New techniques help get rid of unwelcome guests

RIU

Validated RNRRS Output.

Rodents have a serious impact on people's lives. They nest in the roof thatching of rural households, relying on food and human drinking water stored inside the home and causing serious losses to these stores. They also damage crops, personal possessions and buildings, and transmit dreaded diseases such as the bubonic plague. Ecologically based management techniques—including the use of kill traps and multi-capture live traps—have enabled rural communities in Mozambique to reduce rodent numbers significantly. Before the project, rodent pests and their damage went largely unchecked in the project villages. Poisons were not available and traps were usually self-made and unreliable. At least a dozen villages are now intensively trapping rodents and, although the scale of use remains limited, the techniques are spreading through word-of-mouth.

Project Ref: **CPH15:**
Topic: **5. Rural Development Boosters: Improved Marketing, Processing & Storage**
Lead Organisation: **Natural Resources Institute (NRI), UK**
Source: **Crop Post Harvest Programme**

Document Contents:

Description

CPH15

Research into Use
NR International
Park House
Bradbourne Lane
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UK

Geographical regions included:

Mozambique,

Target Audiences for this content:

Crop farmers,

A. Description of the research output(s)

1. Working title of output or cluster of outputs.

Impact of rodents on rural household food security, health and nutrition

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

Crop Post-harvest Programme
Crop Protection Programme (supplemental field crop trials)
World Vision (50% co-funding)

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.

R7372 (Apr 1999 to Mar 2002)

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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.*

As part of the Zambezi Agricultural Development Programme (ZADP) financially supported by DFID and managed by World Vision, large-scale **needs assessments** were carried out which indicated that **rural agricultural communities** had severe problems with **rodent pests**. Subsequent technical surveys carried out as part of R7372 showed that 50-100 rodents normally nested in the

roof thatching of rural households. These multi-purpose houses normally contained large **food storage** platforms and a cooking and sleeping area for up to 8 people. Although rodent populations scavenged widely, many relied exclusively on the stored food and human drinking water supplies inside people's houses. People are routinely bitten by rodents while they sleep (>10% has been recently bitten), and bubonic plague is endemic in the western part of Zambezia Province on the border to Tete Province and into Malawi, with several thousand human cases annually. Rodents are widely eaten by people in Zambezia, forming one of their main sources of protein through lack of other sources and because they are considered a delicacy.

The project outputs were based on first establishing some measurement of the **impact** of rodents on peoples livelihoods, through measuring food **storage losses** caused by rodents, and documenting the scale of other rodent damages (e.g. **crop damage**, damage to personal possessions, damage to buildings, disease prevalence). Baseline surveys of rodent species dynamics, population size, and spatio-temporal habitat utilisation were carried out through trapping trials which involved end users and extension staff in the implementation, management and data collection stages.

These surveys led to the development of **ecologically-based rodent management** intervention trials to determine whether it was possible to intensively trap rodents at a sufficient scale to reduce rodent populations and the damage they were causing to livelihoods in a cost-beneficial manner. The results showed that rural communities could significantly reduce rodent populations through the daily trapping of rodents with kill traps and multi-capture live traps. These interventions were replicated across villages and the results were compared to places where no rodent interventions occurred (untreated control sites) in order to scientifically analyse the cost-benefits of EBRM. Farmers readily observed the benefits accrued to their families and carried on the rodent management activities after the project completed.

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*		

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

Three distinct agro-ecological habitats in Zambezia Province were involved in the project so a wide range of crops were grown by small-scale farmers; nearly all were significantly damaged by rodent pests in the field and during storage. The main commodities focussed upon were rice and maize as the main staples stored. Coconut and paprika were also focussed upon because they were relatively higher value crops that were being promoted to small-scale farmers, and where significant rodent damage was observed pre- and post-harvest. Several other crops grown by subsistence farmers, notably squash, papaya and cassava also showed significant damage levels.

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*	*x*	*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*	*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**).*
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 theme of integrated pest management in crop production (including insects, weeds, diseases) would be a natural clustering for which the project research outputs could be integrated. It is expected that similar extension approaches for different pest problems for crops such as maize could be sustainably managed through a common platform. However, most other crop pests are not as mobile or polyphagous as rodents. Therefore, management strategies which narrowly focus on a single crop may fail to mitigate rodent population dynamics in the same way as other relatively geographically restricted pest problems. (e.g. R8220, 8406, 8422, 8453,7566, 8219, 7405, 8445, 8030, 8452, 8409, 8233, 8412, 6519, 7778, 8447)

Outputs would also be relevant for clustering around post-harvest protection and marketing by reducing rodent access to stored food at household levels through preventing contamination and damage to stored grain and food produced for sale, including the sale of fruits and vegetables and post-harvest processing and handling where rodent contamination may enter small- and large-scale processing systems. (e.g. R8263, 7543, 6331, 6658, 6502, 6684, 8265, 7486, 6684, 7442, 8433, 8272, 7530,)

In relation to post-harvest issues, rodents are well-known reservoirs for many microbiological contaminants such as salmonella and can contaminate food and water sources used by people and animals as well as vectoring zoonotic diseases that affect livestock production and human health. In this regard rodents could be clustered with platforms on 1) livestock health and production, 2) water utilisation/sanitation management, 3) or maternal and child health programmes. (e.g.

R8306, 8495, 6608, 8151, 7596, 7597 8152, 7359)

Farmer training platforms focussed on subsistence level or food insecure small-holders can easily benefit from knowledge on how to manage rodent pests and making use of available technology. Generic issues on population dynamics, preventive management, damage thresholds and monitoring are applicable to the management of any crop pest. Platforms that target the service providers and policy makers that deliver knowledge to farmers at a community level (NGOs, national extension) would be highly appropriate. (e.g. R8299, 8219, 8296, 8041, 8219, 8417, 8341, 8429, 8447, 8438)

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)**.*

Validation was carried out at three different levels: 1) by farmers and end users based in rural agricultural villages, 2) by extension staff and 3) scientific staff.

Scientific validation occurred through ensuring that trials were replicated across households, fields and villages and through comparisons between experimental treatment interventions and untreated control situations. For example, some villages would be introduced to intensively trapping rodents and the results obtained there would be compared to other villages where no rodent management interventions occurred (e.g. traditional rodent management only). This allowed statistical comparisons to be made based on changes in rodent population dynamics and to rodent damage levels.

Validation by end users occurred through the involvement of farmers and households in the research trials. Farmers collected data on the numbers of rodents captured, and made observations to changes in the rodent damage incurred (e.g. less damage to stored maize stocks and food supplies lasting longer than usual). Farmers noted that there were very few rodents around after the implementation of intensive trapping and this benefited their lives in several ways, particularly fewer people bitten by rodents, reduced food storage losses and reduced field crop damage.

Extension staff were involved in the trials, making the same validations as farmers and scientists,

and further validated the outputs by extending similar activities to other villages in the area after the completion of the project.

*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 project took place in three districts of Zambezia Province, Mozambique (Namacurra, Gurue and Morrumabala Districts). Entire village communities were targeted where the main activity was subsistence level farming of maize, rice and cassava along with various fruit and vegetable crops, coconut and sugar cane. The villages were relatively remote and food-insecure with limited market access. Formal education was extremely limited, >90% illiteracy.

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 rodent research was co-funded by World Vision through the Zambezi Agriculture Development Programme (ZADP) funded by DFID and other development programmes funded by USAID. The ZADP continued to promote the project outputs throughout the province until the programme was disbanded in 2004. Since then World Vision's activities in Zambezia Province have been greatly reduced with its local staff and infrastructure dispersed. Between the ending of the rodent project in 2002 and the end of the ZADP, World Vision was trying to replicate rodent management interventions in a number of villages. However, it has not been possible to find out the actual number of villages through current or ex-staff. It does not appear that the rodent outputs were transferred to other World Vision programmes after the demise of the ZADP.

Non-DFID research that has taken place in Zambezia in more recent years (EC-funded ratzooman project) has revisited many of the original localities where project outputs were developed, showing that there has been considerable maintenance and spread of knowledge on improved rodent management in the Morrumbala District of Zambezia Province, probably due to USAID-funded activities carried out by World Vision. However, usage has not be systematically quantified.

*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 outputs were developed in six villages in the districts of Gurue, Morrumbala and Namacurra in Zambezia Province, Mozambique. At least a dozen villages in Morrumbala are now intensively

trapping rodents at a community level based on the project outputs, including the original villages. It is not known whether villages in Gurue and Namacurra have continued in their rodent management. Although World Vision through the ZADP was working in several hundred rural communities throughout Zambezia, it is not known to what extent the rodent outputs were reliably promoted.

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

The scale of use remains limited to a handful of villages, but it is continuing to spread through word-of-mouth by farmers in at least one district of Zambezia Province. There have been no systematic studies to assess scale of use since the end of the project.

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).***

Rural development is almost exclusively carried out by NGOs in Mozambique. Although they can work effectively, they are subject to sometimes fickle funding arrangements, creating localised development vacuums when they pull out of an area due to a lack of funding (as occurred with World Vision and the ZADP). There have been national efforts to improve the level of coordination among NGOs, but coordination, collaboration and capacity building of government-managed programmes requires a continuous effort. Despite these problems, NGOs continue to be the most important platform for promoting knowledge intensive agricultural development programmes in Mozambique, and there are few alternatives that would function for promoting the rodent management outputs.

In general, ecologically-based rodent management is knowledge-intensive, and successful adoption requires farmer education about basic rodent biology and behaviour and the way management strategies work. So programmes such as IPM farmer groups, farmer field schools and training programmes operated by NGOs or government will all be effective in conveying appropriate rodent management knowledge. These existing structures can all be used to improve the uptake of ecologically-based rodent management. Training of trainer programmes are one way to increase capacity, but these need to be effectively managed to ensure messages are not degraded. An important feature of ecological rodent management is that many actions are best performed at the community level. In this regard, a degree of organisation and trust are usually required which is often best served by NGOs who generally work with communities on a broad range of issues.

Strategies to educate farmers and raise awareness could be supplemented through simple messages to promote long-term community-wide intensive trapping programmes using effective traps. Low literacy rates in Mozambique would suggest that radio programmes would be the most effective mass media option. As will be the case with all knowledge-intensive agricultural interventions, advertising can get basic messages across that are then backstopped by extension

agency programmes.

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.

Before the project, rodent pests and their damage went largely unchecked in the project target villages. Poisons were not available while traps were usually self-made and unreliable. Environmental benefits through the application of the project resulted in significantly reduced rodent pest populations, reducing rodent contamination and damage to throughout rural communities. Unfortunately the project did not run long enough to determine whether the removal of plague susceptible rodent species from rural communities affected the prevalence of plague among the human population.

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

Rodenticides are not widely used or available in Mozambique. As rodents are consumed by people, poisons should not be recommended. Trapping rodents does increase the supply of rodent meat available. However, as people could contract diseases from consuming rodents, it is important to understand how rodents are prepared for consumption and potentially modified to ensure disease organisms are killed.

Intensively trapping rodents should decrease the prevalence of rodent-vectored diseases, particularly as transmission is correlated with rodent population abundance in most diseases. However, bubonic plague is an exceptional disease with highly complex transmission routes that remain poorly understood even in the best-studied foci in the United States and Central Asia. It is, therefore, not understood whether intensive trapping could exacerbate plague transmission where it is endemic, and this potential should be considered when monitoring output promotion schemes.

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)***

Rodent populations are well-known to outbreak following natural disasters such as flooding. Disasters can result in sudden large increases in food and shelter while knocking out predators which take longer to recover. Commensal rodents are particularly adaptable to changing

ecologies, but are significantly influenced by climate, particularly rainfall and temperature where warmer and wetter conditions will favour higher rodent populations. Climate change may, therefore, create some areas with more severe rodent problems, while other areas find fewer problems. Changing cropping systems may be driven by climate or technology (e.g. irrigation removing fallow periods). Climate change has been reported to lead to the geographic expansion and prevalence of rodent-borne diseases (e.g Lyme disease in northern USA and southern Canada). This is an emerging area and little is known about the potential Impact of global climate change on rodent-disease-human interactions in developing countries. End users which are confident in managing rodent populations using EBRM will have the capacity to adapt their strategies to manage rodent populations and their impacts as their cropping systems change.