

Getting to grips with fish losses

RIU

Validated RNRRS Output.

People can now use a new computer programme to enter local data and work out how best to prevent losses in a particular fish market chain. They can also see the effects of steps that could be taken to reduce losses. Most small fishers cannot freeze or chill the fish they catch. This means it soon spoils and fetches lower prices than fresh fish. Smoking, drying or salting preserves fish for longer but even then it's often damaged by poor processing, storage or transport. Tested in Ghana, India and Uganda, the programme has been used in Cote d'Ivoire and Tanzania and is now spreading in the Philippines. The potential impact on livelihoods is large as returns per 100 kilograms of fish can rise by US\$5-6.

Project Ref: **PHF09:**

Topic: **7. Spreading the Word: Knowledge Management & Dissemination**

Lead Organisation: **Natural Resources Institute (NRI), UK**

Source: **Post Harvest Fisheries Programme**

Document Contents:

[Description](#), [Validation](#), [Current Situation](#), [Environmental Impact](#), [Annex](#),

Description

PHF09

Research into Use

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Geographical regions included:

[Cote d'Ivoire](#), [Ghana](#),
[India](#), [Philippines](#),
[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.

Title

Electronic tools for fish loss assessment and reduction

Working Title

FISHLOSS

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

Post-harvest Fisheries Research Programme (PHFRP)

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.

R5027: 1992-1997 Quantification of post harvest fisheries losses

R6817: 1997-2000 Wet season post-harvest losses in the traditional fish processing sector of India

R7008: 1997-2000 Field and desk-based tools for assessing fish losses: adaptation and validation in West Africa

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Dissemination

2000 Dissemination Conference, Ghana (NRInt. code ZD0034)
2000-2001 Dissemination India: Research Manual (NRInt. code ZD0035)
2001 Fish loss assessment in India (NRInt. code ZD0036)
2000-2001 Collaboration with ICLARM: Dissemination of FishLoss (NRInt. code ZD0037)
2001 Fish loss assessment and control workshop in Uganda (NRInt. code ZD0055)

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 soon as fish have been caught, the quality of the fish begins to deteriorate. Such deterioration can be minimised if the fish are kept on ice or, better still, frozen completely. However, most **artisanal fisherfolk** do not have the means to cool their catches on-board their boats or after landing. Thus, various processes are used to preserve the fish which include drying, smoking and salting. Once treated, the fish then usually have to be transported to markets some distance from the landing points for sale. Fish bought at the port's markets may then be transported inland and re-sold one or more times. At each stage of such chains, there are occasions when the fish will be subject to factors that cause further deterioration or damage.

The cluster of outputs involved investigations of such losses in both physical and monetary terms to identify the stages when the most effective **intervention** methods could be made. The outputs ("FISHLOSS") included two technologies packaged on a single CD, comprising a relational **database** on **post-harvest fish losses** in developing countries derived from the literature. The database allows the user to store their own data as well and thus any data extracted from it are usable as inputs for the second output. The latter is a **computer model** for (a) estimating overall losses, given data for each stage, and (b) for modelling the effects on **loss reduction** of intervention(s) at different stages on the **fish processing** and **marketing chain**. Both **physical losses** (fish or product that is discarded and not sold because of spoilage, damage, insect infestation etc.) in terms of weights lost and **quality losses** (fish downgraded and sold for a lower price than it could have been sold for if the quality was better) were assessed and converted into financial losses (the value of quality lost is the difference between the price attained and the price the fish would have sold for, had its quality been good). Losses incurred using different capture methods, or during processing or transport could thus be quantified and analysed holistically to determine the combination of methods and interventions that would minimise losses.

The methods are designed for use by intermediary organizations such as research institutes, extension agents and Non-Governmental Organisations (NGOs) in conjunction with poor post-harvest fisheries stakeholders. In addition, a service was provided by conducting training courses on the model in Ghana, India and Uganda.

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

The only commodity involved was fish. However, the database design and the modelling approach adopted could both be adapted for assessing post-harvest losses of any biological product and applied to the assessment of losses associated with other foodstuffs such as fruit, vegetables, crops and meat.

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).*

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 outputs (Questionnaire Loss Assessment Method (QLAM) R5027/ R6817/R7008; Informal Fish Loss Assessment Method (IFLAM) R5027/ R6817/ R7008 and Load Tracking (LT) Method R5027/ R6817/R7008) from a related cluster "Field-based methods for fish loss assessment" were used to gather data for the database and during the development of the models discussed here. Furthermore, the model development informed field-workers' decisions on methodologies and data collection protocols. Value could be added to the FISHLOSS database by incorporating all of the datasets collected during fieldwork by the "Field-based methods for fish loss assessment" cluster into it and thus bringing the database up-to-date.

Value could be added to the outputs by linking the economic conclusions of the models with those obtained from the post harvest livelihoods assessment tool (PHLAT, R8111) and a guide to the analysis of fish marketing systems using a combination of sub-sector analysis and the sustainable livelihoods approach (R7969). In addition, means to achieve recommended interventions would benefit from the value added by the processes (Log-It, Ice-it and Cleanse-it) developed by another related cluster (R6959/ R5027/R6817/ R7008). An online version of the database and models would allow wider access to, and interaction with, the outputs. Information obtained recently from use of the outputs of the "Field-based methods for fish loss assessment" in additional areas (e.g. by R6817 in India) could add value to the FISHLOSS outputs by providing quantitative backing to suggested loss reduction interventions.

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 data-base was valued by the International Center for Living Aquatic Resources Management (ICLARM), as they asked for a version to be made available on their website, linked to the FishBase system (<http://www.fishbase.org/search.php>) which provides information on 29500 species of the world's fishes. ICLARM has now become The WorldFish Center and has been a Consultative Group on International Agricultural Research (CGIAR) institute since 1992. Technical software problems prevented the uploading from being achieved before the project came to an end, but it could still be done. The data-base was also given to trainees at workshops in Ghana, India and Uganda who tested it and reported favourably on it. The database was described and disseminated in an international publication (Smith *et al.* 1997).

The computer model was developed using data on Nile Perch *Lates niloticus* from Tanzania. It was validated by:
(1) a peer-review process and published (Ward and Cheke, 1997; Cheke and Ward, 1998);
(2) use of a dataset from Côte d'Ivoire, and
(3) use of datasets in a generalised version.

In each case improvements and modifications were made. Finally, the software was handed over to trainees at workshops in Ghana, India and Uganda who tested it reported favourably on it. Recommendations based on the model's results were made for interventions in Côte d'Ivoire and Tanzania to reduce losses. If taken up, the impacts would have led to financial gains of up to US\$5.5 per 100kg of fish for artisanal fish processors, mostly women, in Côte d'Ivoire; and to improvements in the quality of fish, and hence enhanced prices of up to US\$6 per 100kg of fish, reaching markets in Dar-es-Salaam after landing at Lake Victoria.

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**).

Between 1997 and 1998 the outputs, based on Tanzanian data, were validated by a research team in Côte d'Ivoire in conjunction with private sector small-scale (artisanal) post-harvest fisheries stakeholders. The methods were applied in Côte d'Ivoire, where the outputs were validated by the research team in conjunction with marine fishing communities in Vridi-Sir, Vridi-Ako and Vridi-Zimbabwe fishing villages and where the processed fish were sold at the Chicago smoked fish wholesale market, all within Abidjan and its environs. The choice of communities was made by the research team and the marine artisanal section of the Centre for Oceanographic Research, Abidjan. The data collected mostly concerned *Sardinella* spp. and were analysed using the model during field work in Côte d'Ivoire in March 1998. The results showed that by changing the mesh sizes of smoking grills, and by using secure packaging for transport, savings of US\$5.5 per 100kg of fish could be made. The conclusions were validated again and supported by experimental data collected later in 1998 by the University of Cocody-

Abidjan. The value of the savings that could be made was, however, then found to be seasonal, with fewer losses in the wet season.

Current Situation

C. Current situation

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

No up-to-date information is available but the outputs are probably being used by stakeholders in Côte d'Ivoire, Ghana, India, the Philippines, Tanzania and Uganda to:

- Build capacity of national researchers;
- Generate baseline data to measure the likely impact of interventions;
- Develop understanding of the significance of post-harvest fish losses;
- Identify key post-harvest fish losses;
- Identify interventions;
- Build capacity of stakeholders in the use of quantitative methods.

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**).

Requests for copies of the model and associated documentation have been received within the last year from Tanzania and the Philippines. In addition, copies of the outputs were disseminated for use by fishery workers in Ministries and Universities and private companies in Côte d'Ivoire, Ghana, India, the Philippines, Tanzania and Uganda.

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

See 13.

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 PHFRP through its FLAC initiative and support for capacity building in the outputs at workshops in Ghana, India and Uganda was instrumental in getting the outputs known and adopted by post-harvest fisheries departments in Africa and Asia. The outputs were presented at a workshop organised by FAO in Senegal during 10-13 December 2001 and the FAO are in a position to create an innovative platform for further uptake of the outputs in combination with those of the Fish Loss Assessment and Reduction – field based methods. The FAO

Code of Conduct for Responsible Fisheries (CCRF) could include details of quantitative fish loss assessment methods as well as qualitative methods. FAO is a major player in developing post-harvest fisheries and has been interested in understanding and reducing post-harvest fish losses for nearly 40 years. National fisheries development policy in many countries highlights the need to reduce post-harvest fish losses. As a result of national policies, Departments of Fisheries and national research centres in many countries are committed to fish loss reduction.

Key factors contributing to the success of the capacity strengthening was the attendance at the workshops of practitioners of post-harvest fisheries management and opportunities for them to use the outputs themselves and add their own data to the systems provided for them. The validation of the outputs in collaboration with the stakeholders led to the outputs being well adapted and relevant for use and application in the fisheries sectors of countries in Africa and Asia.

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.

By promoting loss reduction, the outputs will promote greater sustainability of fish stocks as a result of increased efficiency in means used to exploit fish populations. Loss reduction measures will lead to reduced wastage and hence less material available to be exploited by disease-carrying flies. Similarly, simple measures such as ensuring that processed fish are packaged before transport will minimise opportunities for flies to infest the products. Promotion of greater efficiency in the use of smoking kilns will reduce the pressure on firewood stocks. Promotion of fish consumption will be beneficial to the health of consumers.

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

None, except that advocacy of air transport to replace transport by road or rail to minimise losses in the Tanzanian fishery linking Lake Victoria to Dar-es-Salaam would be contrary to initiatives designed to minimise the impacts of anthropogenic climate change.

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)

Climate changes will influence the productivity and species make-up of fisheries. Application of the outputs will help intermediary organisations, as well as the poor themselves, to understand change and how fish utilization

practices may be affected. In turn, opportunities to mitigate negative changes can be identified and implemented, but see under question 25. Many post-harvest fisheries stakeholders, particularly those reliant on inland fisheries, are also engaged in agricultural activities. By improving the efficiency and profitability of post-harvest fisheries, the outputs could help to compensate for reduced yields and the effects of natural disasters on agriculture.

Annex

References

CHEKE, R. A. and WARD, A. R. (1998) A model for evaluating interventions designed to reduce post-harvest fish losses. *Fisheries Research* 35: 219-227.

CLUCAS, I. and STIRRAT, J. (2005) Impact assessment of two seedcorn activities in Ghana. Post-Harvest Fisheries Research Programme. Interim Report.

FAO (2002). The State of World Fisheries and Aquaculture. FAO Information Division, FAO, Rome, Italy.

MCGOODWIN J. R. (2001) Understanding the cultures of Fishing Communities: A key to fisheries management and food security. FAO, Rome.

SMITH, M. C., VENN, J., CHEKE, R. A. and WARD, A. R. (1997) A relational database of post-harvest fish losses. *Naga*, ICLARM Q. 20:8-11.

WARD, A. and CHEKE, R. A. (1997) Modelling post-harvest fish losses. *Aquaculture News* no. 24, December 1997, pages 22-23.
