Saving fish from flies and beetles

RIU

Validated RNRRS Output.

Insects—flies and beetles—destroy vast amounts of fish in developing countries while it is being processed or stored. This means less fish for food, poorer nutrition, and lower incomes. Attempts to control insects have met with mixed success, mainly because people don't understand how, where and when insects infest fish. A study bringing together all that's known about insects that damage fish vastly improves understanding. Now that processors are learning what to do to keep pests away from fish they are benefiting from fewer losses, better prices and lower costs. The reference on insects is being widely referred to by development and extension staff in Southern India, Africa, Uganda and Tanzania, as well as by NGOs and processors.

Project Ref: **PHF12:**
Topic: **5. Rural Development Boosters: Improved Marketing, Processing & Storage**
Lead Organisation: **The Grimsby Institute of Higher & Further Education, UK**
Source: **Post Harvest Fisheries Programme**

Document Contents:

Description

PHF12

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

Geographical regions included:

India, Southern Africa, Tanzania, Uganda,

Target Audiences for this content:

Fishers, Processors,

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.

A review of insect infestation of traditionally processed fish in the tropics

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

Post Harvest Fisheries Research 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.

R6824. Mike Dillon Associates Ltd., now Manufacturing Improvement International Ltd., a subsidiary company of Grimsby Institute of Further and Higher Education. Contact person Dr John Esser.

*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.*

Johnson, C. & Esser, J. (2000). *A Review of Insect Infestation of Traditionally Processed Fish in the Tropics.* Department for International Development, London. 92pp.

Insect infestation of **cured fish** by **blowflies** and **hide beetles** is an important cause of **post-harvest losses** in many developing countries. Fish is susceptible to attack by insect **pests** throughout processing and storage. The principal pests are blowflies (**Diptera: Calliphoridae** and **Sarcophagidae**) and hide beetles (**Coleoptera: Dermestidae** and **Cleridae**). Losses caused by infestation are:

- Physical, whereby the amount of fish available for human consumption is reduced
- Economic, whereby the physical loss depletes the amount of fish available for sale and / or the price commanded for insect damaged fish is below that for undamaged fish
- Nutritional, which is a direct consequence of the above and causes the retail value of fish to increase beyond the purchasing power of the poor.
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Several infestation **control measures** have been evaluated in the past with varying levels of success. The principal limitation of these methods has been that the underlying cause of infestation has rarely been addressed. Despite the considerable amount of research into devising suitable insect control measures for use on cured fish, few, if any systematic studies of the modes and influences of infestation have been conducted. The likelihood of

infestation occurring is thought to be influenced by the interaction of many factors. Some, such as site, season, climate and site location are largely beyond the control of processors. Others, however, appear to be associated with processing practices and procedures. This raises the possibility of optimising the process in order to minimise the infestation risks posed. Applying appropriate measures to reduce external and processing risk factors can enable individual processors to limit the root causes of infestation at their own processing sites, thereby achieving effective control. The **systems based approach** to controlling blowfly infestation, which was another output of R6824, utilises this approach and has been demonstrated to be effective in the field. Application of the systems based approach requires a detailed and holistic understanding of the target insect pests and biology of infestation. Whilst much of the information necessary to develop such understanding is available in peer reviewed journals and conference proceedings, a significant amount resides in unpublished reports etc and is difficult to access. The insect infestation review pulls together the total body of information on insect infestation of cured fish and provides a comprehensive review of available information on blowfly and beetle infestation respectively and includes information on control measures either in current use, or evaluated by research programmes. The review concludes by discussing how best to apply this information to the effective and sustainable control of insect infestation in traditionally processed fish.

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

Traditionally processed salted, salted – dried, dried and smoked fish. The systems – based approach has the potential to be applied to other traditionally processed animal products that are susceptible to blowfly infestation. The insect infestation review contains information that can be applied to developing infestation control strategies for other food commodities. Blowflies are important vectors of parasites and pathogenic micro-organisms. The infestation review therefore also has public health applications.

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		

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**).*

The infestation review is a source of essential information for researchers and development workers involved in projects aimed at assisting small-scale fish processors reduce post-harvest losses through controlling insect infestation. Its purpose is to inform the development of effective and sustainable infestation control strategies that are appropriate to the processors themselves. The content of the Trainer's Guide to Controlling Blowfly Infestation of Traditionally Processed Fish, an output of project R7971, was largely derived from the Insect Infestation Review and provides development workers with the tools to both apply this knowledge to controlling insect infestation in the field and develop the fish processors indigenous knowledge to empower them to take control over the situation themselves – the ultimate outcome being poor fish processors having the knowledge and understanding to apply loss reduction techniques that are appropriate to the socio-economic milieu in which they operate. It would therefore be logical to cluster the insect infestation review with the trainer's guide to controlling blowfly infestation. This would in turn link the review to the outputs of the PHFRP Fish Loss assessment and Control (FLAC) initiative.

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.

This output should be clustered with the Trainer's Guide to Controlling Blowfly Infestation of Traditionally Processed Fish – project R7971.

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)**.*

An independent review of the projects that resulted in the infestation review was conducted by consultants Ivor Clucas and Gerald Runyoro. The findings are presented in Clucas, I. *et al* (2000) *An evaluation of DFID funded of research into insect infestation control in cured fish.* Unpublished report. Natural Resources Institute. 36 pp. The

review consisted of studies of research related papers and reports in the form of a desk study, discussions with research workers and stakeholders and a mission to Tanzania to visit sites in where the research had been undertaken.

Regarding project impact on the processors, the reviewers commented:

"The fact that the primary processors had been involved in the research work both as participants and as sources of local information and knowledge seems to have acted as stimulus for them to take up innovations……As a result fish is less contaminated with dirt, processors say they have reduced losses, and sanitary conditions around the processing site have improved. Processors indicated that their losses of fish had been reduced, prices had increased marginally for better quality fish and that the amount of salt needed had been reduced by 25%. These changes are more than enough to repay the costs of purchase and maintenance of raised racks needed for salting and drying."

With respect to the insect infestation review, the consultants acknowledged that the document brought together into one document a wide range of information and provided the foundation for the systems based blowfly control strategy that was successfully field tested in project R7971. They commented it deserved to get wide circulation and should be published as an output of the research programme for as wide an audience as possible. Following this recommendation, the infestation review was re-published as an output of the Post Harvest Fisheries Research Programme Fish Loss Assessment and Control (FLAC) initiative and distributed in Africa, South Asia and South East Asia.

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 review team visited Tanzania in 2000. Locations visited included Mwanza on the shore of Lake Victoria, and Bagamoyo is which located on the coast, north of Dar es Salaam in Tanzania during 2000. The stakeholders consulted are divided into two broad groups, those that were involved in conducting the research itself and those producers of salted-dried fish who stand to gain by the project outputs. At the time of the review, most of the producers located in Mwanza had recently entered the industry and consisted of approximately equal numbers of males and females. Raw material in the form of reject fish and by-products was sourced from processing establishments producing Nile perch fillets for the export market. In Bagamoyo, the producers were predominantly males processing salted – dried marine fish species.

Uptake of the project outputs has also been investigated by Integrated Coastal Management (ICM) in India during October-November 2006 through email communication with several people e.g. researchers, development workers, administrators, trainers and traditional fish processors), face to face interactions with project stakeholders and visits to fish processing sites. The feedback generated by this process also contributes to the validation of research outputs.

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 insect infestation review contains detailed background information necessary to inform the development of effective insect infestation control strategies. The content of the trainers guides to controlling blowfly infestation were largely derived from the insect infestation review.
Central and state organisations such as the Central Institute of Fisheries Technology (CIFT) and the Andhra Pradesh State Institute of Fisheries Technology (SIFT) are reported to have found the infestation review to be a useful tool in developing understanding of the biological aspects of blowfly infestation and has thus helped them in their training programmes. This knowledge has also been reported to have helped development workers (working in conjunction with fish processors) in developing some innovative and locally-based control measures and refining existing measures to suit the local context.
For private sector organisations like ICM, the infestation review has been useful in undertaking training programmes at the processors' level on behalf of development agencies and also in undertaking studies on developing appropriate interventions for improving product quality and forging stronger market linkages..
The review is also reported to have found use in formal research streams in entomology and, to a lesser extent, in fisheries, and is considered required reading for the researchers interested in the subject.

*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).***

CIFT in Kochi (Kerala) and SIFT in Kakinada (Andhra Pradesh) have used the infestation review in their training programmes regularly. There are anecdotal references to sections of the review being used in teaching graduate and post-graduate fisheries students in the Andhra University at Visakhapatnam (Andhra Pradesh) and the College of Fisheries in Tamil Nadu. That a number of institutions working all along the coastal areas of southern India have become involved in training fish processors and development/extension workers in their respective areas of work indicates that the outputs of the review are fairly widespread in most coastal states in Southern India. In Africa, the review is being used by the Department of Fisheries and the Food Science and Technology Research Institute in Uganda, the Mbegani Fisheries Development Institute in Tanzania and INFOSA, the South African Development Community (SADC) regional office for INFOPECHE in southern Africa. The review has been widely circulated to universities and training institutes in Africa, south Asia and south east Asia, but it has not been possible, in the time available, to obtain feedback on actual extent of current usage.

*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 current 'direct' use is restricted to research and training institutes, but interactions with various people indicate wider spread of the knowledge contained within the review and possible changes in behaviour as a consequence. Considering that the review led to developing control strategies for reducing infestation of fish, one proxy indicator could be the extent of uptake of the control measures themselves. Even here, one can only

try to obtain the numbers of people trained by different institutions (a laborious and time-consuming task) because it would be difficult to determine how the spread of knowledge translated into changed behaviours or reduced infestation at the fish processors' level without undertaking further detailed studies.
The faculty at SIFT cite a few cases where the processors whom they trained have not only developed a remarkable understanding of the biology of blowflies and its implications for their work, but also became extension agents themselves, even explaining to trainee-processors (who were brought from other areas for exposure or training on loss reduction methodologies) how they could reduce infestation-related losses due to a better understanding of its life cycle. That some of these processors-turned-trainers had actually taken part in implementing the research in controlling infestation may have been responsible for their enthusiasm to disseminate the knowledge far and wide. According to SIFT, this highlights the need for more demonstration projects along the coastal areas.

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 systems based blowfly control strategy was tested at a time when the government of India was developing increased interest in addressing the needs of fish processors and other post-harvest workers (especially women). Awareness of the impact of blowfly infestation (among others) has led to an enthusiastic adoption by government and some civil society organisations of blowfly control strategies which were themselves the direct outcome of the infestation review. This adoption has resulted in delivery of training programmes on reducing losses through better methods of controlling infestation to traditional fish processors and development and extension workers. In some of states, this also led to programmes providing financial support to enable processors to acquire the necessary tools.

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).***

In India, the training being provided by organisations such as SIFT, CIFT, state colleges of fisheries and private sector organisations like ICM is the main pathway for promotion of the research outputs and it can be said that the most active promotion is currently taking place in Andhra Pradesh state, though less vigorously in Orissa, Kerala and Tamil Nadu states. SIFT has developed posters delineating the various stages of blowfly infestation and is aiming to produce large numbers of these for wider dissemination, which will help the research outputs reach 1000 villages in Andhra Pradesh state alone. The Vizag centre of the Marine Products Export Development Agency (MPEDA) also promotes the outputs through training as well as posters. Fishers' organisations such as the District Fishermen Youth Association in Vizag also regularly undertake training programmes on biology of blowflies and its relevance to infestation issues. Apart from these, ICM responds requests, mostly from professional researchers working with universities and research institutes, for copies of the infestation review.

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)****.*

The infestation review is only published in English, which restricts its accessibility to many development workers. Being in book form, it also tends to be simply shelved and easily forgotten, which has been the case with many institutional stakeholders. Lack of more effective dissemination tools, such as a video focusing exclusively on the life history of blowflies and their impact upon the processed fish restricts the scope for processors to relate to the ideas at a personal level.
At the level of development workers, its effectiveness as a standalone document is much less than when it is read in conjunction with the manuals on blowfly control strategy, which provide a usable tool to address a practical issue.
Lack of systematic dissemination strategies and the institutional mechanisms to promote and monitor the usage of the outputs restrict scope for assessing the effectiveness of the outputs in addressing the needs of the processors or to develop better tools to improve the dissemination strategies.

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).***

- Produce the review in vernacular languages with more illustrations and disseminate them amongst development workers in a systematic and monitored way.
- Produce a video-cd on the blowfly life cycle and its relation to fish processing activities and dub it into different vernacular languages. Although the project has already produced a video-cd discussing control strategies, there is a need to make the life cycle aspects more explicit in order to drive the message home more effectively as well as to help the processors (and development workers) develop measures of their own to address the issue rather than stick to a standard set of interventions. The video-cd should also need to target the general public on the hygiene and nutritional aspects, which is necessary in order to improve the general environment in the coastal areas and address the macro-level factors leading to infestation.
- Undertake demonstration projects targeting processors in more locations to disseminate awareness about blowfly biology and its relation to infestation
- Identify and promote training/extension organisations such as SIFT as the nodal agency for undertaking future dissemination on a formal basis and extend technical, advisory, financial and infrastructure support to them for being able to do so

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).***

The review has only been published in hard copy which makes distribution expensive and time concerning. Whilst a large number of copies have been distributed using conferences, workshops and training courses as dissemination vehicles, it is recognised that this is insufficient to ensure widespread availability. One way to increase accessibility would to be post the review on appropriate websites.

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.

No studies on impact on poverty of this project have taken place.

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*

Being a research output aimed at adding and disseminating knowledge, as opposed to providing direct action to address the needs of the poor, it is impossible to assess in any meaningful way, how the poor may have benefited from this particular research output.

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 project outputs, if implemented on a sufficiently large-scale, can have a direct positive environmental impact in areas where traditional fish processing takes place. At the individual processor level, benefits in terms of improved hygiene and cleanliness in the processing areas have become noticeable in the locations where the

research was conducted. Considering blowflies (and other flies in general) have a direct impact upon the health of the people (especially children), the implementation of any strategy to reduce their numbers can be considered to have a direct benefit in terms of publid hygiene, although such changes are likely to become apparent only in the long term. The outputs also provide safe alternatives to the widespread use of dangerous and inappropriate insecticides in controlling insect infestation of cured fish. Reduction in the use of insecticides in fish processing villages carries both environmental and public health benefits.

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

No

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)***

To the extent that the uptake of the outputs reduces their economic vulnerability and improves their resilience to withstand risks more confidently, the project could potentially increase the capacity of the poor people to cope with major changes. However, these changes are likely to be indirect and long-term..
