

Full of beans: new varieties fight drought and sell well

RIU

Validated RNRRS Output.

New bean varieties are now available for the Southern Highlands of Tanzania. These include 'Urafiki', which tolerates drought and disease, and cooks well. 'Urafiki' has been adopted by many women farmers, especially by those growing for market. It has great potential for drier areas too. Working with public-sector seed supply systems, NGOs and community groups has brought the new varieties to many villages. Adoption rates of even recently-released varieties are very high: up to 40%. And, seed from the 350 farmers that were growing 'Urafiki' in 32 villages has already spread to 400,000 growers. Laminated information sheets are available which describe 'Urafiki' and other new bean varieties produced at the Uyole Agricultural Research Institute.

Project Ref: **CPP28:**

Topic: **1. Improving Farmers Livelihoods: Better Crops, Systems & Pest Management**

Lead Organisation: **Natural Resources Institute (NRI), UK**

Source: **Crop Protection Programme**

Document Contents:

[Description](#), [Validation](#), [Current Situation](#), [Environmental Impact](#),

Description

CPP28

A. Description of the research output(s)

Research into Use

NR International
Park House
Bradbourne Lane
Aylesford
Kent
ME20 6SN
UK

Geographical regions included:

[Tanzania](#),

Target Audiences for this content:

[Crop farmers](#),

1. *Working title of output or cluster of outputs.*

In addition, you are free to suggest a shorter more imaginative working title/acronym of 20 words or less.

Dissemination of improved beans [R8415]

Project Leader: Rory Hillocks, NRI-University of Greenwich, Chatham Maritime, Kent ME4 4TB, UK.

2. *Name of relevant RNRRS Programme(s) commissioning supporting research and also indicate other funding sources, if applicable.*

Crop Protection Programme

3. *Provide relevant R numbers (and/or programme development/dissemination reference numbers covering supporting research) along with the institutional partners (with individual contact persons (if appropriate)) involved in the project activities. As with the question above, this is primarily to allow for the legacy of the RNRRS to be acknowledged during the RIUP activities.*

R7569: Participatory promotion of disease resistant and farmer-acceptable Phaseolus bean in the Southern Highlands of Tanzania

Leader: Dr Dawn Teverson, NRI, UK

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4. *Describe the RNRRS output or cluster of outputs being proposed and when was it produced? (max. 400 words).*

This requires a clear and concise description of the output(s) and the problem the output(s) aimed to address.

Please incorporate and highlight (in bold) key words that would/could be used to select your output when held in a database.

Phaseolus bean is one of the most important crops in the **Southern Highlands of Tanzania**, being both a food security crop and a source of cash income. There is therefore great demand for new varieties that meet household and **market requirements**. To get the best from new varieties released from breeding programmes, farmers need to know what varieties are available, they need to be able to obtain both planting seed and information on how best to grow the **new varieties**. A previous CPP project [R7569] developed a **new bean variety**, 'Urafiki', but **dissemination** had not taken place due to the absence of funding for multiplication, dissemination and promotion. There is no interest locally from the private sector seed companies in supplying seed of self-pollinated legumes. The project partners, NRI, Reading University, CIAT and Uyole Agricultural Research Institute, therefore sought to address this situation by supporting public sector **seed supply systems** as well as NGOs and CBOs and to explore existing sources of technology and information to bean farmers, to determine how these could be improved. The main outputs were a seed multiplication and distribution system that involved the NARS, farmers groups and numerous NGOs and CBOs. Seed distribution of the new varieties developed at Uyole in Mbeya was accompanied by supporting **information media**. Seed distribution channels in Southern Tanzania were also reviewed and found to be inadequate to meet the challenge of getting improved bean varieties quickly distributed to meet the demand from smallholders.

Outputs:

Technology

New bean variety 'Urafiki' with good disease tolerance, acceptable colour and culinary qualities with good drought tolerance.

Product

Laminated A4 information sheets for farmers and extension workers describing Urafiki and other new bean varieties produced at ARI Uyole.

Process

Seed multiplication and dissemination using a wide range of private and public sector actors; farmers groups, NGOs, church groups, schools, prison farms.

5. What is the type of output(s) being described here?

Please tick one or more of the following options.

Product	Technology	Service	Process or Methodology	Policy	Other Please specify
X	X		X		

6. What is the main commodity (ies) upon which the output(s) focussed? Could this output be applied to other commodities, if so, please comment

Phaseolus beans

Access to seed of new varieties is an issue for several smallholder food crops. The private sector seed companies are interested mainly in maize and the legumes are neglected. There is a case for allowing research

institutes to multiply their own varieties on a commercial basis, as there seems to be little chance that seed of self-pollinated smallholder crops will interest private seed companies.

7. What production system(s) does/could the output(s) focus upon?

Please tick one or more of the following options. Leave blank if not applicable

Semi-Arid	High potential	Hillsides	Forest-Agriculture	Peri-urban	Land water	Tropical moist forest	Cross-cutting
	X	X		X			

8. What farming system(s) does the output(s) focus upon?

Please tick one or more of the following options (see Annex B for definitions).

Leave blank if not applicable

Smallholder rainfed humid	Irrigated	Wetland rice based	Smallholder rainfed highland	Smallholder rainfed dry/cold	Dualistic	Coastal artisanal fishing
X			X	X		

9. How could value be added to the output or additional constraints faced by poor people addressed by clustering this output with research outputs from other sources (RNRRS and non RNRRS)? (**max. 300 words**).

Value could be added to this output by clustering with other projects which provide support to smallholder maize/bean farming systems. The delivery of inputs, including seeds needs to be coordinated with the delivery of information on crop management, IPM etc [ICM]. Almost all bean growers also grow maize, either separately or as an intercrop and therefore require integrated services. The need is for a 'one-stop shop' whereby farmers are able to access technologies and supporting information for their farming system as a whole, rather than have to seek separate sources for each crop. This would be more in keeping with an integrated farm management approach. From an innovation system perspective, seed companies wanting to woo customers for their hybrid maize may find it worthwhile to invest in some of the other services those same customers might require, such as seed of other crops in the system. Bean seed could be provided free or at cost as an inducement to purchase maize seed.

In Tanzania the source of information at community level is the Village Information Centre [VIC]. The extent to which these are provided an effective service varies greatly depending on the support they receive from the District Extension Office and the village authorities. In some zones the link between VICs and Zonal Communication Centres could be improved. Devolution to the Zones does not remove the need for National coordination to avoid duplication. Information media should be stored centrally as a resource for all zones. At present the lack of coordination results in duplication of effort and often the templates for information media are lost when projects terminate.

The innovation system in Tanzania needs to be strengthened by building incentives and linkages in the system with ARI Uyole, Private sector seed companies, Input and output traders, Extension, NGOs, Church and CBOs, Village Information Centres and the Farmers Education Unit or similar organisations in other countries. These

projects have researched the system thoroughly in Tanzania, now comparison needs to be made with other countries to improve regional systems of delivery for technology and information.

Scaling up of the lessons learned from these project could be carried out in the main maize/bean growing areas of Rwanda, Malawi, Uganda, Tanzania.

Please specify what other outputs your output(s) could be clustered. At this point you should make reference to the circulated list of RNRRS outputs for which proformas are currently being prepared.

Beans: [Crop Protection Programme]

R7965: Promotion of integrated pest management strategies of major insect pests of Phaseolus beans in hillsides of eastern and southern Africa.

R8414: Promotion of integrated pest management strategies of major insect pests of Phaseolus beans in hillsides of eastern and southern Africa.

Dr Eli Minja, CIAT Arusha, PO Box 2704, Arusha, Tanzania

R8316: Bean root rot in Uganda

R8478: Bean root rot disease management in Uganda

Dr Nicola Spence, HRI, UK.

Project R8414 and predecessors developed, validated and promoted IPM systems for beans using participatory methods and working with farmer groups. The building of social capital in Tanzania, mainly by encouraging farmers to make use of the Village Information Centres, as well as improving their access to information on agricultural technology, also empowered farmers to be more confident about their own knowledge and in seeking it from other sources.

Maize: [Crop Post-Harvest Programme]

R8422: Improving farmer and other stakeholders' access to quality information and products for pre and post harvest maize systems management in the Southern Highlands of Tanzania.

Dr Nick Lyimo and Mr LTH Nsemwa, ARI Uyole, Box 400, Mbeya, Tanzania

The project supported the development of a strategic maize promotion plan for each district. This had the longer-term aim of enhancing the capacity of this knowledge management system for translating farmers' demands into the development of appropriate information and its delivery. Through the Zonal Research & Extension Liaison Office the project facilitated the development of a Zonal Maize Strategy for the Southern Highlands. By gaining a better understanding of agro-input stockists information, training and product access the project was able to improve the service they offered to farmers.

More needs to be done to improve smallholder access to seed of all crops [other than hybrid maize] and this should be done by addressing the needs of farming systems, rather than single crops. The maize-bean farming system provides a good model and the type of programme required would build the linkages and partnerships between all stakeholders involved in the utilisation, development and dissemination of improved seed.

Validation

B. Validation of the research output(s)

10. **How** were the output(s) validated and **who** validated them?

Please provide brief description of method(s) used and consider application, replication, adaptation and/or adoption in the context of any partner organisation and user groups involved. In addressing the “who” component detail which group(s) did the validation e.g. end users, intermediary organisation, government department, aid organisation, private company etc... This section should also be used to detail, if applicable, to which social group, gender, income category the validation was applied and any increases in productivity observed during validation (max. 500 words).

The new bean variety ‘Urafiki’ was validated by the project in collaboration with the NARS through participatory on-farm trials and follow-up surveys with end-users. Villagers reported that Urafiki was their highest yielding variety and also showed good tolerance to drought. In the on-farm trials Urafiki was at least as high yielding as the best of the previous improved varieties and scored first or second for farmer preference based on taste and marketability. While some of the local types were preferred for home consumption, all the improved varieties were higher yielding.

The Pendo Womens’ Group reported that Urafiki is well liked because of its good cooking and taste qualities and the leaves are also good. They consider its disease reaction to be ‘normal’. When asked which was their preferred improved variety, they were unanimous in saying it was Uyole 98. The first reason they gave for this was that its leaves were very tender, the beans tasted good and the cooking time was short. They particularly liked the yellow bean colour and this type was highly demanded on the local market. There are two local varieties with yellow seed and similar quality characters, particularly ‘Kigoma’. They said the market demand for Kigoma is greater than for U98, but they agreed that the problem was that yield was very low compared to the improved Variety, U98. In the on-farm trials, Urafiki and other Uyole varieties out-yielded the local varieties by at least 94%.

The final validation for new lines is when they are approved for release as an official variety by the National Variety Release Committee. This happened for Urafiki at the end of 2004.

The use of simple laminated information sheets to inform farmers of the new bean varieties available and their attributes was validated by a survey conducted by Chris Garforth from Reading University with end users. The information sheets provoke a lot of interest and discussion. Their public display at Lyadebwe seemed particularly effective: they were on their own – i.e. not surrounded by other posters or notices – and could be missed by anyone approaching the door of the village office. Literacy rates in rural Tanzania are relatively high and there is

real demand for printed information. The lamination makes them robust when passed from hand to hand. Farmers particularly like the photographs of the seeds: visual appearance is an initial criterion farmers use to assess whether an unfamiliar variety is of potential interest. For this reason, the photographs should perhaps be larger, without too much potentially confusing superimposition of images. The very act of passing these sheets around a group for their scrutiny can stimulate requests for specific varieties. It is easier to find copies of the information sheets in District and Divisional offices than in the village; and they are more likely to be found in the village office than in farmers' homes. Only when print material is available in large quantities, or when farmers have an opportunity to buy it, will it become readily available at village and household level. Evidence that farmers are willing to pay for print material related to beans, comes from ARI Uyole's experience of selling leaflets about bean production at the NaneNane Farmers' Show in Mbeya.

11. *Where and when* have the output(s) been validated?

Please indicate the places(s) and country(ies), any particular social group targeted and also indicate in which production system and farming system, using the options provided in questions 7 and 8 respectively, above (max 300 words).

Validation of Uyole varieties took place in 12 villages over six districts in the Southern Highlands of Tanzania during 2003, over a range of production system from semi-arid rainfed to highland rainfed systems. Those targeted were the vulnerable poor, but where individuals were marketing beans, they were more likely to be moderate poor as a result.

Because of its drought tolerance the initial seed distribution was done in three districts of the Southern Highlands with lowest rainfall.

The information outputs were validated in 2005 in 6 villages in three districts of the Southern Highlands of Tanzania.

The bean crop in Tanzania is grown mainly by women and where there is market demand for a variety, this offers a source of income for women and is of great benefit to female-headed households. The projects' contact farmers and farmers groups were predominantly women. The validation was applied therefore mainly to women ranging from poor to moderately poor, the latter being those who were able to market the largest quantity of beans.

Current Situation

C. *Current situation*

12. *How and by whom* are the outputs currently being used? Please give a brief description (max. 250 words).

Uyole improved bean varieties are widely grown in the Southern Highlands of Tanzania. Urafiki has been adopted for both home consumption and for market but the main interest is from farmers growing beans for market.

Adopters are mainly women as they are the predominant bean growers in Tanzania. Breeder and foundation seed is produced at Uyole and through preliminary distribution to farmers, NGOs, CBOs etc, demand is assessed. If there is sufficient demand from communities and individuals, the Uyole farm is able to produce some certified seed for sale. Some of the better-off farmers are able to buy seed direct from Uyole but the others depend on free or less expensive seed obtained from NGOs, or from other farmers.

Partner organisation other than ARI-Uyole who produce seeds are Agricultural Sector Programme Support (ASPS) for Quality Declared Seed (QDS) and Farmer's seed. Many other intermediary partner organisations obtained foundation or certified seed from ARI-Uyole, which they distributed to farmers, to basically produce food. However, farmers saved part of their produce as farmers' seed for sale, to re-plant a subsequent crop or to share with neighbours and relatives. This pattern was applicable to almost all varieties that were captured in this study: Uyole 84, Uyole 90, Uyole 94, Uyole 96, Uyole 98, Uyole 03, Uyole 04, Wanja, Urafiki and BILFA - Uyole.

On-farm seed multiplication in Mbozi for var Urafiki is currently being supervised by Uyole. The variety is apparently [C. Madata] in high demand in Mbozi district. Uyole farm has planted foundation seeds and also sold seed of Urafiki to Dabaga Foundation Seed Farm.

With respect to the information media, more of the laminated sheets describing Urafiki are to be distributed during 2006, to farmers in drier areas where the demand for the variety is expected to be greatest.

In addition to the approved variety 'Urafiki' the 'NRI' breeding lines developed by the CPP projects are being used for further crossing and reselection in the Uyole bean improvement programme.

13. *Where are the outputs currently being used? As with Question 11 please indicate place(s) and countries where the outputs are being used (max. 250 words).*

The variety Urafiki was bred for the Southern Highlands of Tanzania and it is there that it has been adopted. As a drought tolerant variety it may have potential for use in other areas.

14. *What is the scale of current use? Indicating how quickly use was established and whether usage is still spreading (max 250 words).*

An adoption survey of Uyole improved bean varieties was conducted by the Southern Africa Bean Research Network [SABRN] in 2002. More than 500 farmers in 44 villages were included in the survey, conducted in areas where bean promotional activities had been carried out since 1999. The estimated adoption expressed as a percentage of farmers in the survey was 40% for Uyole 96 in Njombe and 36% was the same variety in Mbeya District. These are very high adoption rates for a variety five years after its release. Even Uyole 98, the most recently released variety at the time of the survey, had reached 36% of households sampled in Njombe. Of the varieties released much earlier Kabanima [1980] reached 54% of farmers in Nkasi, while Uyole 84 [1984] was being grown by 48% of households sampled in Sumbawanga. Thirty percent is normally regarded as a successful adoption rate for improved varieties of self-pollinated crops.

Specifically for 'Urafiki' it was too early for a full adoption study as it is only in 2006 that there will be sufficient

breeder seed to produce certified seed on the Uyole farm. Our estimates of spreads of Urafiki as a result of distribution in villages participating in validation which began in 2003 and distribution to a wide range of NGOs and CBOs, is that by March 2006, 300,000 – 400,000 farmers had access to the seed from the 350 farmers that were growing Urafiki in 32 villages by the end of 2004. The variety has proved highly marketable and is therefore in demand and it is expected that its dissemination will continue to at least 1 million growers. In addition, its drought tolerance may be sufficient for Urafiki to have potential for the lowland ecologies.

15. In your experience what programmes, platforms, policy, institutional structures exist that have assisted with the promotion and/or adoption of the output(s) proposed here and in terms of capacity strengthening what do you see as the key facts of success? (max 350 words).

Seeds of self-pollinated legumes are not produced by private sector seed companies and the NARS are therefore the only seed source. For the foreseeable future, both crop improvement and seed production will have to be publicly financed and the NARS are therefore the main platform for bean R & D. Promotion of agricultural technologies and supporting information media then requires good linkages between research and extension facilitated by the Zonal Communication Centre based at Uyole and that District Extension Offices which support the Village Information Centres. These extension pathways need to be well linked to form an effective dissemination platform. The role of the Farmers Education Unit in Dar es Salaam could be expanded to provide greater national coordination of information systems and to improve the linkages between the Zonal Communication Centres and the Village Information Centres.

The bean research networks are important dissemination platforms:

CIAT Bean Project SABRN/PABRA: Contacts: Rowland Chirwa, CIAT, Chitedzi Research Station, Lilongwe, Malawi.

In the absence of private sector seed production for beans, farmers rely on the public sector and the NARI [Uyole] plays a key role here in producing breeder, foundation and certified seed. There are a whole range of organisations including NGOs, CBOs, schools, prison farms etc that play a role in seed multiplication and distribution, all of which needs to be involved in order that farmers gain access to new bean varieties soon after they become available.

The key to success in the uptake of 'Urafiki' was to involve farmers at an early stage in variety development and testing, to produce a variety with high market potential that outyields local varieties under a range of conditions and then to involve a wide range of CBOs and NGOs in variety distribution.

Capacity strengthening has been carried out by the project directly with farmers and through workshops, improving farmers bean crop management skills and their awareness of sources of seed and information.

Environmental Impact

H. Environmental impact

24. What are the direct and indirect environmental benefits related to the output(s) and their outcome(s)? (max 300 words)

This could include direct benefits from the application of the technology or policy action with local governments or multinational agencies to create environmentally sound policies or programmes. Any supporting and appropriate evidence can be provided in the form of an annex.

A popular new variety in northern Tanzania has been shown to have environmental benefits as well. Because of its shorter cooking time, it reduces annual consumption of firewood in rural households by 10 percent. Research conducted under CPP funding has shown that the distribution of improved bean varieties enhances biodiversity as they tend to be added to farmers' collections.

Beans can be nitrogen-fixing and therefore beneficial to soil fertility, especially if crop residues are incorporated.

25. Are there any adverse environmental impacts related to the output(s) and their outcome(s)? (max 100 words)

None

26. Do the outputs increase the capacity of poor people to cope with the effects of climate change, reduce the risks of natural disasters and increase their resilience? (max 200 words)

The variety Urafiki produced under the CPP project showed improved drought tolerance compared to previous Uyole varieties and therefore its adoption represents an adaptation to increased drought expected under climate change.