New opportunities for cotton croppers in Sub-Saharan Africa

RIU

Validated RNRRS Output.

A range of crop and pest management technologies have been tested in Uganda and Zimbabwe and are now available to make cotton growing more profitable in Sub-Saharan Africa. These go hand in hand with easy-to-understand tools like manuals and identification sheets. One of the most innovative aspects of the project was the partnership that it formed with private cotton-processing companies (ginneries) to disseminate the results to farmers and provide them with new opportunities. To this end, around 600 ginnery staff were trained in integrated pest management. They then went on to provide training to 6000 farmers hosting on-farm cotton demonstrations.

Project Ref: **CPP39:**
Topic: **5. Rural Development Boosters: Improved Marketing, Processing & Storage**
Lead Organisation: **Natural Resources Institute (NRI), UK**
Source: **Crop Protection Programme**

Document Contents:

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

Geographical regions included:

Uganda, Zimbabwe,

Target Audiences for this content:

Crop farmers,

Description

CPP39

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.

IPM/ICM for smallholder cotton farmers in sub-Saharan Africa [R8403]

The original title may be too narrow. The new title below gives a better idea of the projects scope:

'**Using vertically integrated commodity chains for knowledge and technology dissemination on integrated crop management'**.

Short version:

Cotton ICM technology dissemination using the commodity chain

Lead Institute: **Natural Resources Institute [NRI]**, University of Greenwich, Chatham Maritime, Kent ME4 4TB, UK.

Lead Person: **Dr Rory Hillocks** r.j.hillocks@gre.ac.uk

Main partner Institutes:

Agricultural Productivity Enhancement Programme [APEP]
Agribusiness House
58 Lumumba Ave., Nakasero
Po Box 7856
Kampala
Uganda

Tel: 256 31 350700
info@apepuganda.org
Pius Elobu
Serere Agricultural & Animal Research Institute
P/Bag Soroti
SOROTI
Uganda

piuselobu@yahoo.com

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

Parent Project: Crop Protection Programme [CPP]

Associated Projects: Crop Protection Programme, Natural Resources Systems Programme [SP], Livestock Production Programme [LPP]

Successful implementation and uptake pathways depended on the partnership with the Agricultural Productivity Enhancement Programme [APEP] in Uganda which is funded by US AID.

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.

CPP:
R6760: A systems approach to sustainable integrated pest management in irrigated cotton in India

Team Leader: Derek Russell, NRI, UK

R7474: Weed management options for cotton systems in the Zambezi valley

Team Leader: Jim Ellis-Jones, Silsoe Research Institute, UK

R8197: Development and promotion of appropriate IPM strategies for smallholder cotton in Uganda.

Team Leader: Rory Hillocks, NRI, UK

R8191: Promoting improved crop management in cotton and cereal-based cropping systems in semi-arid areas.

Team Leader: Prof O Chivinge, University of Zimbabwe

R8403: Promotion of Integrated Pest Management for small holder cotton in Uganda

Team Leader: Rory Hillocks, NRI, UK

NRSP:

R4840: Conservation tillage management for marginal smallholder farming systems in Zimbabwe

Team Leader: S. Twomlow, Silsoe Research Institute, UK

R7085: Promotion of practical approaches to soil and water conservation for smallholder farmers in sub-Saharan Africa.

Team Leader: S. Twomlow, Silsoe Research Institute, UK

LPP [joint with CPP]:

R7401: Improving production in the Teso farming system through the development of sustainable draught animal technologies.

Team Leader: P. Obuo, Serere Agricultural and Animal Research Institute, Uganda and David Barton , Silsoe Research Institute, UK

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.*

The problem all the outputs addressed was cotton yields that are 5 – 10 times below the yield potential of the current varieties under rain-grown conditions. This was addressed by the development of technologies that make **cotton** growing more profitable and more adapted to climate change for smallholders. This was done by developing, validating and promoting crop and pest management technologies based on **integrated pest management [IPM]** and **draught animal power [DAP]** as a **weed control** method [CPP] and as a **conservation tillage** technology [LPP, NRSP]. In the system developed in R8197 and R8404, an **integrated crop management** system was promoted that included, reduced tillage, IPM and DAP for weed management. Research contributing to the outputs was conducted mainly in **Uganda** with supporting research in **Zimbabwe**. The dissemination platform for the IPM outputs were the 6000 on-farm cotton demonstrations supported by consecutive US-AID-funded programmes culminating in the **Agricultural Productivity Enhancement Programme** [**APEP].**

The innovative aspect of the project was in engaging with the **private sector** ginning companies to provide training and extension support on integrated crop and pest management [ICPM] through the vertically integrated **commodity chain**. More than 600 staff employed by the ginneries were trained in IPM who subsequently provided training to 6000 farmers hosting **on-farm cotton demonstrations.**

The IPM component was based on controlled use of insecticide through a simplified **scouting system** using a **wooden pegboard** on which farmers recorded pest numbers and which were marked at the point where pest numbers reached the **spray threshold**.

All the outputs developed under the various projects could be combined into an ICM package which would be supported by already prepared **information media** and a delivery system that was validated in R8197 and R8404, of using private sector **vertical integration** to reach cotton growers with **advisory services**.

Process output:

i]. Engagement of private sector in service provision to cotton farmers [R8197, 2002/5]
ii]. Training in IPM of ginnery staff as extension service providers [R8197, R8403, 2002 – 2005]

Technology output:

iii]. Design of a cotton IPM system appropriate to the needs of cotton smallholders [R8197; 2002].

iv]. Integration of herbicide use with animal draught for efficient land preparation and in-crop weed control [R4840, R7401, 2005, R8403, 2005]

Product output:

v]. IPM manual for extensionists and lead farmers [R8197, 2003].
vi]. Simple peg-board for scouting by farmers of insect pests and to indicate action thresholds [R8197, 2003].
vii]. Laminated identification sheet for pest and beneficial insects on cotton for advisory services and farmers [R8197, 2003]
viii]. Manual on use of draft animal power for trainers and lead farmers - [R8404, 2005].

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

COTTON.

The principle of using vertically integrated commodity chains to deliver extension services has wide application in the region but probably only for export crops and perhaps, maize, where trading companies have a vested interest in increased production. The use of herbicides to reduce labour inputs and improve timeliness of land preparation and weeding can be applied to a range of row crops.

7. What production system(s) does 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							

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**). Please specify with what other outputs your output(s) could be clustered.*

The RNRKS has supported a number of IPM/ICM projects on cotton and other crops. Value could be added by combining the lessons learned from these projects to institutionalise IPM and ICM concepts and approaches into stakeholder organisations. This is not happening at present and limits the impact of project outputs. Complete understanding of the principles of ICM and IPM is poor at all levels of agricultural administration. For example, insecticide purchasing policy is often not sufficiently co-ordinated so that the products available to farmers are not those that are most IPM-compatible. The need for change in farming practice to be institutionalised will become all the more important when Bt cotton and other transgenic crops are introduced for smallholders. The livelihood benefits of transgenic technology for smallholders in SSA will not be realised unless the technology is deployed within an IPM/ICM framework.

IPM cannot contribute to poverty reduction in isolation but must be a component of an integrated crop management [ICM] approach, with an overall emphasis on more profitable but sustainable crop production.

Poor soil fertility constrains yields in many cotton growing areas of SSA. Improving this aspect of the farming system by either expanded use of fertilisers, validated by R8197 in Uganda, or by incorporation of more legumes into rotations will be essential in the future.

A considerable expansion in the use of Draught Animal Power [DAP] will be required to raise near subsistence farming to sustainable commercial production. DAP is labour-saving and cost effective for conservation tillage and weed management and should be in the basket of ICM options on offer for smallholder farming systems. Wider adoption of DAP may require also supporting animal health programme.

These outputs can be combined into a basket of ICPM options and promoted and supported through vertically integrated commodity chains.

Associated outputs:

Integrated weed management system for smallholder cotton systems [R7474, R8191 work in Zimbabwe 2002-2005]

- Integration of herbicide use with animal draught cultivation for in-crop weed control ;
- Series of 15 Best Practice Guidelines on land preparation, crop establishment and weed control for cotton for advisory services and lead farmers - Zimbabwe
- A group extension training guide using pictures for land preparation, crop establishment, soil conservation, and weed management for cotton and maize.
- Five posters on safe handling and use of herbicides to raise awareness among farmers – Zimbabwe [R8191, 2005]

Validation of conservation tillage and weed management based on DAP [R4840]. DFID- LPP

Validation of DAP for weed management in Uganda [R7401] DFID-LPP and CPP

- Development of ox-drawn cultivator that is suitable for weeding in cotton

On-farm assessment of green-manures to improve soil fertility/crop yields in Tanzania [R8215 – 2002-2005]

- Legume green manure species that could be grown in rotation with cotton or undersown in cereals that are rotated with cotton.

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 IPM system developed for Uganda was validated initially by NRI/NARO [NARS] in 30 on-farm demonstration plots[i.e with end-users] compared to 30 non-adopters and then with lead farmers on 300 demonstration plots funded by US-AID's IDEA project [precursor to APEP]. Detailed data on pest damage, insecticide usage and yield was recorded by site coordinators and NARO staff in the validation exercise involving 60 farmers. The 30 demonstration farmers were a subset of the 300 who hosted demonstrations in Kasese in the 2002/2003 cotton season. More effective pest control was achieved with fewer sprays and the system was approved for scaling-out following a review of IDEA's 300 cotton demonstrations by US AID.

Seed cotton yield in all the demonstration plots was more than double that achieved with farmer-practice and almost 4 times as much, where IPM was used combined with high input levels.

A baseline survey (2002) that surveyed a random sample of cotton demonstration farmers in two districts of Uganda, showed that farmers with demonstration plots belonged to the "moderate poor". Household food security averaged nine months/year. Most owned assets such as a bicycle, a radio, a tin-roof house, and cattle. The majority had received a primary education. About 10 % of demonstration farmers were female heads of household. A matching sample of non-demonstration farmers showed that they had the same level of household food security but fewer assets, and (in one district) were less likely to be women.
.
Target farmers in western Uganda were poor mountain dwellers in a remote montane farming system, who came down to the plains for the cotton season and rented land. The baseline survey showed that these households had fewer physical assets, less livestock, were less educated, and more likely to be headed by women. They also suffered from physical insecurity because of ongoing conflict between the government of Uganda and the Lord's

Resistance Army.

DAP, integrated with pre-planting herbicide application to allow reduced tillage and for inter-row weed management was validated in 25 on-farm trials conducted with cotton farmers by NRI/NARO. Results showed significant cost savings of reduced tillage with herbicide compared to standard practice of two ploughings and both cost and labour saving of inter-row cultivation compared to hand-hoeing. Seed cotton yields were not affected. The farmers involved were the moderate poor and those with oxen tended to be better off.

In the context of this cluster DAP would be seen as both an ICM and IPM technology where it would be introduced for weed management as well as land preparation.

*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)**.*

The IPM system was developed for Uganda as a whole but validated in western Uganda in 200203 in rain-grown dryland [smallholder rainfed dry (SRD)] systems for migrant smallholders, before being scaled-up to cover all the cotton areas of the country.

The project worked with households that had sufficient land available to provide on-acre demonstration plots, the size that was necessary to visually demonstrate the difference in yields produced by new cotton technology. This limited the initial target group of cotton growers to the “moderate poor” (see above). However, the new cotton technology itself was scale-neutral. The new “technology package” consisted of eight crop management components as well as IPM. Of these, three (planting in pure stand, wider spacing, and removing stalks after harvest) required no additional cash expenditure and were therefore appropriate for all cotton growers regardless of income. These components were the most widely adopted by demonstration farmers. Other components (basal fertiliser, topdressing, herbicides) were more likely to be adopted by better-off demonstration farmers. One-third of “moderate poor” growers had adopted fertiliser for cotton. About half the demonstration farmers sampled owned pegboards. Two thirds of demonstration farmers used pegboards and based their decisions for pesticide spraying on thresholds established by counting relevant pests.

DAP conservation tillage and weed control was validated in 2005 with moderately poor smallholders in SRD farming systems of Teso in eastern Uganda. Protocols for DAP in cotton have been validated in Zimbabwe by projects in the NRSP.

Current Situation

C. Current situation

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

The IPM system was adopted for country-wide dissemination by the USAID-funded IDEA and later Agricultural

Productivity Enhancement Project (APEP). which promoted best practice in cotton crop management. APEP site co-ordinators were trained by NRI in IPM and they supported 6000 on-farm demonstration plots every two years. Some components of the ICPM basket are being used at least by the 12,000 farmers who have already hosted demonstrations. The outputs are therefore being used both by private sector ginning companies to raise cotton production among their cotton farmers and by large numbers of farmers who hosted cotton demonstrations.

In addition APEP has an organic cotton programme which uses IPM methods devised by the CPP project to replace pesticide use.

There has been high demand for the scouting peg-boards of which 10,000 were manufactured by the project, some of the ginneries funded the production of additional boards and an entrepreneur in Lira was selling his own version. The pest identification sheet was also in high demand with several thousand going to cotton farmers [production costs were funded by an agrichemicals company – Balton]. An impact study conducted by NRI showed that two-thirds of demonstration farmers who had received IPM training used pegboards to scout for pests and used thresholds to decide when to spray their cotton.

DAP for reduced tillage using herbicide to replace one ploughing was similarly promoted throughout Uganda, as part of the cotton demonstrations. DAP for inter-row weed management did not go beyond the validation stage carried out in Teso, by the end of the project i.e. 25 farmers. However, DANIDA intend to promote DAP, including inter-row weeding in cotton in anew programme they are supporting in Lango.

The Common Fund for Commodities has expressed an interest in funding a programme to promote cotton IPM through private sector commodity chains.

*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).***

All cotton growing areas in Uganda; mainly south west, northern and eastern Uganda [especially Teso]. Demonstrations close to refugee camps in eastern Uganda have disseminated the technologies to refugees now returning to their land in areas previously controlled by LRA and Karamajong.

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

From the initial 300 farmers trained in IPM in 2002/3, this expanded to 6000 and then 12,000 by the end 0f 2005, as the demonstrations farmers are changed every 2 years. When APEP ends in 2008 18,000 -24,000 cotton farmers will have hosted demonstrations. With each farmer expected to bring at least 15 friends and neighbours to the demonstration site, 270,000 – 360,000 farmers will have been exposed to the ICPM technologies [i.e. all cotton farmers in Uganda].

A knowledge-intensive technology such as IPM does not spread naturally but requires commitment to continuous training, re-training and promotion. The advantage of training the ginning company staff to promote IPM is that this is a lasting legacy of the project. Even after the end of the APEP in 2007, those 600 ginnery staff will continue to disseminate the knowledge they have gained of best practice in cotton ICM. It has been shown in other

countries that investment by ginning companies in extension services and input delivery, results in an increase in seed cotton deliveries to the ginnery.

15. What programmes, platforms, policy, institutional structures exist within the DFID PSA countries to assist with the promotion and/or adoption of the output(s) and in terms of capacity strengthening what do you see as the key facts of success? ***(max 350 words).***

The project combined research on IPM/ICM with piloting of the use of vertically integrated commodity chains run by the private sector ginning companies as a promotion pathway. From a starting point of two participating ginning companies, by mid-way through the project, all eight major ginning companies in Uganda were participating and contributing staff to be trained as Site Coordinators, who act as private sector extension service providers. Similar opportunities exist in other countries, particularly Zambia with Dunavant ginning company and also in Tanzania, where it would be possible to use the lessons learned in Uganda to out-scale the project outputs through linking research with private sector ginning companies. The 'platform' in this case is the private sector commodity trading companies and where they exist, vertically integrated value chains. Tanzania and Zambia also have cotton ginners associations through which agreement can be reached on service provision in a way that prevents 'side selling'.

Success in Uganda depended on the commitment from ginning companies to provide staff to be trained as trainers in IPM/ICM. This was a large capacity-building achievement which can be repeated elsewhere. Projects R7474 and R8191 worked with Cotton Company of Zimbabwe field staff and other buyers to validate improved weed management practices with farmers. The private sector in Zimbabwe is already extending the use of improved technology and could utilise IPM/ICM outputs developed in Uganda. The project also played a leading role in expanding the curriculum at Busitema Cotton Training Centre to provide training to site coordinators and farmers on ICM/IPM. One possibility might be to use the Busitema Cotton Training Centre in Uganda for regional training which would build on the inputs that the CPP project made to developing the Busitema capacity, [but private sector could hardly be expected to fund residential training and travel].

There is no way to get away from the fact that IPM is 'a knowledge-intensive technology' and there is still a long way to go to improve the understanding of and commitment to IPM at all levels of agricultural research and administration. This was not done as part of the project in Uganda, under the mistaken belief that the concepts were already institutionalised. It would be a prerequisite for success in the scaling-up process to begin by addressing these capacity development issues in the research, advisory and regulatory bodies. The APEP is already addressing these issues in Uganda and lessons learned there could be applied in all other cotton-producing countries in the region.

The key institutions in most of these countries are the Ginners Associations and the Cotton Development Organisations, Marketing Boards etc. e.g Uganda Cotton Ginners & Exporters Association and the Tanzania Cotton Association.

In the absence of a CG centre for cotton, regional R & D is usually carried out by projects funded through CFC. CFC are currently in the process of formulating ideas on which to base a call for proposal on cotton commodity chains.

The EU through STABEX is providing support to cotton R & D in Tanzania and they may be interested in ways of improving private sector support for commodity development.

The Multi-country Agricultural Productivity Programme [MAPP] is being implemented in southern Africa as the SADC-MAPP with a similar programme in West Africa. The SADC-MAPP represents a major platform which will be able to commission agricultural R & D and should be included among those organisations 'invited' to provide the demand for RiU technologies.

In Tanzania there is an overall framework for agricultural development the Agricultural Sector Development Strategy [ASDS] and the framework for its implementation is the Agricultural Sector Development Programme [ASDP]. This, along with cotton ginning companies w should contribute to be the demand platform for RiU outputs.

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 projects promote reduced tillage and IPM as part of the ICM system for cotton smallholders. These approaches are all based on sustainable practices and their adoption would have favourable environmental outcomes:

Reduced tillage with herbicide for land preparation will result in less run off of rainwater and soil loss from erosion after planting and before cotton canopy closure as weed residue is left on soil surface and it therefore mitigates the effects of drought.

Pesticide misuse is common among smallholders in Africa. Extension worker and farmer training on safe use of herbicides can be supported by training materials developed by associated DFID projects and industry supported programmes including Crop Life.

IPM – promotes safe and targeted use of pesticides. This has resulted in large decreases in pesticide use where the number of sprays had escalated e.g. India and Australia. In SSA where much less spraying is done, the problem is more one of wasted spay through poor equipment and poor timing of the sprays. Where 4 – 6 sprays is recommended on a calendar basis, this can be decreased to 2 – 3 sprays, except in seasons with high bollworm pressure.

ICM – encourages sustainable farming methods. Inclusion of more legumes, cover-crops and use of organic

residues to counteract declining soil fertility and contributes to the mitigation of climate change through higher levels of carbon sequestration.

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 100 words)***

Growing more cotton can be seen as an adaptation to climate change because the crop has some ability to withstand drought, compared to maize. I remember talking to a commercial farmer in Zimbabwe who said that out of the previous 14 years he had failed to make a profit on his maize 6 times but never failed with his cotton. Cash earned from cotton can be used to purchase maize to supplement household food security.

Reduced tillage with herbicides and decreased number of ploughings has water conservation benefits, particularly if used with a plough or cultivator for inter-row weeding that produces ridge and furrow landforms to trap water. Greater use of these methods is therefore an adaptive response to climate change.

Annex

Related documents

Click below to view the related information ....

PF_CPP39_Annex.pdf
