Farmers learn to profit from not saving seed

RIU

Validated RNRRS Output.

Seed-tuber production schemes are helping farmers in Kenya and Uganda to produce quality potato planting material. Previously, because of the difficulties smallholders faced in purchasing good quality seed-tubers, they found themselves forced to depend on tubers saved from their own harvest. Yet infected home-saved tubers often carried bacterial wilt over to the next crop. A method known as the 'seed-plot' technique now allows smallholders with limited access to land to multiply seed-tubers effectively, lessening the impact of home-saved seed practices. Farmer associations, market chains, and communication and management structures support these production schemes. Materials designed to strengthen farmers' knowledge of marketing, finance and group dynamics help to ensure success.

Project Ref: **CPP10:**
Topic: **1. Improving Farmers Livelihoods: Better Crops, Systems & Pest Management**
Lead Organisation: **Central Science Laboratory, UK**
Source: **Crop Protection Programme**

Document Contents:

Description

CPP10

A. Description of the research output(s)

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.

Sustainable potato seed management systems

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

Geographical regions included:

Burundi, Ethiopia, Jamaica, Kenya, South Africa, Tanzania, UK, Uganda,

Target Audiences for this content:

Crop farmers,

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

Crop Protection Programme

With additional support in the first year of R8104 from DFID Uganda as part of Livelihood Initiative for Eastern Uganda [LIFE] Project 1st July 1999-30th June 2003.

Additional support for quality management training [R8435] was provided by DANIDA ASPS.

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.

R - number	Institute	Contact person
R8435 Sustainable Potato Seed-Tuber Management and Marketing through Commercialization	Central Science Laboratory, UK	Julian Smith
	AT Uganda, Uganda	Rita Laker-Ojok
	NARO, Uganda	William Wagoire
	MAAIF, Uganda	Grace Akoa
	SACRED Africa	Eusebius J. Mukhwana
R8104: Promoting Potato Seed-Tuber Management For Increased Ware Yields in Kapchorwa District, Eastern Uganda	CAB International, UK	*
	Central Science Laboratory, UK	Julian Smith
	AT Uganda, Uganda	Rita Laker-Ojok
	NARO, Uganda	William Wagoire
	Makerere University, Uganda	Adipala Ekwamu
R8016: Promotion of on-farm small-scale seed potato production in low input farming communities in Kabale district, Uganda	CIP	Charles Crissman
	CAB International, UK	*
	Africare, Uganda	
	NARO, Uganda	William Wagoire
	Uganda Seed Potato Producers Association UNSPPA	
	PRAPACE, Uganda	Berga Lemaga
R7858: Promoting potato seed-tuber management for increased ware yields in Kenya, Uganda and the Republic of South Africa October 2000 - March 2002	CAB International, UK	*
	KARI, Kenya	Kinyua Murimi
	KEPHIS, Kenya	Gladys Maina
	CIP, Kenya	Charles Crissman
	PRAPACE	Berga Lemaga
	NARO, Uganda	William Wagoire
	Africare, Uganda	
	ARC - VOPI, RSA	

* Julian Smith moved from CAB International to Central Science Laboratory during the course of these projects [April 2005]
** Some outputs and comments relate to earlier CPP project R5310 [1992-96] and R6629 [1996-200]
*** More specific information on project R8435 is to be found within the submission of AT Uganda [Sustainable potato seed - tuber management

and marketing through commercialisation]

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.*

Purpose: This project cluster focused on **potato** and the benefit to **smallholders** in using **clean [pest-free] seed-tubers** [1].

Problem statement: The project cluster recognised as the main constraint the limited supply of quality **seed-tubers [formal sector]** to smallholders for **ware** production, and the common practice of farmers to **home-save seed [informal seed]** that carries the risk of 'concentrating' seed-borne pests. **Bacterial Wilt [BW [*Ralstonia solanacearum*]]** was identified as the main seed-borne pest. Research focused on potato production in **Kenya** and **Uganda**.

Compounding constraints were recognised within the marketing of potato seed and the absence of a **market pull** to command a **price differential** between formal and informal seed, linked to constraints in **distribution**.

Project Cluster Outputs:

- The development of a **biocontrol agent [BCA]** for the control of Bacterial Wilt in potato. Component outputs:
  - Genetic engineering of a non-pathogenic mutant of *R. solanaceraum* [= BCA] effective at reducing incidence of BW.
  - Permission for in-country testing of the BCA in Kenya and **Republic of South Africa [RSA]**; undertaken in RSA but not in Kenya. Only the second approval for **GMO** testing in Kenya and instrumental in establishing the national **biosafety legislation**.
  - Methods for monitoring **[epidemiology]** BW and BCA in soil that revealed some crops suppress soil populations of BW. If validated under field conditions, would place **crop rotation recommendations [soil health]** on a scientific platform.

- The development of **Best Practice seed-tuber multiplication** protocols for phased multiplication of seed and ware production by medium and small-scale landholders. Component outputs:

  Phase 1:
  - Distinct from ware, **ridge/furrow** seed-tuber management practices for optimised multiplication of basic seed; sorting of harvested seed by size for sale.
  - Development of **quality-assured, traceable systems of seed production** and a farmer-based decision framework for **field and post harvest pest thresholds [voluntary standards]**.
  - Development of an on-farm method for the **detection** of BW within seed.

  Phase 2:
  - The development and promotion of **Seed Plot Technique** [SPT] for optimised quality seed [Phase 1] and land utilisation by smallholders for further seed production and ware production.

- The development of **farmer association, market chain, communication** and **management** structures for **commercial** seed and ware potato production. Component outputs:
  - **Seed communication/distribution systems** [e.g. Parish Development Committees] that identified the **poorest-of-the-poor**.
  - Development of **farmer association constitutions [e.g. Kapchorwa Seed Potato Association].**
  - Use of **Safe Havens** for seed sharing amongst 'trusted' sources
  - **Market branding** of farmer association [e.g. farmer association KASPPA logo and bag] and introduction of **collective marketing** and **pricing structures** by quality-criteria.

– Development of **Best Practice capacity strengthening materials for farmer associations in marketing, finance and group dynamics.**

[1] The term seed and seed-tuber is used throughout, but it is recognised that technically this project cluster delivered tubers of a recommended size and low pest status that were suitable for planting.

[An overview of these projects is to be found at: Smith, J.J. [2005]. Research approaches to improve crop productivity using potato seed health. In proceeding of Pathways out of Poverty, Eds. D. Harris, J.I. Richards, P. Silverside, A.F. Ward & J.R. Witcombe. *Aspects of Applied Biology* 75, 23-36]

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*	*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

This project cluster focused on the commodity potato seed and, to a lesser extent, potato ware, and extends to [outputs] capacity building in bacteriology, development of a biocontrol agent, development of GMO biosafety assessments and indirectly legislation, pest control practices and quality/traceability management systems, and establishment and function of farmer associations through development of an innovation platform.

Research approaches and capacity building realised in bacteriology within KARI can support investigation on the bacterial and/or soil microbiota constraints of other commodities, notably Banana Xanthomonas Wilt of banana. This project cluster recognises soil health as a generic theme. Experiences gained in working with GMOs are applicable to GMO biosafety legislation and environmental impact testing for soils in general.

The Best Practice seed quality and traceability outputs generated are widely applicable to 1] other seed crops, especially vegetatively propagated, were pests are transmitted with planting material and the practice of farmer-saved planting material are dominant over formal systems and/or 2] where a quality product can realise a higher market value. Similarly, the procedures and lessons learnt in establishing the framer associations [KASPPA and ware marketing groups] have generic value to associations supporting other commodities and their functioning. Collectively these outputs, or the experiences gained, can be applied to any system where a quality product supported by a policy or voluntary standard is appropriate and can command a higher market value through promotion and collective marketing by an association.

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			

*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**).*

See Question 6 for added-value of *this* project cluster outputs to be realised by promotion through *other* project clusters.

Areas where value may be realised in clustering *other* project cluster outputs with *this* project cluster outputs [in address of additional constraints] are outlined below.

i. KASPPA remains actively producing and selling seed amongst its membership [operating safe havens], but is not producing enough to sell a significant volume outside of the organisation. Limited availability and access to basic seed presents a significant obstacle to the expansion of KASPPA.

ii. The policy position in Kenya and Uganda [and East Africa] on seed-tuber pest standards is weak; dialogue with policy-makers on voluntary/ more appropriate standards is needed.

iii. Initially, the project focused on the push of seed, with attention given to the pull for ware and ware markets towards the latter stages. This innovation platform remains to be substantiated with additional players and durable linkages through to main ware markets. Moreover, farmer through to marketer awareness on how to work an innovation platform remains weak.

iv. Smallholders use diverse risk management strategies based on the production of many crops and livestocks, and income realised from outside of agriculture. The value of an association is more likely to be bought into by farmers if it is likewise pluralistic and not focused on a single commodity. For example, although potato is recognised by farmers as a higher value crop than maize, it is viewed as too high risk for single-enterprise due to input costs and risk of pests.

Thus added value from other project clusters would be realised where those outputs addressed the above constraints on 1] basic [foundation] seed production, 2] policy on pest thresholds, 3 & 4] Development of innovation platforms and functionalising farmer associations, providing diverse interests in terms of crops and market-chain provisions.

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.

The below R numbers appear to share themes with this project cluster where value [2-way] may be realised [Qu 6 & 9 combined].

Seed health policy: R8312/R8439/R7571; R8447; R8480

***Soil Health and Pest Control*:** R8453/R7566; R8414/R7965/R7568/R7569/R8316; R8478/R8316/R7568/R7965; R8435/R8014/R7858/R8016; R8452/R8215; R8296; R8449/R8212; R8342/R7567/R7529/R7972; R8513; R8443/R8044; R7778; R8436/R8194/R7564; R8480; R6580; R7962. R8436/R8194/R7564

***Seed Production and Quality*:** R104/R8435; R8442/R8105; R8312/R8439/R7571; R8445/R8030;R6733; R8243; R8416/R7503; R8415; R7445/ R6811; R8040; R8443/R8044; R8485/8182; R8480; R8273; R8417/R8341 Also Various PSRP projects.

***Production and Market chain promotion*:** R8104/R8435; R8442/RR8105; R8219/R7405; R8445/R80830/R6733; R8429/R8281; R8485/R8182; R8182/R8418; R8275; R7151; R8274/R8498; R8113; R6344/R7013/R7668; R7496; R8250; R8114; R8421; R7520/R6769/R6507; R7494; R7498;

R8422.

[links with post-harvest aflatoxin control [R8435] omitted]

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)**.*

Question 10a **Output and How Validated**	Questions 10 b **Who Validated**	Question 11a **Where**	Question 11b **When**
Biocontrol agent [BCA] Smith, J.J. & Saddler, G.S. [2001]. The use of avirulent mutants of *Ralstonia solanacearum* to control Bacterial Wilt disease. In Biotic Interactions in Plant-Pathogen Associations. Eds. M.J. Jeger & N. Spence. CAB International, Wallingford, UK, pp. 159-176.			
Development of the BCA [R5310]	INRA & CABI [research]	France	1992-96
Validation of BCA under contained-use conditions [R6629]	CABI & ARC VOPI [research]	UK & RSA	1996-2000
Approval for in-country testing of BCA in Kenya [R7858]	National Biosafety Council	Kenya	1995 - 2002
Biosafety assessments on survival in soil and other crop roots of BCA and *R. solanacearum* [R7858]	KARI & CABI [research]	UK	2000-02
BCA application for in-country testing used as training aid on biosafety risk assessments for African biosafety stakeholders under ABSP I project [USAID]	ABSP 1 partners and national receiving training	Pan Africa	2002
External End of Project Review [R6629] commissioned by CPP. Recommended progressing BCA testing in Kenya	Malcolm Blackie, Fred Wangati, and Peter Mills	Kenya	2000
Best Practice protocols for seed production by medium-sized landholders [primary multipliers] S. Namise & J. Smith [2004]. Promoting potato seed tuber management for increased ware yields n Kapchorwa, Eastern Uganda. Uganda Journal of agricultural science, Vol 9:1 723-730			
Protocol provides a physical record on quality assurance and traceability of produce, and includes components of field and storage inspection and setting of pest tolerance threshold. Protocol developed through on-farm development with farmers [28] that subsequently formed KASPPA [see below].	KASPPA [farmers]; AT Uganda [NGO]; CABI/ CSL [research]	Kapchorwa, Uganda	2002-06
Field incubation method for on-farm testing of Bacterial Wilt. Simple technology appropriate for farmers and the detection of latent infection of potato with Bacterial Wilt. Validated over 6 seasons of production through comparisons with ELISA tests carried out at MAAIF	KASPPA [farmers]; MAIFF [MoA] AT Uganda [NGO]; CABI/CSL [research]	Kapchorwa, Uganda	2002-06
Decision-making framework for acceptance and rejection of potato as seed: Main criteria for acceptance / rejection to date has been level of Bacterial Wilt that is set at 2%. This has been used for 5 generations of seed production	KASPPA [farmers]; AT Uganda [NGO]; CABI/ CSL [research]	Kapchorwa, Uganda	2002-06

Seed Plot Technique [SPT] Kinyua, Z.M., Smith, J.J., Lung'aho, C., Olanya, M., and Priou, S. [2001]. On-farm successes and challenges of producing Bacterial Wilt-free tubers in seed plots in Kenya. Proceedings of 5th Triennial Congress of the African Potato Association, 29 May-2 June, Kampala, Uganda. Published in African Crop Science Journal 9[1], 279-285.			
Development and initial validation of SPT: The SPT is a flat bed seed nursery planted at 20 x 20cm. It is more suited for use with farmers of limited land and smaller tubers [<30mm] of known good health. The SPT was developed through DFID CPP R6629 and R7858 under on-farm trials [6 farmers over 8 seasons] at Njabini Kenya. Treatments comprised SPT and farmer-saved seed, against certified seed as the control. A substantial data set was realised through these trials	KARI & CABI [research]	Kenya, Njabini	1998-2002
Further validation of SPT under R8016. Various demonstrations and training activities located through the Africare FFS programme for the region exposed the SPT to a reported 1129 farmers [FTR R8016].	Farmers [FFS]; CIP/ NARO/CABI [research]; AFRICARE [NGO]	Kabale, Uganda	March 2002-03
Further validation of SPT under R8104 & R8435. Various demonstrations and training activities; the seed distribution scheme from the Primary Seed Multipliers targeted the poorest-of-the-poor and women.	Farmer [co-ordinated as grower groups]; At Uganda [NGO] CABI/CSL [research]	Kapchorwa, Uganda	2002-06
External End of Project Review [R6629] commissioned by CPP. Recommended promotion of SPT within region.	Malcolm Blackie, Fred Wangati, and Peter Mills	Kenya	2000
Farmer Associations and community communication structures - see submission by AT Uganda for more detail			
Development of Kapchorwa Seed Potato Producers association and a market brand: KASPPA evolved during the project from the initial primary seed grower farmers. The function of KASPPA is underpinned by a constitution that was developed and modified during the project and in light of experience. KASPPA has a market brand that it uses on its official letters and the bags for the sale of seed.	Farmers; AT Uganda [NGO] CABI/CSL [research]	Kapchorwa, Uganda	2002-2006
Parish Development Councils: 8 Parish Development Councils were established to agree on the seed dissemination pathways of seed, targeting poorest-of-the-poor and women	Farmers; AT Uganda [NGO]	Kapchorwa, Uganda	2002-2006
Ware Grower associations [R8104]: 4 potato marketing associations were established with a total of 156 paid-up members [Dec 2005].	Farmers; AT Uganda [NGO]	Kapchorwa, Uganda	2004-2006
Capacity building in association management, quality control, book-keeping, and project planning: see submission by AT Uganda [R8435]	Farmers; SACRED Africa; AT Uganda [NGO]	Kapchorwa, Uganda	2004-2006
Cereal banks: see submission by AT Uganda [R8435]			

*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 Add some facts and figures!! farming system, using the options provided in questions 7 and 8 respectively, above **(max 300 words)**.*

See 10

Current Situation

C. Current situation

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

*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).***

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

Question 12a **Output and How Used**	Questions 12b **By Whom**	Question 13 **Where**	Question 14 **What Scale**
Biocontrol agent [BCA]:			
The BCA was not tested in Kenya and is held as freeze dried culture within the CABI Genetic Resource Collection, UK	NA	CABI, UK	NA
The BCA application was instrumental in driving the formation of the national biosafety legislation within Kenya. Kenya has the most advanced GMO R&D within East Africa. In turn other African nations have looked to emulate Kenya in progressing biosafety legislation and GMO research, notably Uganda. The BCA application remains in the public domain and is used for training purposes [USAID ABSP I project]	National Biosafety Council of Kenya; USAID supported ABSP I project	Africa	Kenya mainly
Biosafety assessments on survival in soil and other crop roots of BCA and *R. solanacearum* [R7858]. These research data were not validated under field conditions, although the research approach was taken up under the CIP managed DfID project CRF CRF7862[c] in Bolivia and Peru.	NA	NA	NA
Best Practice protocols for seed production by medium-sized landholders [Primary Seed Multipliers]			
Best Practices use by KASPPA. A visit to KASPPA in Oct 2006 substantiated the protocols use outside of project support by approx. 50% of KASPPA members. Notably KASPPA members within Kaproron sub-county were effectively using the scheme.	KASPPA [Kaproron sub-district]	Kapchorwa, Uganda	Approx. 12 of the 28 KASPPA members
Field incubation for Bacterial Wilt	As above		
Acceptance/rejection of seed based on pest thresholds: In discuss with the KASPPA farmers [Oct 2006] its was apparent that KASPPA was not selling seed outside the association but was operating a Safe Haven environment for the movement of seed amongst members	KASPPA	Kapchorwa, Uganda	KASPPA members [24]
KASPPA have procured for the 2006B season potato seed from NARO and are preparing to purchase a larger volume for the 2007A season. KASPPA has submitted a tender to become the private sector service provider to NAADS to supply seed and to offer training to Kaproron sub-county that selected potato as a promoter enterprise	KASPPA	Kapchorwa, Uganda	38 80kg bags of see-tubers shared between KASPPA members
Further and by good example, aspects of the scheme have influenced the NARO national seed programme at Kabale that now actively sort and sell seed by size categories and is more aware of traceability of produce. NARO has also increased its level of surveillance for Bacterial Wilt through ELISA testing	NARO	Kabale, Uganda	Not known
Seed Plot Technique			
The SPT has been exposed to farmers in Kenya [Njabini] and Uganda [Kabale & Kapchorwa]. Its use has remained as intended: for the safe multiplication of seed tubers by smallholder farmers with limited access to land and good quality seed, providing a flush-out mechanism for seed that lessons the impact of home saved seed practices. No direct measures of adoption are available, however, the following appears to be a realistic measure of adoption at the institute and farm level			
Institute level: The SPT is reported as a central part of the training activities routinely provided by NARO [Uganda] and forms a component of the ASARECA project IRC04_C4-05 implemented in Kenya, Ugandan and Burundi.	NARS and NGOs	Kenya, Uganda, Burundi and Ethiopia	Demonstration plots and FFS
Farm level: No quantitative date is available. It is reported that farmers within Kabale use the method, however, adoption of the method has not been strong in Kapchorwa and Njabini although potato production for all regions has increased as a result of the projects. By example in Njabini the farmers involved in the project have formed an association called Jetegemee Agriculture and General Development Self Help group [JAGED-SHG] that continue to actively produce potato seed and ware.	Farmers	Kenya, Uganda	Not known

KASPPA members are providing services to farmers on seed multiplication and proper management of the potato crop			
Farmer Associations and Community communication structures - see submission by AT Uganda for more detail			
KASPPA - see above			
Marketing Associations: As of Oct 06 the Kapchorwa marketing groups continue to buy and sell produce; mainly maize, beans, and wheat, and look to add value by sort and correct storage. The marketing groups report holding regular meetings to update the members on the business transactions and were able to demonstrate the effective use of their books of accounts. They have not been trading in potato because of the perishable nature of the commodity: see submission by AT Uganda [R8435]	Farmers Marketing Initiative Groups	Kapchorwa, Uganda	156 members
Cereal banks: see submission by AT Uganda [R8435]			

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).***

The success of the work undertaken on the BCA was muted by the failure to undertake efficacy tests in-country due to an absence existing biosafety legislation and the time this took to be implemented. Whilst the appropriateness of the institutes that pushed for the biosafety approval is recognised, the gaining of approval of the BCA application was as much down to the persistence of individuals *'championing a cause'*.

The success of the potato multiplication outputs has been based on the robust partnership of technical and local NGO partners, with the full participation of [= project level platform]. A clear vision for the project has always been apparent; the project although working with farmers has never gone in with an overt FFS approach or an open-ended offer to farmers on how to progress ideas. The technical and NGO partners have been very purposeful and hands-on in what needs to be achieved, but have also been effective in evolving the proposed technologies to the interests of farmers.

Capacity building has taken place at various levels, between the project partners and between the project partners and farmers. Particularly the technical partners have worked well with the NGO in communicating agronomic and pest issues that the NGO in turn has communicated to the farmers.

A further key factor has been the availability of clean seed from the NARs of Kenya [KARI] and Uganda [NARO] without which the starting material would most probably have been infected by Bacterial Wilt, with resulting crop failure. However, if the NARs are the correct source of commercial seed is questioned - see later sections. The additional institutional linkage with NAADS has provided a necessary platform for further and sustained development of KASPPA. These have represented the main institute platforms though the absence of involving the MoA inspection services [KEPHIS; MAAIF] more strongly should be noted.

The value of forming farmer associations [= community level platform] so as to have a strong position to negotiate with traders, credit-providers and in accessing markets is borne out by this project cluster. Most notably the ability to link with NAADS is only possible through such structures. The strength of the NGO, AT Uganda, in motivating and training the association members has been a key factor.

Current Promotion

D. Current promotion/uptake pathways

16. ***Where*** *is promotion currently taking place? Please indicate for each country specified detail what promotion is taking place, by whom and indicate the scale of current promotion* ***(max 200 words).***

The BCA and related Bacterial Wilt epidemiological methods is not being promoted to the author's knowledge. Aspects of the epidemiology

research was promoted in Bolivia and Peru [CRF7862[c]], but it is not known to what extent these are continuing.

The main promotion of the potato SPT is taking place under the ASARECA project [IRC04_C4-05]. This project has the SPT as a training component for farmers and is due to be implemented in Kenya, Uganda and Burundi. In Uganda 10 farmer groups with a composition of 120 females and 82 males are involved, with similar scales of promotion in Kenya and Burundi.

The Best Practice protocols for seed multiplication and ware production are not being promoted actively through any other project to the author's knowledge.

The Best practice materials for business management and farmer association function are being promoted in Uganda by AT Uganda through projects supported by USAID [APEP] and DANIDA [APSP]. See submission by AT Uganda for more information.

17. What are the current barriers preventing or slowing the adoption of the output(s)? Cover here institutional issues, those relating to policy, marketing, infrastructure, social exclusion etc. ***(max 200 words)****.*

Questions 17 and 18 are combined in the below table; also refer to questions 6 & 9 for constraints and way forward suggestion.

Qu 17: Current constraint to adoption	Qu 18: Way forward
BCA and related epidemiology methods: The BCA was reviewed positively under R6629 and recommended for development. However, this was requiring of a longterm investment that was not seen as appropriate for the CPP during the programmes closing phases. Interest was expressed by USAID ABSP, however, this programme placed emphasis on crop biotechnologies.	The value of the BCA and the epidemiology methods for Bacterial Wilt should be viewed separately. The value of the BCA to Kenya needs to be revisited and reprioritised. To see this product through to a commercial outcome requires a specific investment with a vision for development of 4yrs+. The BW epidemiology tools could form part of a soil health theme, linking with other RNRRS outputs [e. g. maize Grey leaf Spot [R7566/R8453] and Bean [R8478/R8316 etc].
Understanding risk strategies of farmers: As a generic observation a lesson from this project cluster has been the shortcoming of trying to promote a single commodity amongst farmers that manage their household risk through multiple interests. Often it was found that 'non-project' priorities confounded project goals. For example potato was seen as a higher risk crop than maize and therefore maize was preferred despite potato being recognised as more profitable; and in the context of associations the cost of school fees often prevented farmers paying membership fees in a timely way.	Farmer associations provide the ideal platform for donor investment to articulate ideas and technologies, but experience has shown that such dialogue needs to blend more with the interests and risk strategies of farmers. Towards the end of these projects marketing groups were established for the collective purchase and sale of various commodities [not just potato]. This markedly improved the commitment and interest of the group members. Ideas were also promoted for paying association fees through a return at harvest of production proportional to the harvest [a levy], rather than a cash sum. The placement of membership fees at a time that is affordable to farmers is critical.
Dysfunction within associations: Experiences from this project cluster has shown that, whilst agronomic ideas can be successfully adapted and adopted by farmers, the expectations held by farmers in forming an association are poorly formed and the training provided in marketing, group dynamics and collective marketing are poorly understood and applied. It was noted that association members to KASPPA were all farmers despite the constitution providing for provision of other partners that would be more akin to an innovation platform. In this the expectation of an individual in becoming an association members [the 2-way obligation and value] is not well understood by farmers.	Under R8104 and R8435 various role-play activities were used to illustrate to KASPPA the problems they were facing with the way they were working their association. Greater emphasis needs to be placed on group dynamics of an association and its membership, building deep-rooted understanding of the value and obligation of being within an association. Model association formats [constitutions and partnerships] that build innovative-type platforms need to be developed that are sensitive to the risk management strategies of farmers and other stakeholder members. Within the innovation platform all appropriate partners as form the production and marketing chain need to be identified, and the benefit and risk residing within the chain must be fairly distributed throughout.
Commercial basis for seed: For the formation of a viable potato seed industry compelling evidence to farmers is still needed on the value [increased quality and ware yields] of planting clean potato seed as then commands a price differential between quality-assured seed and informal seed. The field trials conducted under R6629 revealed that over 80% of yield variation was accounted for by abiotic soil factors [e.g. fertility and water retention] and seasonal factors [e.g. rainfall, temperature], with pest factors being a relatively minor factor.	There is a thin line between farmer participation, on-farm research and achieving the level of trial management [quality control] needed to realise the desired outcome. Greater investment needs to be apportioned within projects to trial management. With a view to wider dissemination, greater value is also to be realised through the robust collating of quantitative data that is statistically sound and report writing.

Appropriate policies on seed health: At the policy level, the failure to develop a coherent and well consider certification scheme/voluntary standard for seed-tubers results in various barriers in furthering a seed industry. For example, it cannot be expected of the private sector to invest in potato seed whilst seed health standards support a zero tolerance for Bacterial Wilt that, for the main, is unattainable in the near-term for developing nations. Accordingly, basic seed amongst East African nations continues to be produced through the respective NARs potato programme that can only realise limited production and presents a confused role for the NARs as researcher and private sector producer.	A clear change in the policy relating to the health off certified seed is required that accommodates aspirations for local or regional/export trade. A project under ECAPAPA [PRAPACE = contact point] is now starting that seemingly may address this issue. Unfortunately to date opportunity to feed in the experiences of KASPPA to these discussions has not been realised. Within the scope of this analysis consideration is needed as to the opportunity and positioning of the private sector, foremost as a seed producers, but also as inspectors of seed health with costs integrated into a supply chain. This review must embrace the latest technologies for seed testing and the sampling strategies required to support a policy position.

18. What changes are needed to remove/reduce these barriers to adoption? This section could be used to identify perceived capacity related issues ***(max 200 words).***

See 17

19. What lessons have you learnt about the best ways to get the outputs used by the largest number of poor people? ***(max 300 words).***

Placing value on evidence-based scientific and commercial principles has been foremost in decision-making.

It has not been the objective of the projects to directly deliver the outputs to the poorest people and thus robust quantitative data at the level of use by the poor is not available against all outputs.

Earlier phases focused on technologies [BCA] and basic research questions that, in addition to the direct outputs that were to be taken forward by NARs, built institutional capacity that can be demonstrated as having subsequent value through other potato related projects and other commodities. Capacity building has by example enabled KEPHIS and KARI to better manage Bacterial Wilt within the pelargonium industry within Kenya, protecting large-revenue export markets.

The work under R8104 and R8435 mainly focused on the Primary Seed Multipliers that were medium-sized landholders [not small-scale farmers]. Subsequent dissemination of the seed was then targeted [cascaded] to more numerous poor people and women groups. Supporting mass dissemination of training material went alongside these seed dispersals. The training of trainers was effectively used as the mechanism of training. Critical in this process of upscaling was the role of the Parish Development Councils that enabled the effective targeting of smallscale farmers and the formation of farmers as associations that provide coherent group structures for interaction. Though all aspects of the seed and ware production were participatory with farmers, project activities were never structured as FFS and were from the outset progressing commercial interests amongst the farmers.

In summary, by two very different aspects of the project, the approach to targeting the poorest-of-the-poor has focused on stakeholders above this stakeholder tier and in the case of the potato dissemination with women as a recognised target group.

Impacts On Poverty

E. Impacts on poverty to date

20. Where have impact studies on poverty in relation to this output or cluster of outputs taken place? This should include any formal poverty impact studies (and it is appreciated that these will not be commonplace) and any less formal studies including any poverty mapping-type or monitoring work which allow for some analysis on impact on poverty to be made. Details of any cost-benefit analyses may also be detailed at this point. Please list studies here.

One formal impact survey was conducted at the conclusion of R8104:

Impact Survey Report on Promoting Potato Seed Tuber Management for increased Ware Yields in Kapchorwa, Eastern Uganda. Sarah Namisi, Rita Laker-Ojok, and Julian Smith. December 2004 [Draft Report]

A total of 116 beneficiaries and 240 non-beneficiaries were surveyed; the survey include a cost benefit analysis:

The cost-benefit analysis of seed potato production in Kapchorwa was calculated with KASPPA seed multipliers in a participatory manner with technical guidance from the project. The production cost of seed production for one acre was estimated to be USh8,681/= per bag and USh11,000/= per bag when marketing costs were included. With the value of seed averaging USh25,000 this resulted in a net profit per bag of USh14,000/=, a very high return on investment.

This survey realised a substantial data set. Resources available did not allow for the fullest of analysis.

21. Based on the evidence in the studies listed above, for each country detail how the poor have benefited from the application and/or adoption of the output(s) ***(max. 500 words):***

- *What positive impacts on livelihoods have been recorded and over what time period have these impacts been observed? These impacts should be recorded against the capital assets (human, social, natural, physical and, financial) of the livelihoods framework;*
- *For whom i.e. which type of person (gender, poverty group (see glossary for definitions) has there been a positive impact;*
- *Indicate the number of people who have realised a positive impact on their livelihood;*
- *Using whatever appropriate indicator was used detail what was the average percentage increase recorded*

The quantitative results of the impact survey indicated that the project R8104 had made an impact amongst the Primary Seed Multipliers and the small-scale farmers that received seed from the Primary Seed multiplies in terms of

- § Area of land cultivated that was now higher amongst beneficiaries
- § Production patterns towards cultivation of potato; displaced banana production, with maize and beans remaining as the crops having the largest cultivated area.
- § Production practices for potato production reflecting adoption of advocated Best Practices
- § Eating patterns that were now more varied and included a higher consumption of potato; 80% of beneficiaries households reported higher levels of food security
- § Income source, with potato realising a higher % of household income (34% increasing to 74%); with 42% of respondents reporting selling potato for cash

In addition to adoption amongst the project partners, the impact survey assessed the diffusion of the technologies beyond the project beneficiaries amongst neighbouring farmers and farmers of neighbouring villages and parishes. These data supported a trend of adoption by non-beneficiaries that was strongest amongst neighbouring farmers and declined with distance from the project farmer.

In addition to the impact survey various project milestone data has been obtained for R8104 and R8435. These are listed below:

Community structures and communication pathways

- § 1 seed producer association [KASPPA]
- § 4 Farmer Ware Marketing Groups
- § 8 Parish Development Councils

Primary Seed Multipliers

- Number of Primary Seed Multipliers trained in seed production = 28
- Number of diffuse light seed stores built with Primary Seed Multipliers = minimum of 24
- Bags of seed distributed [End R8104] = 1340 @ 80kg per bag

Small scale farmers

- Number of smallscale farmer receiving training in ware production and seed = approx 1700
- Simple ware storage units facilities [not known]

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.

The outputs of this project cluster have a common goal of increasing potato productivity and controlling bacterial wilt. When realised these outputs will result in the more effective use of land; notably through reduced contamination of soil with Bacterial Wilt. The impact of this outcome on the environment will be most apparent at the hill/forest interface, a region that is often characterises by potato cultivation. In Kenya, Uganda and many other nations the encroachment of agriculture into primary forest is a significant environmental concern, and the need to open up new land is often related to the falling productivity of existing land due to soil borne pests.

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

No negative environmental impacts are envisaged. The BCA if it were to realise commercial use would have satisfied the fullest biosafety assessments.

However, this project cluster has already realised a change in cropping practice, with potato displacing banana in order of cultivation by area. Further, any outcome on recommended crop rotation with potato to control Bacterial Wilt might lead to a changed cropping pattern. The environmental impacts of these landscape level changes are not known.

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 impacts of climate change are likely to result in an increased severity of Bacterial Wilt within potato production, thus the outputs of this project should mitigate this risk.

It is recognised that resilience to human diseases, most notably HIV and aids, is strongly related to nutrition and health. The impact survey on R8104 reported smallholders having a more varied diet and enjoying greater food security as a result of the outputs from this project cluster, which should in turn result in improved nutrition and health and therefore improved resilience to disease.
