Farmers zero-in on insect pests

RIU

Validated RNRRS Output.

Armed with new knowledge, farmers are taking action to reduce damage to crops in storage. A risk warning system, based on a model of insect flight activity and climate data, enables extension services to warn them of anticipated increases in the threat from a pest known as the larger grain borer (LGB). In addition, using targeted insecticide applications, farmers can reduce by at least 70% the amount of pesticide applied to their crops, zeroing-in on the portion they will be consuming during the storage season. LGB can be devastating to maize and dried cassava. Without a warning system, the sporadic nature of LGB outbreaks can take farmers by surprise. The new techniques, developed and validated in Ghana and Tanzania, cut losses—and costs—considerably.

Project Ref: **CPH42:**
Topic: **5. Rural Development Boosters: Improved Marketing, Processing & Storage**
Lead Organisation: **Natural Resources Institute (NRI), UK**
Source: **Crop Post Harvest Programme**

Document Contents:

Description

CPH42

A. Description of the research output(s)

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

Geographical regions included:

Ghana, Tanzania, Zimbabwe,

Target Audiences for this content:

Processors,

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.

Larger grain borer (*Prostephanus truncatus*) risk assessment and control in farm maize stores

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

Crop Post-harvest 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.

R6684 (1996 – 1999) Risk Warning to Farmers of Larger Grain Borer Infestation and Reduced Pesticide Treatment in Farm Maize Stores (Ghana)

R7486 (1999 – 2002) Development of IPM techniques for the control of Larger Grain Borer and effective management of household food grain stocks in sub-Saharan Africa (Ghana)

R8265 (2002 – 2005) Improving household food security by widening the access of small-holder farmers to appropriate grain store pest management (Ghana)

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Lead institute (R8265):

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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.*

To African small-holders, food and financial security are often represented by **stored grain** and other commodities. These are subject to attack by a complex of insect pests including the **larger grain borer (LGB)**; an especially damaging species from Central America now endemic in many parts of sub-saharan Africa. LGB can be utterly devastating to maize and dried cassava, with infestation often reducing sound stock to dust in a relatively short time. Moreover because of its recent introduction to Africa and the sporadic nature of its

outbreaks – over time and space – farmers (and extension staff) are frequently been taken by surprise. To tackle this problem an **LGB risk warning system**, based around a model of LGB flight activity driven by climate data, was completed in 2002 that enables well equipped extension services to warn farmers of coming bad years and so take action to reduce the severe damage expected. Typical action by farmers is to apply insecticide to their stored crop but this is expensive. To reduce the costs of treating the portion of the crop that farmers will be consuming during the storage season, a method of **targeted insecticide application** was developed. This reduces by at least 70% the amount of pesticide applied to stores but still provides good protection. This is achieved by treating only the bottom 30% of traditional maize cob granaries or small bulks of maize grain. However, maize for longer-term storage may require the usual full treatment.

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

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

The commodities for the LGB risk warning are maize and dried cassava. For targeted insecticide treatment maize is currently the only commodity included, other commodities cannot be included without further research.

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		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		

*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**).*

Other relevant outputs would relate to improved methods of maize/cassava storage. Good examples would be the substitution of synthetic pesticides by diatomaceous earths on maize and sorghum (R8179) and the output cluster 'Better grain stores for farmers and traders' **(**R6311, R6658, R6502, R8265).

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).

Risk warning system – this is based on a flight activity model that was developed in Ghana in a woodland savannah zone and validated in Tanzania in a semi-arid short grass steppe zone. Project staff entered historical Tanzanian climate data into the model and predicting LGB flight activity to compare with the observed LGB flight activity record for that time. The model worked extremely well, so demonstrating that it could be applied outside Ghana and in other habitats. However, this was only a validation of the model and to date the risk warning system, which includes taking a warning of a coming bad year to a farming community, has not been fully implemented to test whether farmers can actual benefit from it.

Targeted insecticide treatment – in Ghana, following on station trials, targeted treatment was validated by 25 subsistence farmers in their own granaries using partial treatment of the bottom 30% of maize cobs using Actellic Super emulsion. In subsequent farmer assessment meetings, with a total of 66 farmers, the method was considered to have offered effective protection of stored maize cobs against LGB and other pests. In Zimbabwe, the method was validated in on-station trials in brick-built farm stores with compartments holding maize grain in bulk. The bottom 20% or top 10% and bottom 20% of maize grain was treated with Actellic super or a diatomaceous earth formulation. All treatments provided good control of insect pests.

*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)**.*

Risk warning model - was first validated in Tanzania, in 2000, in a semi-arid area where the farming system was smallholder rain-fed and dry compared with smallholder rain-fed and humid in which it was developed. The social group involved is not directly relevant at this level since the predictions of the model were not actually used to advise farmers on the need for pest management against LGB; however this is a further important step that has still to be investigated. In a second technical validation, the model was tested in a hotter dryer semi-arid area in Northern Ghana again the model worked well but did require some adjustments to ensure that its predictions were accurate.

Targeted insecticide treatment - was validated in five villages in the Volta Region of Ghana with small-holder maize farmers in 2002, in a rain-fed, humid farming system. In Zimbabwe, validation was done in on-station trials close to Harare in 2000.

Current Situation

C. Current situation

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

Risk warning model – is not currently being used.

Targeted insecticide treatment - was introduced to farmers in five villages in Ghana in 2002. During an assessment in October 2006, in the same villages, few insect infestation problems were reported, most farmers were not now storing maize cobs but shelling their grain and then applying pesticides before storage in bags, one possible recommendation for reducing LGB damage that has been extended since the mid-1990s. Relatively few were farmers using targeted treatment of cobs except in two villages where not more than about 15 farmers were using it.

*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).***

Risk warning model - not currently being used.

Targeted insecticide treatment – in two out of the five villages used in validation studies in the Volta region of Ghana

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

Risk warning model - not currently being used.

Targeted insecticide treatment – limited to not more than 15 farmers in two villages. It seems doubtful that use is spreading due to the predominance of earlier extension messages to shell maize cobs, treat all the shelled grain with insecticide and store it in bags.

*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).***

Risk warning system – to date a suitable institutional structure to support the full implementation of this system

has not been found.

Targeted insecticide treatment – the technique is simple in principle and easy to apply so that very little training and support is required to enable the method to be extended by competent agriculturalists. The method can therefore be easily promoted by any organisation offering services to farmers (agricultural extension service or NGOs) in Tanzania, Uganda, Zambia, Malawi, Zimbabwe, Mozambique, Ghana, Nigeria or Sierre Leone.

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.

There is a positive environmental impact of targeted pesticide use in that less pesticide will be used in the protection of individual grain store. This may however, be offset in that the use of pesticide treatment will become more affordable, hence for some poorer households more likely to be used. Overall it is therefore likely that the effect will be neutral.

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

No environmental impacts expected.

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)***

Both risk warning and targeted pesticide use increase the amount of food available for consumption and sale. For individual families this could be 5% to 10%. This can be an important bridge between harvests and can be an important contribution to reducing hunger.
