total of sixty participants attended the Workshop and the Seed Fair created a great deal of interest at the *Nanenane* Agricultural show. It is very notable that more than

half the workshop participants were farmers (31). Twenty-three invitations were sent out, one to each of the farming households who had actively participated in the *'In-situ'* project by donating their beans over a period of three years. These farmers were therefore familiar with the on-going bean research and were very active participants, as shown in the Workshop report (Appendix 1.1).

A video of the Stakeholder Workshop and Seed Fair held at ARI-Uyole, Mbeya Tanzania from 7 – 10 August 2000 entitled 'Increasing Farmer Access to Phaseolus Bean Germplasm in the Southern Highlands of Tanzania,' was also produced and is included with this report.

The workshop was conducted primarily in Kiswahili, with interpretation into English or *vice versa*, as required. This allowed the large number of farmers and extension personnel, who are not familiar with the use of English, to actively participate (Appendix 1.1 and Workshop video).

Activity 1.2 Simultaneous farmer participatory and laboratory based screening and evaluation of bean varieties using farmers' performance criteria, including palatability and cooking tests to ensure consumer acceptability

Laboratory and greenhouse based screening based at Horticulture Research International, was possible because of the expertise and materials accumulated as a result of previous DFID-funded bean projects[1]. The seed used as parental material for the cross Kabanima (5060/6) x Canadian Wonder was progeny of a sub-component of a bean mixture collected from the southern highlands of Tanzania by Dr D Teverson in 1991. The original bean mixture collected from the farmer was divided into components on the basis of seed colour, size and shape. Individual seeds were then multiplied in the glasshouse at HRI-Wellesbourne in order to produce seed of genetically pure lines (ie derived from a single seed) for screening against isolates of a range of different diseases. Often single seed lines which appeared pheontypically identical had completely different disease resistance profiles, thus 5060/6 was the 6th single seed line of bean mixture component 6060 to be tested, and the only one to show such significant resistance to angular leaf spot[2] (ALS).

The original cross between 5060/6 and Canadian Wonder was made in 1995, producing three seeds. These were then grown and the resulting seed screened. ALS resistant F2 plants of two of the three seed lines were again multiplied and the F3 progeny screened. This process of multiplication, screening and selection was continued over several generations in order to produce the F6 progeny which was sent to ARI-Uyole in 2000.

During 2000 and 2001 bean lines identified for possible promotion in Tanzania were double checked at HRI Wellesbourne for their disease resistance to five different foliar diseases and multiplied (under quarantine conditions - Plate 14) in sufficient quantities to be sent to Tanzania. The results of these activities may be found in Appendix 1.2.

The disease isolates used in the screening process are detailed in the Activities section, as well as the reasons for selection of the isolates used. Pathogenic variation is important in foliar pathogens of beans, several of which are seed-borne. In halo-blight alone there are nine different races (Teverson, 1991). These races are significant, as some affect a wide range of bean varieties and others are so severe that the plant is likely to be killed, rather than just causing reduction in yield. The situation is similar with anthracnose, the race structure of which has been extensively studied by researchers at ARI-Uyole. The distribution of

[1] Crossing activities were additional to planned DFID-funded project activities.
[2] Resistance to angular leaf spot is significant because it is so rare; the disease very common, very severe, causes heavy yield losses.

pathogenic variants of these diseases is significant. Several are known to be more common at research stations than in farmers' fields. It is vital that these pathogens are not spread by the dissemination of new germplasm, otherwise farmers may ultimately be in a worse position than they were before researcher/donor intervention. Furthermore, farmer confidence is lost if seeds are not of the highest quality. Even if farmers are not aware of diseases as such, they will be aware of the immediate effect of reduced germination – one of their first performance criteria - which may occur as a consequence of disease infected seed.

Disease-free seed dispatched from HRI-Wellesbourne, by Dr John Taylor and Barbara Everett was grown on-station at ARI-Uyole, after fulfilling the Tanzanian quarantine regulations at the Tropical Pesticides Research Institute (TPRI), Arusha. Permission was given for the seed to be grown under quarantine conditions and regular inspections were conducted by TPRI personnel. The 2000 growing season was particularly wet. The progeny of Small Masusu (5084/5), although showing exceptional resistance to both several halo-blight races and anthracnose in UK screening tests, were agronomically poor in the field and the seed lines were discarded after the first season of on-station testing at ARI-Uyole in 2000. This was in keeping with the project remit to ensure that the material identified, developed and promoted within the lifetime of the project had the highest likelihood of contributing a significant improvement in yield[3] compared to the germplasm currently available to the smallholder farmer.

Although it was disappointing to have to discard such a potentially useful seed line, it was concluded that the severe conditions were a good test of the material. Everyone involved in the project realised the importance of only allowing the most robust material to be released for use in farmers' fields, even at the on-farm testing stage. It is of paramount importance that research and extension sources retain their high credibility with the farmers in terms of quality of information and seed material released (see sample survey on seed uptake pathways – section 2.1 and also 3.1).

Due to the seasonality in the southern highlands of Tanzania, 2003 field trials will be harvested in June 2003, after the FTR submission. The results of palatability and cooking tests, many of which have already been conducted, with be compiled and the analysis for all fieldwork presented as a whole. An addendum will be produced, for 31 July 2003.

Activity 1.3 Field days and farmer exchange visits to involve farmers in the selection process and demonstrate new materials being developed.

Farmer exchange visits were in progress during May 2003 to fit in with the seasonality of the crop. Farmers need to see the crop growing in the field to assess a range of characteristics, as well as seeing the harvested seed and finally assessing the beans for culinary characteristics such as cooking time, consistency of 'soup' and palatability. Furthermore, farmer perceptions of marketability will need further assessment, and will improve as farmers and consumers become more familiar with varietal characteristics. Matrix rankings of farmers' selection parameters were conducted in several villages. (Appendix 1.3, Table 1).

Due to the seasonality in the southern highlands of Tanzania, 2003 field trials will be harvested in June 2003, after the FTR submission. An addendum will be produced analysing both these and the 2002 seasons results together, for 31 July 2003.

Output 2. Seed uptake pathways and distribution channels used by and available to resource poor farmers, identified and characterised.

[3] Whilst integrating with current farmer production techniques and maintaining agrobiodiversity.

Activity 2.1 Desk study and sample survey to update available information on seed uptake pathways in the southern highlands.

The desk study (literature review) concluded that, in Tanzania as in many other countries, the formal seed sector has not served resource poor farmers well, in terms both of access to quality seed and of a range of appropriate varieties (Appendix 2.1.1). The formal seed sector accounts for less than ten per cent of the seed used by small-scale farmers in developing countries. Informal systems of giving and exchanging seeds of varieties which perform well and have desired characteristics have been widespread throughout East Africa. These are based on social networks and family relationships, which may limit their accessibility to resource poor households, and often involve very small quantities of seed. Some literature suggests the total amounts of seed given and received through these systems are declining and that local bean seed systems cannot meet the seed needs of farmers under current production conditions. Such informal systems alone, therefore, cannot be relied on to support rapid diffusion and uptake of new varieties, particularly given the prevalence of farmers' using seed saved from their own fields.

Studies in the late 1990s elsewhere in East Africa highlighted the importance of market transactions for acquisition of seed by small-scale farmers. Irrespective of their wealth category, farmers are prepared to buy seed of new varieties in order to investigate the value and suitability of these varieties to their agricultural coping strategies. However, market sources are considered to be less reliable than social networks in terms of physical and genetic quality of seed. NGOs are becoming significant actors in seed multiplication and distribution, for example through community-based seed multiplication projects and through credit and training support for shopkeepers in rural areas to stock and sell seed.

For seed systems to function effectively, multi-directional flows of information between the various sets of actors are necessary. The review highlighted the relative lack of access of resource poor farmers – and of women in particular – to information from outside their immediate social milieu. The requirement for an analysis of existing communication systems and patterns was considered a prerequisite before development of a plan for a promotion and communication strategy, as part of the present project.

Seeds of new varieties are easier for farmers to try out than many other innovations: they are inherently divisible and can therefore be tried out on a very small scale without jeopardising overall production. Important characteristics that farmers look for when evaluating varieties that are new to them include yield, grain quality, plant structure, performance under specific cropping practices and seed appearance. The literature confirms that farmers are relatively unaware of the relationship between seed quality and plant health, and that the concept of disease resistance is unfamiliar. Bean diseases are attributed to soil conditions, insects and the weather, and the ideas that some varieties are more susceptible to disease than others and that disease can be carried in the seed are not widely known.

Suggestions in the literature for improving or speeding up the dissemination and adoption of new and improved varieties include: distribution of "test kits"; using a range of both market and non-market channels to disseminate seed in as many locations as possible; involving farmers much earlier in the research process; organising farmers into community seed banks and establishing local seed pools; initiating farmer seed enterprises; packaging seed in small quantities with basic information about the variety on the package; and using seed fairs. The overall conclusion of the review was that any strategy for disseminating new or improved varieties must build on existing channels of diffusion and information exchange.

The project survey of seed uptake pathways in the southern highlands of Tanzania (Activity 2.1) showed that:

(a) the main attributes of importance to farmers when assessing bean varieties are growth potential and yield potential, with only about 6% of male respondents and no women giving any attributes relating to disease (e.g. "adapted to weather")
(b) market actors and "other farmers" are the principal preferred sources for acquiring bean seeds, with the market being preferred by a slightly higher proportion of poorer (45%) than richer (33%) respondents (Annex 2.1 Figure 3)
(c) although not a preferred source for acquiring new seed, research and extension agencies scored highly in terms of credibility of information about new varieties: other farmers are also regarded as credible sources of information about new varieties, equally among both men and women (45% average across all wealth ranks) and particularly among farmers in the middle wealth rank (67%) (Appendix 2.1 Figure 5)
(d) informal contacts are farmers' primary sources of information about new bean varieties (Table 2.1). There is an interesting gender difference here: women are more likely to cite the market as their primary source of information, while men are more likely to cite friends and other farmers.

Table 2.1 Primary sources of information about new bean varieties

Sources	Proportion ranking source as "most important" (%)
Neighbours, friends or other farmers	41
Market stalls / middle wo-men	22
Research or extension agencies	21
Family members	12
Radio	4

Source: survey data

The findings from Output 2 have implications for the design of promotional activities in the Southern Highlands. The low number of farmers mentioning radio as a primary source of information on bean varieties is likely to reflect the lack of relevant content rather than lack of exposure to radio *per se* (see below, Output 3), suggesting there is scope for using the radio to create widespread awareness and interest in new varieties. There would also seem to be an opportunity to bring together the ubiquity of the marketplace, which is already a common means of acquiring seed of new varieties, and the credibility of formal research and extension agencies – for example by using markets as a forum for distributing information about varieties developed and promoted by these agencies. The lack of reference to disease resistance as a desired attribute presents a particular challenge for a breeding programme focused specifically on this characteristic, suggesting the need to promote the idea of disease resistance before using this as a "selling" point for a new variety. Finally, it is clear that there are different audiences to which a promotion strategy needs to be directed – a point taken up in relation to Output 6 below.

Output 3. Access to and use of sources and channels of agricultural information by different categories of farmers analysed and documented.

Activity 3.1 Identify sources and channels of agricultural information, and their use by farm households, using a modified version of the RAAKS methodology

Of the four distinct sources of agricultural information identified by farmers in the seven villages, the most commonly cited was "other farmers" who were mentioned in all seven. The prevalence of other sources varied with location and with social and economic conditions. Traders and religious leaders were identified as significant sources in one village, excursions to other areas in another and video in a third. The sources highlighted in more than half the villages, apart from other farmers, were local leaders, reading material, radio and research and extension agencies.

Two dimensions on which farmers assessed their sources of information were credibility and degree of control over the content. The first relates to the perceived reliability or trustworthiness of the source, the second to whether or not the farmers can ask for or seek the information they want rather than simply accept the information the sources want to give them. Print material scores high on both counts, though there is not much it available which in effect reduces the degree to which the farmer can control or select the content to which they are exposed; nor can the reader establish a dialogue with the people who produced the material. Radio is acknowledged to be widely accessible, but the content is not always relevant because programmes are broadcast with a national audience in mind and the listener has no control over the content. Farmers are wary of information put out by seed companies because they perceive the motive as being simply to make a profit by encouraging farmers to buy their products. There were mixed views about information received from other farmers. Many discussants recognised its limitations due to the limited knowledge of their peers, while recognising the benefit of continuing dialogue and the opportunity to verify at first hand what they say by observing what is happening on their farms.

Information maps were drawn up for five villages (Bakari and Garforth 2001: Appendix 3.1.1). All showed quite a variety of channels and sources though which farmers access information, though most of these are indirect. The number of channels with which farmers are in direct contact is relatively small, highlighting the importance of placing promotional information carefully to ensure maximum exposure to farmers. It also suggests that local leaders and development professionals play an important gate-keeping role, which can be exercised both to facilitate and to restrict the flow of information, of institutions. The media (print and radio) are acknowledged as sources, but information from these reaches farmers through local government leaders and extension staff rather than directly.

The follow-up PRA study in July 2002[4] (Luleka and Garforth 2002, Appendix 3.1.2) suggested that local government structures could play a much bigger role in promotion of new varieties of beans. In the Tanzanian context, village and sub-village leaders (councillors, and sub-village chairmen), and open forums such as Village Assemblies are recognised by villagers as their main source of information from beyond the village. Diffusion of information about new varieties from the ARI-Uyole led research groups appears to have been slower than expected. This is an aspect of the group remit that can be improved now that they have access to project outputs, especially the posters and leaflets produced as part of the promotion strategy.

Although initial contact for setting up the groups was made through the local government structures, researchers have subsequently tended to work directly with local extension staff and the farmer groups. The study confirmed the important role of traders as sources of

[4] This output is additional to those planned in the project memoradum form

information on bean varieties and their characteristics and marketability, though more for traditional than improved varieties. The fact that ARI-Uyole and government extension staff are primary sources of information for improved varieties disadvantages women farmers who in general have less contact than men with formal research and extension organisations. The scarcity of, and demand for, print material with technical information and advice was also evident.

There is little evidence of strategic alliances among the various actors in information networks to improve and streamline the flow and availability of information. Alliances tend to be location specific, as when a research organisation engages with farmers in specific communities in on-farm research or variety testing, or an NGO works through government extension agents within its operational area. The overall impression from the studies was of fragmented efforts by a range of organisations to put across “their” information leaving the majority of farmers without answers to their most pressing questions relating to agricultural production, processing and marketing.

Activity 3.2 Promotional strategy planning workshop with stakeholders

Developing a promotion strategy

A meeting was held at ARI-Uyole 8-9 November 2001 (Activity 3.2) to develop a promotion strategy (Garforth and Hayden, 2001: Appendix 3.2.1). The objectives of the meeting were to:

(1) review available information on farmers' sources and uses of information about beans, and on their seed uptake pathways
(2) design a promotion strategy, including identifying audiences, content, communication channels and activities.

Based on the findings from Outputs 2 and 3 and the professional expertise of the researchers, extension personnel, NGOs and farmer representatives at the meeting, appropriate objectives, message content and communication channels were identified for distinct audiences. The meeting recognised the importance of promoting ideas and knowledge supportive of the uptake, as well as promoting varieties; and the need to balance the desire to get good varieties out to farmers whilst minimising the risk of promoting materials which may have unforeseen negative consequences for farmers.

It is important to note that there is already considerable experience of promotion in the Southern Highlands. Promotion activities normally involve collaboration between researchers and other stakeholders. Examples familiar to the participants at the meeting included:

Ileje Rural Development Trust Fund exposes bean producers to technology developed by ARIs. This includes varieties provided by ARI-Uyole and ARI-Selian, and bean production technologies. IRDTF work in partnership with ARI-Uyole - for example helping establish on-farm trials with farmer groups, and participating in demonstrations. Some of these are arranged by ARI-Uyole, others by IRDTF and farmer groups. They also multiply seed on land owned by IRDTF: this is seed of varieties which farmers have identified as promising, through scoring at the end of the season. At the local *Nanenane* show they have prepared a display showing packets of seed of different varieties with information on the performance of the variety. At twice-yearly meetings of farmers' groups, they show varieties and technologies. (There are similar Trust Funds working in Mbosi and Isangati Districts, as well as Ileje District.)

Mbeya Regional Extension Office manages some on-farm trials on behalf of ARI-Uyole, through the facilitation of Ward extension staff. They also arrange field days. They have received leaflets from ARI-Uyole and from the Media Centre (ZCC – Zonal Communication Centre) on soils, diseases, pests, agrochemicals and agronomy (planting time and spacing).

Iringa District Extension Office has received support from the HIMA project, now from DANIDA via the Agricultural Sector Project. They have a bean seed production programme: villagers select a farmer to produce seeds. He or she receives training; TOSCA provides training on clean seed production; extension staff give training on agronomy and supervise throughout the process. Farmers come to evaluate and select varieties. In the second year, two farmers are selected to produce seed from the preferred varieties. Farmers' Field Days are held at the seed producers' fields.

These promotion activities are based on face-to-face interaction, are regarded as highly effective but are expensive in terms of specialist input and reach only a small proportion of villages and farmers. A wide range of supporting methods and channels have been used to varying degrees: *Nanenane* shows, demonstrations, training, field visits, leaflets and booklets, radio (the former Southern Highlands (IFAD) project had a weekly broadcast; Radio Tanzania (national) now sometimes mentions new varieties when reporting meetings of

researchers), cross visits, group discussions, video (used in Iringa to show the idea of seed multiplication in new villages) and farmer volunteers. Farmers are generally enthusiastic about these promotional activities: they want to learn, and are searching for new ideas and information. This is underlined by their willingness to share costs and to give land for demonstrations. Conversely, there has been a lack of leaflets to give out during these face-to-face contacts and farmers have lacked a reference source. In particular, there is very little material which is locally produced and locally relevant: videos from Europe and South Africa are of limited use[1].

The meeting drew up a SWOT analysis of current and potential channels for promotion (Table 3.2.1).

Table 3.2.1 Strengths and weaknesses of methods and channels for promotion

Method	Strengths	Weaknesses
On-farm trial (OFT)	– farmers pick up the varieties they want – proves what works and what does not work	– few farmers are covered – limited use in promoting technology (cp. varieties)
Demonstration	– as for OFT, but more focused and simple	– farmers have limited choice
Field Day	– bigger audience – more interactive – has a big impact when it is in the farmer's field	– too brief
Agricultural Show	– attract more people – diverse people (traders, consumers as well as producers) – opportunity to buy seed	– not frequent – less focussed
Leaflets / posters	– farmers can keep them longer – can be shared – can be reproduced	– expensive – only effective for those who can read
Farmer visits	– farmers get more information – more enthusiasm – can get starter seed – demand driven (farmers see what they want to see; ask questions of the scientists)	– farmers have to travel a long distance – few farmers can come to the station
Seminars, workshops, meetings	– interactive learning – discussion can be documented and shared; and referred to later – focused	– limited audience – expensive – limited topics covered
Radio	– wide, fast coverage – cheap	– short lived – can be misunderstood
Newspaper	– Majira and Nyasa cover Southern Highlands	– limited coverage – not kept for reference – expensive to the reader
Mobile van	– attract more, and diverse, people – flexible: can go right to the village	– very few; visits are rare – expensive

Source: Appendix 3.2

[1] The project has produced a video of the *Nanenane* Workshop and Seed Fair (Output 1.1).

A number of audiences, with varying degrees of interaction, were identified for promotion activities. These included farmers, traders, consumers and policy makers. Intermediate audiences included research scientists and managers, extension agencies, NGOs and local government.

The meeting identified seven topic areas for promotion:

1. released varieties,
2. improved crosses (including lines which are currently undergoing on-farm evaluation),
3. "scientific knowledge" (including aetiology of bean diseases and concepts of resistance and tolerance),
4. farmer knowledge and management practices,
5. production technology (to ensure optimal performance of available planting material),
6. markets and market information,
7. early farmer involvement in variety development (targeted at scientists).

For each topic area and audience, promotion objectives were established: these represent statements of the outcome or change we would expect to see as a result of promotion activities. These are illustrated in Table 3.2.2.

Table 3.2.2 Promotion objectives for selected topics and audiences

Topic or area	Audience	Objectives
Released varieties	Farmers (across SH and nationally)	Growers will select appropriate varieties for their circumstances Growers will try new varieties
	Consumers	Buyers will demand new varieties with attractive characteristics
	Traders	Traders will promote new varieties for distinct markets
	Policy makers	Extension programmes will encourage multiplication, trial and adoption of new varieties
Improved crosses	As for "released varieties", but to be promoted more locally and with a more restricted and cautious set of information about performance and traits	
"Scientific" knowledge	Farmers	Growers use clean seed Researchers receive more informative feedback on variety performance Farmers empowered to make better decisions on choice of variety Improved management of pests and diseases
	Traders who supply seed	Clean seed made available to farmers Traders reinforce science-based advice to growers

Topic or area	Audience	Objectives
Farmer knowledge and bean management	Researchers	Farmers' criteria incorporated into breeding programme Improved design of on-farm trials More appropriate scientific advice on production and management
	Extension staff	Extension staff understand rationality of farmers' management practices Advice better tailored to farmers' perspectives and farming system
Markets and market information	Farmers and traders	Better farmer – trader co-operation (e.g. contract growing for specific markets) Farmers empowered through market intelligence
	Policy makers	Policies support development of export markets
Production technology	Farmers in all AEZs	Farmers select, buy and use better quality seed
	Traders who sell seed; seed stockists	Traders supply clean seed Traders advise farmers who purchase their seed on appropriate technology and practices
Early farmer involvement in variety development	Researchers, extension staff, NGOs and farmers	Farmers' criteria taken into account in breeding and evaluation Faster development of farmer-acceptable varieties

Source: Appendix 3.2

Details of the content suggested for each audience and topic area are given in Appendix 3.2.1 (Garforth and Hayden, 2002, pages 18-22).

The meeting then matched topic areas (and their associated audiences and content) with potential methods and channels, as shown in Table 3.2.3. Those shown in italics are methods identified by the workshop as not yet being used or little used which appear both in demand and suitable for "next steps" activities. The first four rows in the table represent activities which are already a key part of the activities of the various stakeholders at the meeting.

Table 3.2.3 Proposed methods for promotion, by geographical spread and topic

Methodology	Topics and geographical areas for promotion			
	On-farm in village	Specific AEZ	Bean Areas of Southern Highlands	Tanzania
Demonstration		RV	SK	
Field day	Cr	RV		
On-farm trial	Cr, FI			
Ag Shows		RV	Cr	
Radio		*RV*	*SK, Mk*	*FK*
Leaflets		*RV*	*SK*	*FK*
Posters		*RV*	*SK*	*FI*
Mobile van		RV	SK	
Newspapers		*RV*	*Mk*	
TV				*RV*
Stickers		*RV*		
Phone/fax/e-mail				RV
Extension workshops		RV	SK	
Tasting panels	Cr	RV		

Key: RV = Released varieties; Cr = Crosses in earlier stages of development / evaluation SK = Promotion of scientific knowledge; Mk = Market; PT = Production technology; FI = Early farmer involvement in variety development and assessment; FK = Farmer knowledge; AEZ = Agroecological zone

From Table 3.2.3, print materials and radio were prioritised for action, with a more intensive use of the mobile van, articles submitted to newspapers and television broadcasts identified as the next priorities.

Output 4. **Selected lines, derived from locally adapted bean mixture components, multiplied in sufficient quantities for on-farm and on-station evaluation. After further selection, seed bulked in appropriate quantities for dissemination to farmers.**

Activity 4.1 Implement seed multiplication strategy designed at the project workshop in Year 2.

The seed multiplication strategy was initially involved multiplication of specific seed lines in quarantine polytunnels fitted with blackout screens at HRI-Wellesbourne, UK. (Activities section 4.1,1.2 and Plates 11 and 14).

After multiplication and disease screening (Activity 1.2) two separate batches of seed were sent from the UK to ARI-Uyole, Tanzania. The first batch was sent in 2000, just after the beginning of the project, and the other in early 2001, to replace the seed lost due to the severe, wet growing season at ARI-Uyole during 2000.

After the requirements of the Tanzanian quarantine service had been met, and a further season of multiplication at ARI-Uyole, seed lines were multiplied once again, both at ARI-Uyole and at several other sites in the southern highlands of Tanzania, including farmer participatory seed production in farmer's own fields. From the original three seeds resulting from the crossing of Kabanima and Canadian Wonder in 1995, activities have been ongoing in order to produce enough seed for the large numbers of on-station and on-farm trials that have been conducted, and ultimately to fulfil farmer's requirements after the CPP developed variety is released (Activities section 4.1).

The project has taken advantage of the contrasting seasonality in different areas of the southern highlands zone, of both glasshouse and field multiplication and of dry season multiplication, using either residual moisture (eg. in valley bottoms) or irrigation.

Final details and quantities of clean (disease-free) seed produced by the project will be indicated in the addendum to this report which will be produced in July 2003, after the final harvest, which is anticipated in June 2003.

Output 5. **Farmer selected, disease resistant bean lines approved for release to farmers by Tanzanian Seed Release Committee.**

Activity 5. 1 On-farm trials at a selected range of locations in appropriate agro-ecological zones.

and

Activity 5.2 Multi-site on-station trials to test materials in different agro-ecological zones and to fulfil the requirements of the Tanzanian variety release mechanism.

[Activities 5.1 and 5.2 will be considered together].

On-farm trials have been conducted throughout the southern highlands of Tanzania in a range of contrasting agro-ecological zones (Activities section Table 5.2.1). This has allowed farmer selection to take place concurrently with on-station evaluation. Several of the farmers have also multiplied their own seed after they have been impressed by it's performance in their on-farm trials.

Due to the seasonality in the southern highlands of Tanzania, 2003 field trials will be harvested in June 2003, after the FTR submission. An addendum will be produced analysing both these and the 2002 seasons results together, for submission on July 31 2003.

Dr Catherine Madata has indicated that there is sufficient data available from the 2002 season on-station and on-farm trials to satisfy the Tanzanian Seed Release Committee (four research stations in different agro-ecological zones and on-farm in four different districts). The best material will be released in November 2003.

Output 6. Finished bean varieties widely promoted among farmers using appropriate communication strategies.

Activity 6.1 Develop, pre-test and modify communication materials in participation with stakeholders

and

Activity 6.2 Implement communication and promotion strategy

[Activities 6.1 and 6.2 will be considered together].

The main elements of the strategy which have been implemented (Activities 6.1, 6.2) are the continued on-farm trials, demonstration and evaluation with farmers; design, production and distribution of print material (posters and leaflets); and a radio broadcast.

During 2002, the on-farm testing of varieties was expanded to around 300 farmers. On-station farmer assessment of varieties has been ongoing, both at Uyole and at sub-stations. Informal seed multiplication is happening at all on-farm trial sites.

For the *Nanenane* Show, 8 August 2002 at Mbeya showground, the ARI-Uyole team prepared the following materials:

- printed leaflet on bean husbandry: this was sold at TSh 50 per copy; around 700 copies were sold
- A4 text poster on each released variety, which was displayed together with a sample of the respective bean seeds
- hand-written posters, with colour photographs - including one on nutritional value of beans.

The research team then designed a set of posters and leaflets for wider distribution. Production was timed so that the materials were available for the World Food Day event in Mbeya on 16th October 2002. They were distributed to farmers, policy makers and others throughout the day.

Subsequent distribution within the Southern Highlands was co-ordinated by the ARI-Uyole Research-Extension Liaison Officer, through District and local extension staff, local government and NGOs. There was insufficient time for formal pre-testing: instead, reactions of farmers were canvassed during the follow-up survey in February 2003 (see below).

The content of the posters and leaflets was based on areas identified for priority in the Promotional Strategy Meeting of November 2001. The details are given in Appendix 3.2.1 (Garforth and Hayden, 2002) and are summarised in Table 6.1.1. The three posters promoting specific released varieties provide a template for future varieties, establishing a

format and style that will be recognised as coming from the ARI-Uyole bean programme. The design (text, layout, pictures) took one week of intensive work for a team of scientists, extension staff and media specialists at Uyole. Drafts of the designs were produced at the Media Centre in Mbeya. The final designs were prepared by a graphic design company in Dar es Salaam and printing was done by *Mkulima wa Kisasa* – the Extension Unit of the Ministry of Agriculture and Food Security in Dar es Salaam.

Table 6.1.1. Summary of print material produced for distribution in Southern Highlands[1]

Leaflets	Format	A4, two folds (to give six "pages"), full colour, text plus photographs
	Quantity	3,000 of each of three leaflets
	Topics	(1) Better husbandry for bean production (2) Producing clean bean seed in the village (3) Combating pests, including the use of solutions derived from local plants
Posters	Format	A2, full colour; photographs with bulleted text
	Quantity	300 of each of six posters
	Topics	(1) – (3) A series of posters promoting specific varieties, Uyole 94, Uyole 96, Uyole 98 (4) Single poster announcing varieties that are at an advanced stage of development (Wanja, TM Uyole, NRI lines) (5) "Watch out for these pests!" (6) Benefits of involving farmers from an early stage in developing new varieties (aimed at researchers, extension personnel and development projects)

Copies of the leaflets and posters have been widely distributed. The process has, however, highlighted some constraints to distribution. The general scarcity of print material, and the perceived cost and quality of the leaflets, seem to combine to create reluctance on the part of extension staff (public sector and NGOs) to give them out to farmers. For similar reasons, posters are more likely to remain on the (internal) walls of extension offices than be displayed in public places where they run the risk of being taken away or damaged by rain.

The project leaflets and posters have been distributed to all 21 districts of the southern highlands. Each district was given 30 copies of each of the three leaflets and 10 copies each of the five posters. Participants to the ARI-Uyole IPR, ZTC and ZEC were all given promotional materials as well as all the farmers and extension personnel with whom ARI-Uyole are working; distribution is ongoing.

A radio broadcast was prepared by the Uyole Research-Extension Liaison Officer with the support of the Zonal Communication Co-ordinator. The recorded material was taken to *Mkulima wa Kisasa* who arranged for its broadcast in February 2003. The radio programme contents were based on the contents developed for the leaflets and posters. It described the attributes of the released varieties (Uyole 94, 96 and 98) and discussed the upcoming varieties which would soon be going through the formal release procedure. The remainder of the programme highlighted general production practices – good husbandry – for beans, including suitable locations, planting distances, plant nutrition, integrated pest and disease control including the use of *Utupa* and *Dudupala*.

[1] Plates 1 and 16 to 23

Lessons learned from working towards this output include:

- capacity for planning promotion strategies and designing communication materials is present within the research and extension system in Tanzania; an overall strategy and a set of specific materials were developed with relatively "light" external facilitation;
- while much can be achieved at a local and regional level, facilities for professional graphics design and high quality volume printing are available only in Dar es Salaam
- research institutes are not funded for the design and printing of large quantities of high quality print material for distribution to farmers: without the funding provided by R7569, production of the leaflets and posters would not have been possible.

Activity 6.3 Survey to assess impact of the communication and promotion strategy.

A follow up survey was conducted in February 2003 (Activity 6.3) to assess the impact of the promotional activities (Bakari and Garforth, 2003: Appendix 6.3).

A sample of 106 farmers (57 women and 49 men) in five villages in Njombe and Mudindi Districts was interviewed in February 2003 about their reaction to promotional materials. Focus group discussions were also held in the same villages. Although the villages were selected on the basis that the posters and leaflets had been distributed there, when the study team reached the villages it transpired that very few farmers had seen them. In most cases, the materials had reached the extension workers and NGOs active in the area. These, however, had not thought it appropriate to distribute leaflets to farmers, or to display the posters in public places: rather, they kept them for use at meetings and extension activities. The original plan of assessing the impact of the materials could not be followed through. This raises questions about the perception of extension staff of the role of print materials in the village, the numbers of leaflets that need to be available in order for extension staff to feel it is acceptable to hand them out freely, and the means of distributing print material in future (for example, distribution through schools might be more effective in getting leaflets to bean producing households than doing it through extension workers).

In view of the situation, the study team used their time in the villages to test the materials, in order to generate some feedback on design, contents and usability. The overwhelming response from the farmers, when shown the posters and leaflets, was very positive. Posters were praised for their clear layout, straightforward message and striking pictures. Leaflets were regarded as relevant in terms of content and clear in their messages.

Villagers who were interviewed for the study, then, were not in a position to answer the survey questions with respect to the specific promotional materials produced for the project. Instead, they answered questions with respect to their general experience of information and promotion materials and pathways. Having seen, heard and been exposed to different kinds of communication pathways and materials, farmers' assessments of such pathways in relation to the effect they have on bean farming vary (Appendix 6.3, Table 2). Generally, posters, leaflets and on-farm trials are considered to be important (Median = 4 on a 1-5 scale), compared to other promotion pathways such as *Nanenane* shows[2], which are considered fairly important (Median = 3), radio which is considered not important (Median = 2), and visits to research station which are considered not important at all (Median = 1). This confirmed the importance of print material to bean producers in the area.

The moderate importance that is accorded to *Nanenane* shows as a communication pathway for promotion of beans farming within the sample population is probably due to the fact that

[2] Agriculture shows that are organised annually (usually 8th. August) at village, district, regional or at national level.

they would attract only those who are active in pursuing agriculture information or those who have opportunity to visit the *Nanenane* showgrounds.

Scores for radio as a communication pathway for the promotion of bean farming provide an interesting finding. It is considered not important (Median = 2) in the promotion of bean farming or indeed in agriculture in general. There are some people within the sample population who have radio but most of them use the radio to listen to other programmes such as news bulletin and entertainment. There are a limited number of radio stations however which broadcast in the Southern Highlands of Tanzania. These are Radio Tanzania and, more recently, Radio Tumaini and Radio Free Africa.

On the other hand, there is a tendency among the sample population to acknowledge the potential importance of radio in the promotion of agriculture. Many of the individuals who possess radios would leave their radios at home expecting those who are at home to listen and inform them on the matters that arise when they return. There are other respondents who would listen to radio in clubs where the concentration is hardly on matters of agriculture but on entertainment and drinking. Only two people of those who participated in the qualitative information gathering could recall hearing a radio broadcast on beans husbandry that was aired between 2 to 3 days before the study team came to the village. Even those who had a chance to hear the programme did not pay much attention to the content since they heard it accidentally. It seems that people do not make deliberate efforts in seeking agricultural information from radio, let alone information specifically about bean husbandry.

Although visiting research stations is considered to be one of the communication pathways for information about bean varieties and husbandry, the results suggest that this is not important for most farmers (Median = 1). It is likely that the few who might consider visiting research stations for information about bean husbandry are the progressive farmers or those who were once involved in on-farm trials and subsequently developed a friendship with the researchers. Otherwise it would be a group of farmers engaged in a development programme. The overall conclusion from the follow-up study is that a judicious combination of a widespread programme of on-farm trials with high quality, tested print materials provides an effective means of promoting new bean varieties among farmers in the Southern Highlands. Print material would have to be available in sufficient quantities, however, to overcome the reluctance of extension staff and other development professionals to distribute them widely among the farming population. Radio may have a role to play, but effort would be needed to develop programme formats that will appeal to farmers and compete with the entertainment programmes available on the increasing number of radio stations that can be picked up in the area.

Output 7. Dissemination of knowledge from projects R6651 and R5270 Functional Diversity of *Phaseolus vulgaris* beans in East Africa.

Activity 7.1 Write up previous CPP-funded work on beans – Functional Diversity project, R6651 and R5270

Dissemination, to date, has been achieved by a range of activities, but specifically in the form of presentations to three different workshops in Tanzania, two of which were in addition to the planned project outputs. These were

i) *Nanenane* Stakeholder Meeting and Seed Fair, ARI-Uyole 7 – 10 August 2000 entitled ‘Increasing Farmer Access to *Phaseolus* Bean Germplasm in the southern highlands of Tanzania’. Presented by Dr D.M Teverson.

ii) CIAT led Bean Cluster Stakeholder Meeting, 28 January – 1 February 2001 Arusha, Tanzania. 'DFID-funded Bean Research in East Africa, with emphasis on the Functional Diversity Project'. Presented by Dr N. J. Hayden.

iii) PABRA Millenium Synthesis: a workshop on Bean Research and Development in Africa over the last Decade, May 28 – June 1, 2001, Arusha, Tanzania. The presentation was entitled 'From Gene to Farmer: Identification and Promotion of Disease Resistant *Phaseolus* Beans in Tanzania'. This presentation was given by Dr C S Mushi, previously Head of the Tanzanian National Bean Programme based in Arusha, and an active participant in the 'Functional Diversity' project.

The *Nanenane* Stakeholder Meeting and Seed Fair proceedings are to be found in Appendix 1.1 and the other two overseas presentations of the Functional Diversity project are to be found in Appendix 7.1.

Further UK dissemination of Functional Diversity project outputs occurred as part of the DFID Crop Protection Programme, *Phaseolus* Cluster Meeting, held at NRI on 17th July 2002. The proceedings of this meeting, including the project presentations, can be found in Appendix 7.2

Writing of peer-reviewed outputs from the Functional Diversity project (R6651) on beans, by Dr J D Taylor and the project leader, is in progress and documentation is in draft form. These will be available at some stage after the submission of this report.

Contribution of Outputs to Developmental Impact

8.1.1 How the project outputs will contribute towards DFID's development goals

This project addresses the project goal, promoting sustainable livelihoods and protecting and improving the natural and physical environment. DFID aims to improve and strengthen the sustainability of the livelihoods of poor people, especially women. As beans are known in Tanzania as the 'meat of the poor,' this underlines the importance that the farmers themselves place on their beans. The crop is an ideal target for the alleviation of poverty and malnutrition in both the rural and urban poor.

Seeds are small packages of technology, and relatively cheap. They are inherently divisible and therefore can be tried by farmers on a small scale without jeopardising their overall production. Studies[3] have shown that farmers are familiar with management of genetic resources, especially women who tend to be the seed custodians. The variety that will be released as a result of project activities originated from a cross made in 1995 between Kabanima (5060/6) and Canadian Wonder. Kabanima (5060/6) is a bean mixture sub-component that was collected in 1991 by D Teverson, from a farmer in the southern highlands of Tanzania. Canadian Wonder is a commercial variety that has large red seeds which are readily marketable. The new variety is a tangible output of the project which combines adaptation to the severe growing conditions in Tanzania and resistance to angular leaf spot, with the desired colour shape and size of bean that is well liked and readily marketable (Activity 1.2, FTR p19).

Angular leaf spot is a severe disease which causes angular spots on the leaves and defoliation of bean plants at crop maturity. It is very common and has a worldwide distribution, being especially common in the southern highlands of Tanzania. In order to identify the resistance of Kabanima 5060/6, (which is just one seed selected from the farmer mixture sub-component

[3] (R6670)

which showed the phenotypic characteristics of Kabanima), a thousand or more bean mixture sub-components and commercial cultivars were screened.

Simultaneous participatory screening and assessment, both on-station and on-farm means that the farmers have 'ownership' of this variety and has greatly increased the speed of varietal development. After presentation to the Tanzanian Seed Researse Committee, the variety will be released in November this year. It will address the needs of smallholders, having been produced in partnership with farmers, according to their own selection criteria, for their benefit.

The latest news from Tanzania (07.06.03) is that 0.75ha of the new variety is being grown at ARI-Uyole and that farmers in Rukwa region have started to multiply seeds on-farm.

Crop diversity is often used as a means of stabilising yields. This variety has been developed to complement farmers' bean mixtures rather than replace them. It will enhance rather than replace agrobiodiversity, and therefore contribute to sustainable increases in crop yields. Furthermore, it will be a mixture of several near isogenic lines showing different disease resistance profiles. This strategy will optimise the range of diseases to which the released variety is resistant. Sustainable management of agricultural biodiversity is crucial to both increased food production and sound management of the environment.

An important part of maximising household income is decreasing production costs. Bean mixtures are characterised by diverse colours, patterns, shapes and sizes of beans which are all grown mixed in together. The beans also have diverse growth habits, bush, climbers and intermediate types are grown mixed in together to produce a multi-dimensional crop canopy providing maximum light interception, thus making optimum use of the land area cultivated and the water and nutrients that are available. This makes efficient use of resources, minimising the opportunity for weed competition. Weeding is minimised in this system, resulting in more efficient use of labour, with a consequent reduction in drudgery (for women). Farmers select their beans carefully to ensure that they complement other bean mixture components, and the variety developed in this project is suitable for this use.

Furthermore, maximising the use of disease resistance minimises use of crop protection chemicals, which are dangerous to both users and the environment and expensive for resource-poor farmers to buy. This is central protecting and improving the natural and physical environment, a pivotal goal in DFID's development policy. Beans also fix much of their own nitrogen, thus minimising the requirement for artificial fertilisers.

Marketing of beans is increasingly important, both within Tanzania and in export markets to neighbouring Malawi, Zambia and DRC. The variety which we have developed and tested in collaboration with farmers is appropriate both for use as a component of local bean mixtures and has also deliberately been bred to have a seed colour, size and shape which is suitable for marketing. At the same time it retains the adaptation to local environmental constraints of its parent Kabanima, collected as part of a local mixture in 1991.

Smallholder subsistence farmers rely on crops for their livelihood. They need sustainable yields that can be relied upon year on year and crops which are robust enough to provide some yield, even in poor seasons. Part of their coping strategy is the use of bean mixtures, which are fundamental to agriculture in the southern highlands of Tanzania and have withstood decades of political pressure to eliminate them. Only recently have researchers started to understand farmers' management of their biodiversity resources.

Yield *per se* is not the most important attribute required of a bean variety by farmers. Taste, seed coat colour, cooking qualities and keeping ability often more important. The project worked with farmers from an early stage to ensure that their performance criteria were paramount and to give them a sense of ownership. Such is the sense of ownership of the farmers to this work that 31 farmers attended the *Nanenane* Workshop and Seed Fair, from a total of 23 invitations sent out A good example of this is Mrs Fides Benson, from whom the

project leader collected bean mixtures in 1991, who attended and contributed to promotion project workshop in year 2000.

The survey of seed uptake pathways (Output 2.1) showed that farmers are interested in growth potential and yield potential, with only 6% male respondents and no women giving any reference to diseases. However, growth potential is highly negatively correlated with disease. The first effect of most diseases will be decreased seed germination, which will be noticed immediately by farmers.

It does mean, however, that new varieties cannot be marketed directly on the basis of disease resistance, even though this may have been the major force behind their development. Increasing the awareness of farmers about diseases, so that they can take steps to minimise them, has been addressed by production of posters and leaflets. These have been widely distributed, and a template produced for the production of posters on other topics.

Although copies of the posters and leaflets have been widely distributed to extension workers and NGOs the process has highlighted some constraints to distribution. The general scarcity of print material, and the perceived cost and quality of the leaflets, seem to combine to create reluctance on the part of extension staff (public sector and NGOs) to give them out to farmers. For similar reasons, posters are more likely to remain on the (internal) walls of extension offices than be displayed in public places where they run the risk of being taken away or damaged by rain.

Existing sources of agricultural information were found to vary according to location and social and economic conditions (Output 3). Informal contacts were the most important source of information about new bean varieties, for women the market was most important, whereas for men friends and other farmers were preferred. However, although not the preferred source for new seed, research and extension scored highly for the creditability of information and in order to retain this creditability all new germplasm released and disseminated by research stations *must* be free from seed-borne diseases.

These research outcomes have prompted several of the suggestions for further action in order to achieve the full development benefit of this project.

8.1.2 Identified promotion pathways to target institutions and beneficiaries

It is crucial to the success of a project that the outputs are promoted using pathways that are known to be appropriate and successful. The target institutions for project outputs are policy makers, research professionals (not only beans), extension workers, NGOs and farmers. The project has concentrated resources in the southern highlands of Tanzania in order to produce a significant impact, but it is anticipated that the results of this project will be relevant wherever beans are grown, in Africa, South America and elsewhere.

In order to optimise uptake of project outputs, project partners suggest the following:

- Summary of communication and promotion findings (1 x A4 page), with perhaps different versions being targeted at different audiences.

- Project appendices outlining promotional activities produced in a format suitable for the World Wide Web targeting a worldwide audience, including the CG system.

- Promotional activities summarised to suggest a process whereby other researchers can benefit from the lessons learnt.

- Conferences, meetings and workshops, both in the UK and overseas; effective promotion pathways for project outputs at all levels.

- NGOs targeted to ensure that they do not inadvertently spread seed-borne diseases during dissemination of bean seed. Posters and leaflets produced by the project on diseases are appropriate. These activities should be conducted in collaboration with the Tanzanian quarantine service and colleagues from TPRI, Arusha.

- Markets are the preferred source of bean information and seed, especially by women and the poor, whilst researchers are perceived to be the most reliable source of information, (output 2.1), therefore researchers need to go out to the markets to promote project outputs, with posters, leaflets and new varieties of beans. This activity would require further funding.

- Posters and leaflets need to be produced in much greater quantities, so that they are distributed to farmers rather than remaining treasured but relatively unused by extension workers and NGOs. Additional funds will be required for this, ARI-Uyole budgets are already allocated.

- Print materials need to be supplied to local government structures – village and sub-village leaders (councillors and sub-village chairmen) and open forums such as village assemblies (Output 3.1).

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

Promotion of bean varieties

- A template has been created so that in future posters and leaflets can be easily produced – Dr Catherine Madata is Head of the National Bean Programme and incredibly busy. In order to ensure that time and resources are available for continued dissemination, financial support will be necessary so that she can delegate selected activities.

- Seed supply of the new CPP-developed variety needs to be ensured after the stocks produced during project activities have been used. Project Output 2.1.1 showed that availability of quality seed, in appropriate quantities, at the right place and time (ie before planting) is just as important to the dissemination of new varieties as awareness of their existence and characteristics. Donor support will be necessary to ensure that these requirements are met.

- Post-project activities need to be co-ordinated in order to ensure that appropriate promotion pathways are used and that outputs reach beneficiaries beyond the original geographical remit of the project. This may entail personal intervention to take seed and print material from ARI-Uyole, initially to Arusha and then beyond, and to liase with project stakeholders.

Promotion of promotion

- Senior management at the Ministry of Agriculture, Tanzania, needs to be convinced of the value of promotional activities to the dissemination and success of new varieties. Project staff have liased with these people throughout the project and officials are familiar with activities. The proposed activities will entail personal visits and dialogue.

This project could only have been achieved using bean materials developed during the 'Functional Diversity' project (R6651) and the knowledge of bean mixtures and their management by farmers gained during the '*In-situ*' project (R6670). The original bean cross was made in 1995, from a mixture component collected in 1991. Continuity of funding is crucial if this variety is to be moved into the farmer's domain and sustainability of seed supplies safeguarded. Appropriate uptake channels have been identified and await funding. This would ensure fruition of research goals and would meet DFID's development goals of contributing to sustainable livelihoods and reducing poverty in an environmentally sustainable manner.

Biometricians Signature

It is not appropriate at this stage to address biometric issues in the Final Technical Report. The on-station and on-farm data will be complete by July 2003 after the final harvest of bean crops in June 2003.

Signature:
Name (typed): Dr Dawn M Teverson
Position: Research Leader
Date: 12 June 2003

Dissemination

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Lamboll, R. (2001) Report on visit to participate in promotion strategy planning meeting for Participatory Promotion of *Phaseolus* beans in the southern highlands of Tanzania from November 5th – 11th 2001. Natural Resources Institute, University of Greenwich. Pp5.

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Teverson, D. M. (2000) Visit to Tanzania to progress the bean promotion project (A0940) with ARI-Uyole, Mbeya, Tanzania, 8 – 24 May 2000. Natural Resources Institute, University of Greenwich. Pp2.

Teverson, D. M. (2000) Visit to Tanzania for Project Workshop and Seed Fair at ARI-Uyole in the Southern Highlands of Tanzania, 31 July - 14 August 2000. Natural Resources Institute, University of Greenwich. Pp2.

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Print outputs were as follows:

Leaflets:

- Format: A4, two folds (to give 6 "sides"), full colour
- Quantity: 3,000 of each of three leaflets
- Topics:
    - Better husbandry for bean production
    - Producing good quality /clean bean seed in the village
    - Combating pests of beans (in keeping with one of the priorities agreed at the promotion strategy meeting in 2001, this leaflet focused particularly on the use of pesticides derived from local plants)

Posters:

- Format: A2, full colour

- Quantity: 300 of each of six posters
- Topics
    - Upcoming varieties (one poster with information about “Wanja”, “TM Uyole”, and NRI lines)
    - Watch out for pests!
    - Benefits of involving farmers at an early stage in developing new varieties (aimed primarily at researchers, extension personnel, development projects)
    - Series of posters promoting specific varieties (three posters – with the idea that future released varieties can be promoted through posters in exactly the same format)
        - Uyole 94
        - Uyole 96
        - Uyole 98