

**FIELD AND DESK BASED TOOLS FOR
ASSESSING FISH LOSSES: ADAPTATION
AND VALIDATION IN WEST AFRICA.**

FINAL TECHNICAL REPORT ON RESEARCH PROJECT R7008

REPORT 2564

NATURAL RESOURCES INSTITUTE, CHATHAM, UK

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For citation purposes:

WARD A. R. (2000) Field and Desk Based Tools for Assessing Fish Losses: Adaptation and Validation in West Africa. Final Technical Report on Research Project R7008. Report 2564 Natural Resources Institute, Chatham. 45 pp.

This publication is an output from a research project funded by the Department for International Development of the United Kingdom. However, the Department for International Development can accept no responsibility for any information provided or views expressed.

[DFID Project R7008 “Post Harvest Fisheries Research Programme”]

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Acknowledgements

The author wishes to acknowledge the contributions made by all those involved in R7008. Especially, Dr Demba Yeum Kane and Joseph Ndenn of the West African Association for the Development of Artisanal Fisheries (WADAF), Dr Gbola Akande of the Nigerian Institute for Oceanography and Marine Research, Dr Paul Anoh of the University of Cocody, Côte d'Ivoire; Boubacar Diakité of the Institut du Technologie Alimentaire, Senegal; Nicholas Ntiamoah research co-ordinator, Ghana; Dr Amadou Tall of INFOPECHE; Derrick Akintade, DFID; Professor Robert Cheke, Dr Jon Venn, Ulrich Kleih and Dr David Jeffries of the Natural Resources Institute.

Abbreviations

CCRF – Code of Conduct for Responsible Fisheries
CNPS – Collectif National des Pecheurs du Senegal
DFID – Department for International Development
EU – European Union
FAO – Food and Agriculture Organization
FLAC – Fish Loss Assessment and Control
FRI – Food Research Institute
ITA – Institut du Technologie Alimentaire
ICLARM – International Centre for Living Aquatic Resources Management
IFLAM – Informal Fish Loss Assessment Method
LA – Livelihoods Approach
LT – Load Tracking
MS - Microsoft
NGO – Non Governmental Organisation
NIOMR – Nigerian Institute for Oceanography and Marine Research
NRI – Natural Resources Institute
PHFRP – Post Harvest Fisheries Research Programme
PRA – Participatory Rural Appraisal
QLAM – Questionnaire Fish Loss Assessment Method
RNRKS – Renewable Natural Resources Knowledge Strategy
RRA – Rapid Rural Appraisal
SFLP – Sustainable Fisheries Livelihood Programme
UNDP – United Nations Development Fund
WADAF – West African Association for the Development of Artisanal Fisheries
WARF – West Africa Regional Fisheries

Executive Summary

The development of systematic and practical tools which can be used to assess post-harvest fish losses and assist the user to plan appropriate mitigation measures has been a key focus of the Department for International Development's (DFID) Post Harvest Fisheries Research Programme since the early 1990s. The reason for such research being that loss reduction will contribute to the improved utilisation of resources, improved food security, and improvement in the livelihoods of those working in the post-harvest sector.

Based in Tanzania, Project R5027 (1993-96), developed a number of prototype tools: field-based loss assessment methods; a database; and two software models. This project, R7008 (1997-2000), validated and further developed the field-based methods, database and Predictive Model.

Activities

Field validation was undertaken in collaboration with the EU funded West African Association for the Development of Artisanal Fisheries (WADAF) and its partner organizations in Côte d'Ivoire, Senegal, Ghana and Nigeria. Following evaluations of the research by the Food and Agriculture Organization (FAO) and DFID a final phase of development of the field-based methods was undertaken in Nigeria.

Outputs

Final outputs from the project are:

- a **manual** describing three field-based methods for assessing post-harvest losses;
- a **database** (FishLoss) of information on post-harvest losses;
- an MS Excel **model** (Post Harvest Fish Loss Model v1) which enables the user to mimic the effect of loss reduction interventions.

Each of the three methods described in the manual has a specific purpose and use, enabling the user to have a degree of choice depending on need. The Informal Fish Loss Assessment Method (IFLAM) is based on Participatory Rural Appraisal (PRA) and provides qualitative data on a wide range of issues related to loss. It fosters participation of primary stakeholders in the development process and the use of indigenous knowledge. Load Tracking (LT) produces statistically representative quantitative data on loss levels during handling, processing, distribution and marketing. The Questionnaire Loss Assessment Method (QLAM) provides quantitative data on a wide range of issues and enables validation of data over a wide geographical area.

Dissemination

Copies of the manual and software tools have been distributed to end users (research institutes, NGOs and Fisheries Administrations) under the project and with the support of the Programme Manager. The potential influence WADAF has on the promotion and uptake of the outputs by secondary stakeholders in West Africa should not be underestimated. It should be viewed as the key target institution in West

Africa. Providing WADAF with copies of the outputs for distribution and short term technical support in running training courses should be considered as necessary follow-up by DFID.

Contribution of Outputs

End users, particularly of the manual and methods, will need access to resources if they are to use the outputs and then act on the results. Funding is seen as a constraint to uptake and sustained use by secondary stakeholders. Nevertheless, whilst dissemination and promotion has not yet been completed, already three organisations plan to incorporate the field-based loss assessment methods into future work programmes. The WADAF have included training in, and use of, the methods in a proposal for loss reduction in the Gambia. The College of Visayas in the Philippines has secured funding to implement a programme of loss assessment based on the three methods. The Nigerian Institute for Oceanography and Marine Research plan to include a loss assessment programme based on the methods within their 2001/2 budget. Furthermore, FAO have agreed to publish the manual as a Technical Report in English, French and Spanish. This will significantly strengthen long term global promotion and dissemination of this output.

Discussions are on-going with the International Centre for Living and Aquatic Resources Management (ICLARM) over the nature of links between FishLoss and FishBase, a global database of information on fish species available on the World Wide Web and CD. ICLARM has expressed an interest in incorporating FishLoss into FishBase.

Proposed Follow-Up Activities

A draft loss assessment guide designed for use by primary stakeholders has been produced as a secondary output of the project. This self-assessment guide relying on elements of IFLAM and LT requires further development and validation in the field. A short programme of participatory research with a number of communities in West Africa should be sufficient to determine its effectiveness and the need for modifications. If successful, a series of similar guides should be produced based on different products and distribution stages.

A paper, which links the outputs to the Livelihoods Approach (LA), would update the work, which was conceived before the LA was embraced by DFID. The development of a macro level loss assessment approach is seen as a next stage of development. Demand for such a tool has been expressed in a number of countries such as Senegal, Uganda, Zambia and the Philippines. Further promotion of the outputs at secondary stakeholder level is required via workshops, training courses and assistance in the development of project proposals.

Background

The Strategy for International Fisheries Research meeting in Paris in 1991 recommended that post-harvest fish losses should be a priority issue for future research. It was concluded that there were no tried and tested techniques by which losses could be assessed.

Much of the historical data available on post-harvest fish losses, especially loss levels, are derived from limited and unsystematic observations and studies. In many cases the way that data have been collected and interpreted is not clear, neither is the type of loss being measured. Poulter *et al.* (1988) describe the problem in these words “very few quantitative studies of actual losses have been undertaken and much of the available data are therefore actually based on qualitative estimates sometimes involving rather massive extrapolation from single landing sites to whole countries, even regionsthe inherent error in the data needs to be emphasised at all stages”.

There was clearly a need for the development of sound and widely applicable methodologies to not only quantify fish losses more accurately, but also to assist fisheries policy makers and planners to understand the context of losses more fully.

This requirement formed the basis of the demand for R5027: Quantification of Post harvest Losses of Fish, which drew on previous loss assessment work by NRI (Poulter *et al.*, 1988, Wood, 1986, Bostock *et al.*, 1987, Ames *et al.* 1991) and other organisations such as FAO (FAO, 1981) and ICMRD (Morrisey 1988). As well as methodological work by Townsley (1993) and Theis & Grady (1991). R5027 (Ward 1997) produced four outputs: draft loss assessment methods; a quality cost model; a predictive model and a database. Interest in using the outputs was expressed by:

- EU West Africa Regional Programme: Improvement of Post-harvest Utilisation of Artisanal Fish Catches
- FAO
- International Centre for Living Aquatic Resources Management, Philippines
- Central Institute for Fisheries Technology, India
- Small Islands Agricultural Support Services Programme, Philippines
- Zambian Government
- Uganda Government
- Instituto de Desenvolvimento da Pesca de Pequena Escala (NGO) Mozambique
- College of Fisheries Mangalore
- ELCEE Instrumentation, (Consultancy Company) Malaysia
- ITA (Senegal)
- FRI (Ghana)

However, before promoting and disseminating the outputs there was clearly a need to test, use and validate them under different conditions. At the same time links were forged by the DFID Post Harvest Fisheries Research Programme (PHFRP) with the EU West Africa Regional Programme for the Improvement of Post Harvest Utilization of Artisanal Fish Catches, which was executed by the West African Association for the Development of Artisanal Fisheries (WADAF). One of the aims of the Programme being to measure, monitor and reduce post-harvest fish losses in the

region. The EU Programme, based in Abidjan, organised a workshop in February 1997 to plan a pilot loss assessment programme for West Africa. The project leader for R7008 attended the workshop and assisted in the development of a pilot phase loss assessment programme which would validate the field-based methods. The results of the workshop formed the basis of R7008, which validated and developed three further R5027 outputs: loss assessment methods, a predictive model and a database. The quality cost model formed the basis of a separate project: R6959.

Project Purpose

The purpose of the research was to contribute to the DFID RNRKS Post-harvest Fisheries Research Programme output: “An appropriate and replicable methodology for identifying the magnitude and source of post-harvest losses developed and promoted.”

It achieved this by validating and further developing three post-harvest fish loss assessment tools developed by Project R5027. The tools are: field-based fish loss assessment methods designed to generate qualitative and quantitative data on losses; a predictive computer model to mimic intervention scenarios to reduce losses; and a database of fish loss data (FishLoss).

These tools were developed to assist secondary stakeholders improve research and development decision making with regard to the artisanal post-harvest sector. It was anticipated that WADAF, the main collaborating organisation, would be a key beneficiary of the research outputs.

The constraint to development, which the project addressed, was the lack of systematic tools for secondary stakeholders to assess and better understand post-harvest losses so that interventions can be more effectively planned and implemented.

Towards the end of the project it became apparent that the field-based methods could be adapted to suit the needs of primary stakeholders directly. This led to the development of a fourth (additional) output – a draft primary stakeholder manual for loss assessment.

Research Activities

The EU funded West Africa Regional Programme for the Improvement of Post Harvest Utilization of Artisanal Fish Catches (WARF) implemented by WADAF was the primary project collaborator. The Programme provided funds, regional co-ordination and identified national research institutes and primary stakeholder groups with which NRI worked. NRI managed the DFID component of the project, which included the provision of training, advice on design of validation exercises, undertaking evaluations and software development. Due to WARF problems in disbursing funds for the validation exercises, DFID funds were also used for some of this work. Uncertainty over the future of the EU programme surfaced during 1998 and continued until early 2000, when the EU decided to withdraw support. Consequently, DFID funds were increasingly used for most activities. The 10 month extension phase was funded totally by the DFID PHFRP.

Table 1a lists the key project activities in chronological order. Table 1b shows key activities according to country.

Table 1a: Key Project Activities

Date	Output	Activity
February 1997	1	Quality circle meeting Abidjan, outline of R7008 developed with EU regional programme, FAO, INFOPECHE and other collaborators.
September 1997	1,2,3	Project begins with meeting in Abidjan to discuss research with collaborators.
September 1997	2	Predictive model from R5027 reviewed by socio-economist
September 1997	1	Côte d'Ivoire research team trained in three loss assessment methods and field validation exercise planned.
October 1997	1	Senegal research team trained in three loss assessment methods and field validation exercise planned.
December 1997	3	FishLoss database sent to reviewers
January 1998	1	Biometrician sets up data analysis facility at INFOPECHE and with Côte d'Ivoire team
February/March 1998	2	Adaptation and validation of Predictive Model using Côte d'Ivoire data begins. Model developed over period up to October 1999.
April 1998	1	Meeting to review progress in Côte d'Ivoire and Senegal hosted by INFOPECHE.
July 1998	3	FishLoss review completed
July/August/September 1998	1,2	Côte d'Ivoire team undertake fieldwork to test loss reduction interventions.
August/September 1998	1	Ghana research team trained in three loss assessment methods and field validation exercise planned.
November 1998	1	Nigeria research team trained in three loss assessment methods and field validation exercise planned.
January 1999	3	FishLoss passed to Programme Manager for comment
August 1999	1	FAO undertake field visits to evaluate validation exercises
September 1999	1	Evaluation workshop held in Côte d'Ivoire
October 1999	2	Revised Model reviewed by socio-economist
January 2000	1,2,3	Project extended to address additional activities identified by FAO and DFID
January/February 2000	1	Internal evaluation of validation exercises completed including biometric review
February 2000	1	Extension fieldwork plan finalised with FAO

March 2000	1	Extension fieldwork begins in Nigeria to further develop Load Tracking method
July 2000	1	FAO, WADAF, NRI evaluate extension fieldwork with NIOMR in Lagos
August 2000	2	Review of Model by WADAF and NIOMR completed
August / September/October 2000	1,2,3	Loss Assessment Manual, Primary stakeholder manual, FishLoss and Model finalised
September 2000	1,2,3	PHFRP dissemination workshop in Ghana
October 31 st 2000		Project end

Output 1 – Field-based loss assessment manual

Output 2 – Predictive Loss Model

Output 3 – Fishloss: database of information on post-harvest fish losses

Table 1b: Key Activities According to Country

Date	Côte d'Ivoire	Senegal	Ghana	Nigeria
September 1997	Team trained in loss assessment methods and field validation exercise planned.			
October 1997		Team trained in loss assessment methods and field validation exercise planned.		
January 1998	Biometrican sets up data analysis facility at INFOPECHE with Côte d'Ivoire team			
July/August/Sept 1998	Team undertake fieldwork to test loss reduction interventions.			
August/Sept 1998			Team trained in loss assessment methods and field validation exercise planned.	
November 1998				Team trained in three loss assessment methods and field validation exercise planned.
March 2000				Extension fieldwork to further develop Load Tracking method
July 2000				FAO, WADAF, NRI evaluate extension fieldwork
September 2000			DFID PHFRP dissemination workshop	

The documents referred to in the following text and remainder of the report can be found on the accompanying CD. Each document has been given a title for easy reference. A list of documents and their titles is given in Appendix 2.

RESEARCH ACTIVITIES: OUTPUT 1 – FIELD-BASED LOSS ASSESSMENT MANUAL

R5027 had produced a draft manual describing two post-harvest fish loss assessment approaches, which had been developed as a result of fieldwork in Tanzania. The key objective of R7008 was to take these approaches and use them under different conditions in different countries. **The aim was to validate the loss assessment approaches, refine and develop them further into more generic tools for wider dissemination and use and produce a manual for researchers, NGOs and extension services.**

1.1 Meeting to Discuss Proposed Research with Key Collaborators

A two day workshop, organised and facilitated by INFOPECHE, was held in Abidjan in September 1997. The objectives of the workshop were to discuss the proposed loss assessment methodology research and development in West Africa with collaborators.

The participants were from the following organisations: INFOPECHE; WADAF; Institut de Technologie Alimentaire (ITA), Senegal; Collectif National de Pecheurs du Sénégal (CNPS); Food Research Institute (FRI), Ghana; University of Côte d'Ivoire, Chicago Smoked Fish Wholesale Market, Abidjan and NRI.

The R7008 project leader gave an overview of the loss assessment tools developed by R5027 in Tanzania (the focus of R7008). An overview of the proposed programme of research between NRI and WADAF was then given. That session focused on clarifying some of the finer details of the programme.

The remainder of the workshop consisted of group discussions to identify the key types of loss that should be the focus of validation exercises and the end use of the research results. Previous participant experiences of loss assessment were also discussed.

Key issues arising in the workshop were:

- The participants were in favour of a questionnaire approach to loss assessment. Participants thought that the use of students rather than government staff would be more appropriate for survey work.
- It became evident from discussions that there was some confusion as to the focus of the research at each of the four selected sites (Chicago Market - Côte d'Ivoire, Maiduguri - Nigeria, Mbour - Senegal, Chorkor Village - Ghana). It was anticipated that loss assessment trials/research should focus on the whole distribution chain. However, due to budget constraints it focussed on stages within a particular chain.
- Variations of Load Tracking have been used for studying losses for other commodities such as tomatoes. Load Tracking was used in Tanzania for assessing fresh fish losses in a particular distribution chain. There was clearly scope to develop this method further.

For further details see: Ward A R (1997) Report on a Visit to Côte d'Ivoire and Senegal to Initiate Post-harvest Fish Loss Assessment Research, 18th Sept - 21st October 1997. Project report. (CD ref: Initial meeting Sept 97)

1.2 Validation of Loss Assessment Methods in Côte d'Ivoire

During September 1997 a five day training seminar was conducted in Côte d'Ivoire by NRI, for a research team of four from the University of Cocody, Abidjan, Côte d'Ivoire. The team leader was a senior researcher at the University and was familiar with formal questionnaire approaches, as were the three students who comprised the remainder of the team. The group was given an understanding of three loss assessment approaches: informal fish loss assessment (IFLAM), Load Tracking (LT), and the Questionnaire Loss Assessment Method. The training involved both formal and informal theory and discussion sessions as well as fieldwork at sites in and around Abidjan. The seminar was also attended by the Director of INFOPECHE and the WADAF socio-economist.

Following the training seminar the research team undertook two phases of fieldwork, funded by WADAF, within the following 12 month period to validate the methods. The fieldwork focused on the team applying the three loss assessment methods to generate information on post-harvest fish losses. It was decided that the fieldwork would focus on the losses associated with a single species – *Sardinella spp* and that the fieldwork phases would coincide with the low season for landings (October to February) and the peak landing season (June to October). The methods were used by the team in order to investigate losses at the fishing, processing and wholesale market stages. The validation exercise focused on field testing the three approaches with fishing communities in Vridi-Sir, Vridi-Ako and Vridi-Zimbabwe fishing villages/sites and Chicago smoked fish wholesale market, all within Abidjan and its environs.

The choice of communities was made by the team in close collaboration with the marine artisanal section of the Centre for Oceanographic Research, Abidjan. It was influenced by a relatively large population size, the diversity of fishing activities, large landings, and the presence of processing activity at the site. Chicago market was chosen due to its national and sub-regional importance in the smoked fish trade.

Although it was anticipated that the validation exercise would cover two different fishing seasons, in the event fish landings remained low during both fieldwork phases.

For further details see:

Ward A R (1997) Report on a Visit to Côte d'Ivoire and Senegal to Initiate Post-harvest Fish Loss Assessment Research, 18th Sept - 21st October 1997. Project report. (CD ref: Initial meeting Sept 97)

Anoh P K (1998) Evaluation of post-harvest losses in artisanal fisheries: the case of the communities of artisanal fishers of the suburbs of Abidjan (Vridi-Sir, Vridi-Ako and Vridi-Zimbabwe). Project Report. (CD ref: phase I Anoh).

Anoh P K (1998) Tools and methodology developed for the evaluation of post-harvest losses in the artisanal fisheries of West Africa. Project Report. (CD ref: phase2Anoh).

1.3 Validation of Loss Assessment Methods in Senegal

At Mbour, one of the most important fish landings in Senegal, NRI conducted a six day training seminar for a research team of five people. The team consisted of four members of the fishermen's organization - Collectif National de Pecheurs du Sénégal (CNPS), including the President, and the team leader from the Institut de Technologie Alimentaire (ITA) of Dakar. The CNPS representatives included two active fishermen and one active fish processor/trader. Only one person in the team from CNPS was literate and had knowledge of formal research and data collection methods (she had some experience of questionnaire surveys). This presented an interesting and quite valuable challenge for the training team and also for the process of developing loss assessment methods. Until Mbour, loss assessments had been done by either public sector researchers, such as a Fisheries Department or, as in the case of Côte d'Ivoire, educated professional researchers. In other words the fishermen, processors and traders had primarily been more the providers of information rather than the generators and users. Mbour therefore presented an opportunity whereby actual operators themselves would be trained in loss assessment methods.

The three loss assessment methods were introduced to the team in Wolof (Senegalese language). Training consisted of practical as well as theory and discussion sessions. However, due to the team members' experience and literacy levels more emphasis was placed on IFLAM. The Director of INFOPECHE attended part of the seminar.

After the training seminar a programme of fieldwork to validate the three methods in the field was agreed with the team. The work was to be completed by the end of February 1998 and was to be funded by WADAF. However, a delay in funding delayed the implementation of the fieldwork, which began in February 1998. Funding again delayed the full implementation of this work, which was suspended until a second phase of fieldwork began in March 1999, designed to complete the original work programme.

The focus of the fieldwork were losses associated with fishing, processing and transport of *Sardinella spp.* The team worked with fishermen and processors within Mbour and traders who transported fresh fish by road from Mbour to Dakar.

For further details see:

Diakite B (1999) Study of post-harvest losses at Mbour. Project Report. (CD ref: Senegal).

1.4 Biometric Support

During the early stages of the project biometric support was given to project collaborators in the region. Firstly, following the training workshops in Côte d'Ivoire and Senegal support was provided by NRI to INFOPECHE and the two country research team leaders to assist in finalising the use of the Questionnaire Loss Assessment Method.

For further details see:

Ward A R (1997) comments on the questionnaires and statistics. Project Communication. (CD ref: Qcomms).

In February 1998 Dr Roger Stern of the University of Reading visited Côte d'Ivoire with the purpose of establishing a system for data analysis for the validation fieldwork, to train a counterpart in data analysis and to analyse some available data. Dr Stern also provided advice regarding improvements in the questionnaires and in the survey implementation.

For further details see:

Stern R (1998) Report on a visit to Abidjan, from 1st to 8th February 1998, for the post-harvest fish loss assessment research project (DFID project number R7008).(CD ref: stern98).

The University of Greenwich later assisted in the development of Load Tracking into a method which can produce statistically representative data.

Jeffries D J (1999) Load tracking experiments. Project File Note. (CD ref: loadtracking-design).

1.5 Monitoring Workshop

A two day monitoring workshop organised by INFOPECHE was held in Abidjan to discuss the loss assessment research that was being conducted in Côte d'Ivoire and Senegal at the time. The workshop was attended by post-harvest fisheries specialists from Nigeria, Ghana, INFOPECHE, WADAF and NRI as well as the Côte d'Ivoire research team and the Senegal research team leader.

At the time of the meeting the first phase of the Côte d'Ivoire work had been completed, whereas the work in Senegal had only just begun. Hence the meeting focussed on the work that had been carried out in Côte d'Ivoire.

The objectives of the workshop were:

- discuss the results of the pilot phase research conducted by the two active research teams (Côte d'Ivoire and Senegal)
- comment on the Côte d'Ivoire pilot assessment draft report and recommend improvements/changes
- begin preparations for the loss assessment trials later in the year in Nigeria and Ghana
- review the three loss assessment methods being used in Côte d'Ivoire and Senegal
- discuss the application of the Predictive Model

The Côte d'Ivoire team leader summarised the use of the three methods thus:

- enabled the team to build a rapport with the communities
- identified the distribution channels for fish
- quantified the losses in the chain
- provided an insight into the perceptions of the operators

It was agreed that NRI should train the Nigerian and Ghanaian teams later in the year using the same approach as was used with the Côte d'Ivoire and Senegal teams.

For further details see:

Ward A R (1998) Monitoring Workshop - R7008 Validation of Post Harvest Fish Loss Assessment Methodologies, Abidjan, 1-2 April 1998. File Note. (CD ref: monitoring workshop 1998).

1.6 Intervention Testing

During the first phase of fieldwork in Côte d'Ivoire the research team identified two key losses affecting fish smokers: fish falling into the fire during smoking and breakage of smoked fish as result of handling, packaging and transport from the fish smoking site to the wholesale market. Potential interventions to reduce these losses were also identified by the team. These were use of small mesh grills on smoking ovens and better handling and packaging methods during transport of final products. It was agreed that a series of preliminary field trials would be conducted by the research team to investigate the impact of these interventions. The results of the research, which was funded by NRI, contributed to the development of the loss assessment manual, but were also used in the validation of the Predictive Model (Output 2).

For further details see:

Anoh P K (1998) Reducing post harvest losses in artisanal fisheries. Project Report. (CD ref: intervention report).

1.7 Validation of Loss Assessment Methods in Ghana

An eight day training seminar for five artisanal fish processors, one artisanal fisherman and two research co-ordinators was held at the Food Research Institute, Accra, Ghana from 25th August to 3rd September. Core seminar participants were from Kormanste Fishmongers Association, Sekondi Fishmongers Association, Chorkor Co-operative Fish Smokers Society Limited and the Food Research Institute. NRI (socio-economist and project leader) provided training in the three post-harvest fish loss assessment methods. Nicholas Ntiamoah of Wenchi Farm Institute provided backstopping support for training in IFLAM. Joseph Ndenn, the WADAF socio-economist and Peter Kaindaneh of INFOPECHE also attended part of the seminar.

Following the training, a programme of field research to field test the three methodologies in Ghana was drawn up with the research co-ordinators from FRI.

For further details see:

Akintade D (1998) Report of a loss assessment training course in Ghana. Project Report. (CD ref: ghana-akintade).

Ward A R (1998) Post Harvest Fish Loss Assessment Training Seminar, Food Research Institute, Accra, Ghana, 24th August to 4th September 1998. Project Report. (CD ref: ghana-ward)

Although research co-ordinators from FRI were trained and in place, soon after the training was completed and before the validation work began, the key co-ordinator withdrew from the project. This meant that fieldwork was delayed while a suitable alternative co-ordinator was identified and briefed, which was Nicholas Ntiamoah, who participated in the training seminar. The hiatus in activity and a new co-ordinator necessitated a backstopping visit by NRI and WADAF in March 1999 prior to fieldwork beginning. The key aims of the visit were:

- In conjunction with staff from FRI, discuss the proposed fieldwork programme with Mr Ntiamoah and ensure that he is fully conversant with the terms of reference for the co-ordinating role and the methods to be field tested. Provide necessary re-training and briefing as required.
- In conjunction with the research team plan and then assist the team to undertake an Informal Loss Assessment exercise.
- Plan a Load Tracking exercise and a Questionnaire Loss Assessment with the co-ordinator and relevant economic operators. Agree with Mr Ntiamoah a work programme, which is based on that agreed by NRI and FRI in October 1998. Clarify reporting and data analysis procedures.

For further details see:

Clucas I J (1999) Short Report on two visits to Ghana for A0724. Project Report. (CD ref: ghana-clucas).

Following the March backstopping visit Mr Ntiamoah, and the research team comprising of representatives from Kormanste Fishmongers Association, Sekondi Fishmongers Association and Chorkor Co-operative Fish Smokers Society Limited undertook the programme of fieldwork focussing on Kormanste fishing village some 140 km west of Accra.

For further details see:

Ntiamoah N (1999) Field testing of methodologies for evaluating post-harvest losses of artisanal fisheries in west Africa - A Case Study of Kormantse Fishing Community, Central Region, Ghana. Project Report. (CD ref: Ghana-ntiamoah).

1.8 Validation of Loss Assessment Methods in Nigeria

An eight day training seminar for eight artisanal fisheries operators and two research co-ordinators was held at the Nigeria Institute for Oceanography and Marine Research, Victoria Island, Lagos between 10 and 19 November 1998. Core seminar participants were from: Tedak Fishermen Co-operative, Maiduguri; Lagos State Fisheries; Federal Department of Fisheries; and NIOMR. NRI (socio-economist and project leader) provided training in the post-harvest fish loss assessment methods. The seminar was also attended by the WADAF socio-economist and Dr A. Tall, Director of INFOPECHE.

Following the training, a programme of field research to validate the three methods in Nigeria was drawn up by NIOMR, WADAF and NRI. The focus of the fieldwork was the Lake Chad smoked fish trade and distribution chain from the lake region to Lagos via Maiduguri.

It was anticipated that there would be a delay in WADAF releasing funds for NIOMR to execute the research. In the interim NRI provided NIOMR with the resources to undertake an empirical Load Tracking exercise from a fishing village 50km from Lagos. This extra activity was implemented to maintain research team momentum, something which had been adversely affected by funding delays in Senegal and Ghana.

For further details see:

Akintade D (1998) Report on visit to Nigeria (November 8 – 20 1998): Validation of informal fish loss assessment tools in west Africa. Project Report.(CD ref:nigeria-akintade).

Ward A R (1998) Visit to Nigeria - RNRRS Validation of fish loss assessment methods in west Africa: training seminar, Nigerian Institute for Oceanography and Marine research, Lagos, 8 - 21 November 1998. Project Report (CD ref: nigeria-ward).

*Akande G R (1999) Application of load tracking in the distribution chain of smoked sardines (*Sardinella maderensis*): A Case study of Magbon-Alade Fishing Community. Project Report. (CD ref: loadtracking-magbon).*

Approximately five months after the training seminar (March 1999) funds were in place for the validation exercises to start and fieldwork continued until July. IFLAM was used by researchers to assess loss occurring in the post-harvest sector in fishing villages in the Lake Chad region, two smoked fish wholesale markets in Borno State and one smoked fish market in Lagos. Two Load Tracking exercises were undertaken between Maiduguri and Lagos. QLAM was used in a Lake Chad fishing community and a smoked fish wholesale market.

For further details see:

Akande G R (1999) Field testing of methodologies for evaluating post-harvest losses of artisanal fisheries in west Africa: a case study of the fisheries of Lake Chad, Maiduguri, Borno State, Nigeria. Project Report. (CD ref: nigeria-akande1).

Akande G R, King M (1999) Field testing of the questionnaire methodology in the Lake Chad fisheries. Project Report. (CD ref: nigeria-akande2).

1.9 Evaluation

During 1999 the project commissioned an evaluation of the validation exercises conducted by the research teams in each of the four countries. The evaluation consisted of two elements: country visits to assess the use of the methods and determine how they should be used in future. This was followed by a workshop to discuss the results of the country visits and the consultants' draft report, finalising the evaluation.

The evaluation was undertaken by a Fishery Industry Officer of the Fish Utilization and Marketing Service of FAO. Country visits were made in August and a two day workshop was held in September attended by representatives from: WADAF, INFOPECHE, DFID, FAO, University of Cocody (Cote d' Ivoire), Institute Technologie Alimentaire (Senegal), Collectif National des Pecheurs du Senegal, Nigerian Institute for Oceanographic and Marine Research, Kwadaso Agriculture College (Ghana), Chorkor Fish Smokers Society Ltd (Ghana), the Fisheries Department (Cote d'Ivoire) and NRI.

The workshop consisted of country presentations on the validation exercises, a presentation of the draft evaluation report by FAO, a general discussion, a working group session on dissemination, NRI presentation on other project outputs and losses research in India, and recommendations session. It provided an opportunity for key stakeholders in the project and its outputs to discuss their perceptions of the methods, the research as well as the future dissemination of the outputs.

A key conclusion from the overall evaluation was that much progress had been made to developing standardised loss assessment methods. However, there was scope for further fieldwork to be undertaken to determine whether Load Tracking could be used to generate statistically valid quantitative data on post-harvest fish losses.

For further details see:

Teutsher F (1999) Evaluation of field research in west Africa to validate loss assessment methodologies. FAO, Rome. (CD ref: FAOevaluation).

Ward A R (1999) Report of an Evaluation Workshop: Validation of Post Harvest Fish Loss Assessment Methods in West Africa. Grand Bassam, Côte d'Ivoire, 23-24 September 1999. Project File Note. (CD ref: evaluation workshop).

Scullion J (1999) Report on Abidjan workshop. Report to DFID Programme Manager. (CD ref: DFID workshop).

As a result of the evaluation further thought on the use of Load Tracking was given by the project. As a result a series of field experiments were designed, which would form the basis of further fieldwork.

For further details see:

Jeffries D J (1999) Load tracking experiments. Project File Note. (CD ref: loadtracking-design).

In addition to the external evaluation undertaken by FAO, the project also conducted two internal reviews of the validation exercises. The first was undertaken by an NRI Biometrician and focussed on the use of QLAM and the second, by the project leader, focussed on the use of all three methods. The reviews identified strengths and weaknesses of the methods and how they were used. Conclusions from the reviews, and to a certain extent the FAO evaluation, were used during the finalisation of the fish loss assessment manual.

For further details:

Jeffries D J (2000) Biometric review of fish loss assessment methods in West Africa. Project File Note. (CD ref: biometric-review).

Ward A R (2000) Post harvest fisheries review of loss assessment research in west Africa. Project File Note. (CD ref: project-review).

1.10 Project Extension

Following the evaluation by FAO discussions began between the project and the DFID Programme Manager regarding a project extension. In January 2000 an extension was finalised, the project end date was changed from January 2000 to October 31st 2000. This would allow original project activities, implementation of which had been delayed due to various reasons beyond the control of the project, and additional added-value fieldwork to be undertaken.

The additional activities focussed on developing Load Tracking and determining how practical it will be to use this tool to generate statistically valid loss data. Secondly, in addition to the loss assessment manual, which is specifically for secondary stakeholders, it was agreed that a second manual or guide will be produced for primary stakeholders.

For further details see:

NRInternational (1999) Field and desk based tools for assessing fish losses: adaptation and validation in west Africa. Project Extension Memorandum. (CD ref: extension-memorandum).

1.11 Extension Fieldwork

A key element of the project extension was further fieldwork to develop Load Tracking. The fieldwork plan was agreed with FAO and WADAF. A series of field experiments were undertaken between March and July 2000 by the project in

collaboration with the Nigerian Institute for Oceanographic and Marine Research and members of the research team. The experiments combined a statistically designed approach with simplified quality assessment and adapted this to suit different stages of a smoked fish distribution chain. QLAM was also used again to see if this could be simplified for easier use.

The fieldwork was evaluated by FAO, WADAF and NRI in July 2000 and recommendations were made regarding the revision of the secondary stakeholder loss assessment manual and the draft primary stakeholder manual.

For further details see:

Ward A R (2000) R7008 Extension Fieldwork Plan. Project File Note. (CD ref: extension-fieldwork1).

Contract terms of reference (2000) Extract from NRI sub-contract. (CD ref: extension-fieldwork2).

Akande G R, Jeffries D J (2000) Fish Loss Assessment method research. Project Report. (CD ref: extension-fieldwork3).

1.12 Production of Loss Assessment Manual

The results and conclusions of the evaluations of original validation fieldwork and the extension fieldwork along with those of the internal project reviews were used by NRI and WADAF to revise the secondary stakeholder loss assessment manual, produced as an output of R5027. In addition, lessons learnt from loss assessment research undertaken during R6817 also influenced the revision work.

Key changes to the original R5027 output were the inclusion of a separate chapter on Load Tracking and modification of the QLAM method so that the focus was on validating qualitative data and generating quantitative data on aspects of losses other than loss levels.

The manual layout and printing was arranged by the University of Greenwich in-house publications and printing services.

For further details see:

Ward A R, Jeffries D J (2000) A manual for assessing post-harvest fisheries losses. Project Output. (CD ref: manual)

RESEARCH ACTIVITIES: OUTPUT 2 – PREDICTIVE LOSS MODEL

R5027 produced a mathematical model using MATHCAD software which enabled the user to mimic losses occurring in a distribution chain and the likely effect of loss reduction interventions in monetary and quantitative terms. **Under R7008 the Model was validated and developed further using data from loss assessments in West Africa.**

2.1 Socio-economic Review

The Predictive Model produced by R5027 was reviewed by the Social Sciences Department of NRI. The review focussed on: ease of use, data used and interpretation of results.

The review highlighted the need to develop a much simpler, more user-friendly version of the Model for the intended target audience of secondary stakeholders working in the post-harvest fisheries sector. Converting the Model into an MS Excel format was agreed as an appropriate way to achieve this.

There was also concern expressed about the accuracy of the price data used in the calculation of losses and that more thought should be given to the collection of such data. Furthermore, the review pointed out that while the model would provide some indicative results on fish losses, the results should not be treated as definitive. This is partly because of the difficulties in collecting reliable price data and partly because of other factors, which should be considered but, which the model ignores. Therefore the information should instead be used alongside other types of informal research. If this does not happen, then it is possible that incorrect recommendations will be made.

Activities to be undertaken before and during Prof. Cheke's planned field visit to West Africa were identified.

For further details see:

Gray A (1997) Fisheries loss assessment model. Project Internal Memo. (CD ref: socio-economic review1).

Ward A R (1997) Notes of review meeting. Project File Note. (CD ref: review-meet1).

2.2 Adaptation and Validation Using Côte d'Ivoire Data

The original Mathcad model was converted into a prototype MS Excel model by NRI. It was used and adapted by Prof Cheke in Côte d'Ivoire with the University of Cocody research team (see Output 1) and INFOPECHE. Data generated as a result of loss assessment method validation in Côte d'Ivoire was modelled and the effect of potential loss reduction interventions identified by the Côte d'Ivoire team. At this stage in the research the Côte d'Ivoire team were already drawing conclusions regarding the use of the three loss assessment methods. Empirical Load Tracking was suggested as being the key method, as it enabled researchers to understand in detail the fish distribution chain.

As a result of this activity it was agreed that Côte d'Ivoire team would undertake a short field activity to generate real data on the impact of interventions which could be modelled.

For further details see:

Cheke R A (1998) Visit to Côte d'Ivoire to initiate modelling of post-harvest fish losses in West Africa, 22 February to 2 March 1998. Project Report. (CD ref: modelivorycoast98).

2.3 Development of the Model

As mentioned under Output 1, the Côte d'Ivoire team undertook preliminary field trials to assess the impact of two interventions – small mesh grills on smoking kilns and improved handling and packaging of smoked fish after processing. The data generated along with data from the second phase of validation in Côte d'Ivoire was used to produce a case study to provide end users with an understanding of how the model can be used.

For further details see:

Anoh P K (1998) Reducing post harvest losses in artisanal fisheries. Project Report. (CD ref: intervention report).

*Cheke R A (1998) Modelling post-harvest losses to fish (*Sardinella spp.*) at Abidjan, Côte d'Ivoire and comparisons of experimental results with predictions of effects of interventions. Project Report. (CD ref: modelivorycoast).*

It was anticipated that data produced as a result of the validation of the field based methods in Senegal would also be modelled and provide a second case study. Due to delays in the completion of the validation exercises in Senegal due to collaborator funding problems and the type of data that was produced, it was not possible to model the Senegalese data.

During 1998 and 1999 the Excel version of the Model was developed by NRI, whilst it was decided that the Mathcad version would remain as it was and be used to develop any significant mathematical changes at a later date if required. Emphasis was placed on improving the user friendliness of the Excel version as this would be the output which would be widely disseminated and used by stakeholders who were unlikely to have the computer knowledge required to use an obvious mathematical model. Development included designing a user friendly data inputting screen which included the presentation of the model results. This involved the production of several versions of the model and internal reviews with NRI. Another activity was the production of a user manual. This was used to develop a Help facility that was built into the model so that the user would have instant access to information about how to use the model.

2.4 Socio-economic Review

In September 1999 the Model was reviewed by a marketing specialist from the Social Sciences Department of NRI. The review highlighted a number of ways in which the user interface of the Model could be improved as well as guidance on the quality of data Modelled. The key points from the review aimed at the development of the software were addressed and a version of the Model which would be sent to external reviewers was produced.

For further details see:

Kleih U (1999) Fish-loss model. Project memo. (CD ref: socio-economic review2).

2.5 Secondary Stakeholder Review

As a result of the socio-economic review the model was revised and then reviewed by the research and evaluation adviser of WADAF and a technologist from the Nigerian Institute for Oceanographic and Marine Research. The reviewers were asked to use the Model with data of their choice, identify potential end users and suggest improvements. A number of modifications were suggested. These were that by-product income should be shown in relation to each stage in the chain; the model should reflect improving value rather than just reducing loss; include capacity to cope with data on more than just good and poor quality; link savings in income with costs of production. These suggestions were seen as valid, but were beyond the scope of R7008. The improvements would be worth considering in light of any general feedback from users of the Model post-project.

For further details see:

Ward A R (2000) Predictive model review. Project Filenote. (CD ref: modelreview).

RESEARCH ACTIVITIES: OUTPUT 3 – FISHLOSS: DATABASE OF INFORMATION ON POST-HARVEST FISH LOSSES

R5027 produced an MS Access database which contained information on post-harvest fish losses world-wide. **Under R7008, the database was peer reviewed, a user version as well as an administrator version were produced and additional data records added.**

Copies of the R5027 software and manual were sent to a number of stakeholders for peer review. The review focussed on the content of the manual and its format, the ease with which data sets can be added to the database and the ease with which the database can be searched for information.

The reviewers that responded were:

MD Associates Ltd, Grimsby
Mark Harrison, student, University of Greenwich
Ivor Clucas, Adviser to FAO, Rome

The results of the review were collated and discussed with an NRI software developer. A number of revisions were undertaken. These included:

- developing the queries options
- improving the editing facility
- improving data display

The review also identified the need for two versions of the database. One which could be developed into a user-friendly run-time version which could be distributed to end users, but which could not be updated. The other version would be a full-version which was not as developed in terms of front-end and user-friendliness, but which enabled data inputting and editing.

A user version, with no editing facility, was produced and internally reviewed in NRI. Further revisions were made and a number of new queries were developed. An on-line Help facility was incorporated. The data records were cross-checked with the data source and edited where necessary. It was at this stage that the International Centre for Living and Aquatic Resources Management (ICLARM) expressed an interest in hosting FishLoss within FishBase, a database of information on fish species available on the World Wide Web and CD. Communication between the project and ICLARM clarified the nature of the dissemination. The Programme Manager discussed the position with DFID, which agreed in principle with the idea.

Feedback from the Programme Manager identified a need for additional data to be included in FishLoss prior to dissemination. This was undertaken and the database and manual finalised for dissemination.

DISSEMINATION

Dissemination During the Project

During the course of the project a number of articles and papers were published which described either project activities or the development of the outputs:

*Ward A R, Cheke R (1997) Modelling post harvest fish losses. *Aquaculture News*, December 97, p 22-23.

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

*Smith M, Venn J, Cheke R. A, Ward A. R (1997) A relational database of post-harvest fish loss. *Naga, ICLARM Quarterly*, Vol 20(3/4:8-11)

Ward A R (1998) Methodologies for assessing post-harvest fish losses. *Fish Tech News - African Supplement*. Fisheries Industry Division, FAO, Rome. No 4, January 1998.

Article on the training seminars in Ghana and Nigeria published in the EU West Africa Regional Programme for the Improvement of Post Harvest Utilization of Artisanal Fish Catches monthly bulletin, Bonga, No 48, Sept 1998.

Kane D Y (1999) The programme: improvement of post-harvest utilisation of artisanal fish catches in West Africa. *EC Fisheries Cooperation Bulletin* Vol 12 No 1 March 1999. (*includes a overview of the research activities*).

**written either during R5027 or during the period between the end of R5027 and beginning of R7008.*

Three project workshops were held in Côte d'Ivoire. These were attended by primary and secondary stakeholders from Côte d'Ivoire, Ghana, Senegal, Nigeria, FAO, INFOPECHE and EU WADAF who were either directly or indirectly involved in the project. The workshops were held in September 1997, April 1998 and September 1999. Via presentations and discussions participants were informed of key project activities and the development of outputs. They also shared relevant experiences with the project and contributed to project planning and evaluation.

Four loss assessment training workshops for primary and secondary stakeholders were held. These were in Côte d'Ivoire, Senegal, Ghana and Nigeria. The workshops were important activities in the implementation of the project as they enabled the research teams to undertake validation exercises. However, in running the workshops, the project raised awareness of the project and its objectives amongst a small group of secondary and primary stakeholders, the majority of whom did not attend the project workshops.

Fish loss assessments were undertaken during R6817 (Monsoon Season Post Harvest Losses in Traditional Fish Processing in India) which was implemented between December 1996 and June 2000. This raised awareness of R7008 amongst secondary stakeholders in India. It also enabled a degree of validation and method development to be undertaken in India. During a visit to India the project leader discussed R7008 with

the Deputy Director General of Fisheries, India and this included a proposal for a training workshop to be held in India at some stage in the future.

As a result of dissemination and promotion of R5027 the project leader received requests from a number of stakeholders for information and advice:

Dr Leonarda Mendoza, Director, College of Fisheries, UP Visayas 5023 Miag-ao, Iloilo, Philippines.

Jon Lansley, Fishing Technician National Co-ordinator, IDPPE Mozambique, c/o Skillshare Africa, 126 New Walk, Leicester, LE1 7JA.

Oludare Adeogun, Research Scientist, extension Research and Liaison Services, Nigerian Institute for Oceanography and Marine Research, PMB 12729, Victoria Island, Lagos, Nigeria.

Yahya Ibrahim Mgawe, Tanzanian MSc Student, International Fisheries Management Course, University of Tromsø, Norway.

Dr Rainer Froese, International Centre for Living Aquatic Resources Management (ICLARM), Penang, Malaysia.

As a result of the link established with Dr Froese, ICLARM requested that FishLoss (Output 3) be hosted within their global information system FishBase. This was agreed in principle by DFID.

FAO are a key target institution for R7008 outputs. An FAO Fishery Industry Officer was involved in an advisory capacity for the duration of the project. He also undertook an evaluation of the field validation exercises. In addition the project leader held a meeting with a Senior Fishery Industry Officer (H Lupin) in early 1999, facilitated by MD Associates Ltd, at which the key elements of R7008 were discussed.

One of the recommendations made by FAO in their project evaluation report (Teutscher 1999) (**CD ref: FAOevaluation**) was that they would publish the loss assessment method manual. An electronic as well as hard copy of the manual was sent to FAO at the end of the project.

Following a positive review by DFID of the evaluation workshop held in Côte d'Ivoire, September 1999, the PHFRP Manager arranged a meeting in London between the project leader and the DFID Senior Fisheries Adviser. This enabled the project leader to update DFID regarding the research and outputs in relation to the possible uptake of the research outputs by the DFID/FAO Sustainable Fisheries Livelihoods Programme in West Africa. It was suggested by DFID that the loss assessment methods could be used to validate project ideas identified within the SFLP.

Other Dissemination and Promotion Activities

A project team gave presentations on the three main project outputs at a DFID sub-regional Fish Loss Assessment and Control dissemination workshop, held in Accra, Ghana, September 2000.

NRI in conjunction with Gbola Akande of the Nigerian Institute for Oceanography and Marine Research and Joseph Ndenn of the West African Association for the Development of Artisanal Fisheries summarised the loss assessment methods and two

software tools using MS Powerpoint presentations. The forty participants from Anglophone Africa received a copy of the loss assessment manual as well as the software and accompanying manuals. A practical workshop session was also held during which participants used the manual to plan their own loss assessment exercises and used the two software tools.

Participants from Uganda, Ghana and Tanzanian expressed an interest in conducting their own micro level loss assessment exercises, funds permitting. On day three of the workshop a group of participants planned a regional loss assessment exercise for West Africa, which could form the basis of a project proposal. The FAO Regional Fisheries Adviser expressed a willingness to receive research proposals based on the content of the workshop.

For more information see the presentations (*CD ref: presentation*).

The project prepared two papers for presentation at the 7th Expert Consultation of Fish Technology in Africa, which is scheduled to take place in Senegal during 2001. Although, at the time of writing, this was not confirmed. The papers would also be included in the consultation proceedings. The two papers are:

Jeffries D J, Akande G R, Ward A R (2000) Fish loss assessment using intervention load tracking. Paper for presentation at 7th FAO Expert Consultation on Fish Technology in Africa, Senegal, December 2000. To be included in proceedings. English.

Cheke R, Jeffries D J (2000) Accuracy of loss estimates using the predictive model. Paper for presentation at 7th FAO Expert Consultation on Fish Technology in Africa, Senegal, December 2000. To be included in proceedings. English.

Outputs

The research activities were undertaken in order to achieve three project outputs. The following section provides an overview of each of the outputs.

OUTPUT 1: FIELD MANUAL OF FISH LOSS ASSESSMENT METHODS (CD REF: MANUAL)

A manual for researchers, NGOs, fisheries administrations and other development practitioners, describing three different yet complementary field based methods for assessing and understanding post-harvest fish losses was published and disseminated via workshops, meetings and direct mailing to key end users. In addition, FAO agreed to also publish and disseminate the manual at some stage in the future. The three methods described are Informal Fish Loss Assessment Method (IFLAM), Load Tracking (LT), and Questionnaire Loss Assessment Method (QLAM). They are designed to focus on the two most important types of loss: physical and quality.

IFLAM, as the name suggests, is based on informal research and development tools and techniques, primarily those used in Participatory Rural Appraisal (PRA) and Rapid Rural Appraisal (RRA). It is designed for use by a multi-disciplinary team to produce a qualitative understanding of a broad range of issues associated with post-harvest fish losses and the communities affected. It can also be used to identify potential loss reduction interventions. Successful use of the method relies on close interaction with primary stakeholders. It emphasises the importance of indigenous knowledge and learning by researchers. It provides an opportunity to understand post-harvest losses in the context of people's livelihoods. Importantly, this method is recommended as a precursor to LT and QLA as using it will provide data and information, which can be used to: effectively plan and design LT and QLA; and if required, develop research hypotheses for testing.

Load Tracking is used to quantitatively assess loss between stages in a distribution chain, for example the physical loss during transport between a processing site and the wholesale market. It gives statistically valid results. Replicate and random samples of fish or fish products are tracked. Before and after measurements are taken of non-subjective responses or product attributes related to loss such as weight of damaged or poor quality product, or simply weight. Data is analysed and presented according to basic biometric principles. LT can be used to determine the impact of interventions. If LT is used without the replication and random sampling elements it will provide a qualitative understanding of where and why losses occur.

QLAM is based on a formal questionnaire survey approach to research. Enumerators interview a population sample using a questionnaire focussed on post-harvest losses. Data are analysed and presented using appropriate biometric principles. The method produces quantitative data on key aspects of loss such as the type of loss incurred, reasons for loss and the variables, which affect loss such as fishing gear or processing method. It is also used to validate the results of IFLAM or LT over a wide geographical area or within a number of communities.

As well as a description of how to use the methods, the manual includes a description of the resources required and limitations associated with each method. Case studies

are used to highlight key aspects of the methods. An overview chapter also provides the user with an introduction to post-harvest fish losses and guidance on which method to use and when.

For further details see:

Ward A R, Jeffries D J (2000) A manual for assessing post-harvest fisheries losses. (CD ref: manual)

Key Changes in the Field-Based Methods As a Result of R7008

R5027 produced a draft loss assessment manual as a result of research in Tanzania. R7008 developed this manual further and validated it in West Africa. The methods were used by research teams, which had varied skills both within teams and between teams. Validation took place in four countries – two anglophone and two Francophone. The methods were used with coastal fishing and processing communities, urban fishing and processing communities, traders, transporters, wholesalers and retailers. In marine fisheries and in a major freshwater fishery. To investigate losses associated with fresh fish and traditionally processed fish. Table 2 summarises some of the key characteristics of the research teams, their training and fishery and the subsequent administration and support received.

Table 2 Overview of Research Teams and Country Validation

	Côte d’Ivoire	Senegal	Ghana	Nigeria
Co-ordinator	University researcher Geographer	Post harvest specialist Worked independent of govt employer	Original co-ordinator pulled out after training Replaced by Agriculturalist PRA	Post harvest specialist With national research institute
Team	University Students Literate Male and female	Fishermen, processors Mostly illiterate Male and female	Processors Semi-literate Female and Male	Fishermen, processors, trader, NGO Illiterate and literate Male
Training	First course conducted by NRI socio-economist and post-harvest specialist	Second course conducted by NRI post-harvest specialist and co-ordinator. Main focus was on the Informal method due to illiteracy of team.	Polished third course, involved NRI socio- economist, post- harvest specialist and local PRA expert Re training required for replacement co- ordinator	Final and most polished course, involved NRI socio- economist and post- harvest specialist
Training Language	French	English to French to Wollof	English plus local languages	English plus local languages
Communities and Distribution Chains for Validation	Marine, urban fishing and processing. Wholesale. Fresh and processed products.	Marine, coastal, fishing, processing, transporters. Fresh and processed.	Marine, coastal fishing, processing, transport. Fresh and processed.	Freshwater, lake, fishing, processing, wholesale, retail, transport. Processed.
Administration	Shortest time lag between training and fieldwork starting	Delay in releasing funds and not all funds released when needed	Slight delay in releasing funds	Delay in releasing funds
In-country support	Available	Not available/used	Some availability	Not applicable

Internal and external evaluations of the validation exercises identified a number of key changes to the original methods and manuals.

Load Tracking As A Stand Alone Method

What is now termed empirical Load Tracking was experimented with under R5027. The method was seen then as a technique to be used as part of the IFLAM. Prior to the first training workshop of R7008, in Côte d'Ivoire, it was decided that LT should be developed as a third and stand alone loss assessment method. A similar method having been used in Ghana by FRI for assessing the quality loss of tomatoes. Its use as an empirical method, generating qualitative data on the reasons for loss, where loss occurs and the distribution chain in general, was refined as R7008 progressed. By the fourth training workshop in Nigeria the method had evolved into a tailored and flexible method which had a clear participatory planning element. The most detailed and comprehensive use of empirical LT under R7008 is described in: *Akande G R (1999) Application of load tracking in the distribution chain of smoked sardines (Sardinella maderensis): A Case study of Magbon-Alade Fishing Community. Project Report. (CD ref: loadtracking-magbon).*

QLAM was used with varying degrees of success under R7008 to generate quantitative data on loss levels. There were difficulties in implementation, data analysis and reporting which are highlighted in the evaluation reports. The FAO evaluation report and the report by DFID of the evaluation workshop in September 1999 suggested that there was scope to carry out research to determine whether LT could be used to generate statistically representative quantitative data.

A series of LT studies were designed and undertaken during the extension phase. The objective was to determine whether random sampling fish and replication could be used in practice, under field conditions, to obtain estimates of the accuracy of mean losses. This approach also relied on the use of simple quality or loss assessment techniques as opposed to the more complex and researcher led demerit and merit scoring schemes which had been used previously. Overall the results of the research were positive, proving that LT can be used to produce accurate quantitative data on loss levels.

LT is included in the revised manual under a new chapter.

Change in Focus of QLAM

R5027 had used a recall questionnaire survey approach to assess the levels of post-harvest fish loss. The same approach was field tested under R7008. Whilst the four research teams were each trained in the method, understandably, only the more literate teams implemented the method, with varying degrees of success. No team was able to use the method as successfully as it had been used under R5027. Problems were associated with implementation, data analysis and reporting.

Reasons for this are most likely related to the method, the training the teams received and the skills of the research teams. The project internally discussed the potential for a

computerised system of data entry and analysis. Whilst this may have overcome some of the problems, it was not possible under R7008 to develop and test this facility. Discussions between FAO and the project as to the future of QLAM and whether it should be included in the manual were held during the 1999 evaluation. It was the successful use of QLAM to validate data from IFLAs in India on a parallel project R6817 (Ward 2000), that resulted in the method being retained but, based on the experiences of R7008, not being recommended for assessing loss levels.

Guide to Which Method to Use and When

Whilst the three loss assessment methods are complementary, each is used for specific purposes. IFLAM for example is used to provide a broad qualitative understanding of losses and the perceptions of those affected. LT can be used to provide representative data on loss levels. QLAM can be used to generate quantitative data on variables which influence loss as well as to validate the results of IFLAM or LT.

In order to assist the user of the manual and the methods to decide which method best suits their needs a short guide is included in the manual. This includes a table giving the key features and uses of each method and a number of scenarios the potential user may find familiar.

Standardised Reporting

An analysis of the reports of the validation exercises from the four research teams over the course of the project, suggested that there was need for a more standardised and systematic reporting format. As a result report templates were produced for each method. These are designed as guides for those reporting on the results of loss assessment exercises. They provide the user with a list of key headings and suggested contents.

Self Assessment Guide for Primary Stakeholders

A draft self assessment guide for fish smokers and traders was produced. It draws on elements of IFLAM and LT. The principal was to produce something which contains a minimum of text that can be translated easily into local languages. The aim of the guide is to take the user through a self analysis of their own activities and business enabling them to identify where and why loss is occurring and identify mitigation measures. It is designed as a stand alone tool which, depending on the literacy level of the user would require no or some additional outsider support.

This first guide requires further development and the addition of images and diagrams before it is field tested. If the general concept is found to be successful then other guides related to other fish and fish products or other post-harvest activities should be produced.

For further details see:

Getting more from your smoked fish: a self assessment guide. Draft. (CD: primaryguide)

OUTPUT 2: COMPUTERISED MODEL TO PREDICT THE OUTCOME OF LOSS REDUCTION INTERVENTION SCENARIOS (CD REF: LOSSMODEL, LOSSMODMAN)

A computer model, Fish Loss model v1, enabling the user to mimic the effect of interventions was produced using MS Excel software along with a user manual. It is designed for researchers, NGOs, fisheries administrations and other development practitioners and was disseminated via workshops and meetings. The Model should be used as a guide to identify interventions for which a cost:benefit analysis and technical appraisal should then be conducted. Initial research and development of the Model was conducted using MATHCAD software. Whilst MATHCAD is powerful modelling software, the original Model was converted into MS Excel, a much more widely available and known software. The Excel version of the Model utilises the NAMES facility to create an impression of simplicity. This has enabled a user-friendly representation of complex mathematical formulae.

For further details see:

Cheke R A, Venn J, Ward A R (2000) Fish loss model v 1. (CD ref: lossmodel).(The user manual CD ref: lossmodman)

The Model focuses on the two most important post-harvest fish losses: physical and quality losses and categorises what happens to fish, from the time of capture, into a succession of stages and assumes that there is a transport event between each stage. It enables the user to present and link data on loss at different stages in a distribution chain. It is designed for people who wish to mimic a fish distribution chain and explore the effect of loss reduction interventions at different stages of the chain. It enables the user to identify key losses and shows the impact of hypothetical interventions to reduce loss at the distribution stage level and on the total loss for the whole distribution chain.

In order to use the Model certain essential data are required for each stage of the distribution chain. These are: percentage of fish physically lost, percentage of fish sold for a reduced price, price of good quality fish, price of poor quality fish and weight of fish. Data are also required on the local currency to US\$ exchange rate, type and value of any by-products, by-product as a proportion of whole fish and weight loss due to processing. The data may represent some particular sample of fish or may be averaged over several samples to represent the mean loss at each stage of the chain.

Data for the model can be generated using Output 1 the field manual of fish loss assessment methods. The accuracy of the Model predictions is related to the accuracy of the data used.

In terms of summarising data on losses, the Model will provide the user with the following:

- **Net total losses (local currency)** – the sum of the value of physical and quality loss for the whole chain expressed in the local currency used.
- **Net total losses in US\$** - the sum of the value of physical and quality loss for the whole chain expressed in US\$.

- **Total losses considered as a % of initial value of catch** – the total loss in value terms expressed as a percentage of the value of the fish that enters the chain before any loss using the value of the fish at that stage.
- **Total losses considered as a % of maximum value of fish** – the total loss in value terms expressed as a percentage of the value of the fish assuming no loss and using the best price attained.
- **Profit in US\$** - not a loss summary field and not strictly profit, this refers to the income generated from the sale of by-products.
- **Gross total losses in (local currency)** – the loss in local currency once any revenue from by-products has been deducted.
- **Gross total losses in US\$** - the loss in US\$ once any revenue from by-products has been deducted.

The Model has been developed to cope with data for single species of fish rather than mixed catches where prices and losses may vary according to species. Furthermore, the model is designed to run from data on a single product type and chain. If fish from a batch are divided after landing into some which are processed and some which are sold fresh then the two sets of data will need to be modelled separately.

If loss data are statistically valid, and representative of a target population, then it will be possible to use the Model to estimate loss levels on a larger scale rather than for just the micro level. The total loss level for a chain using landing data for a season or year may be of interest to planners and policy makers. If the total financial loss appears to be substantial and interventions can reduce this then estimating the potential benefits of loss reduction may attract interest and lead to more detailed cost:benefit analyses and technical appraisals.

OUTPUT 3: DATABASE OF POST-HARVEST FISH LOSSES (CD REF: FLOSSUSER1, FLOSUMAN)

An MS Access database, FishLoss was produced in two versions: a user version which does not allow editing or updating; and, a full administrator version. A user manual was also produced and as well as available in hard copy format this is available as a Help file within the database.

FishLoss is designed to be a source of reference for people interested in studying post-harvest fish losses, i.e. fishery researchers and planners. It is designed to help identify where losses occur, the reasons why they occur, and to identify aspects on which little or no research has been conducted. Furthermore the structure of the database could be used as a template to guide future loss data research and data collection.

FishLoss contains one hundred and sixty six data sources and details of four hundred and seventy one loss records. Data on various aspects of post-harvest fish losses are available and so far these have been derived from secondary sources. These include reports and papers on shelf life estimates and references relevant to post-harvest losses.

The user version was disseminated via the DFID PHFRP FLAC workshop held in Ghana. Following the project, discussions continued with ICLARM regarding the hosting of FishLoss in FishBase.

The user version is on the accompanying CD. Microsoft Access 97 is required to view and use it:

Venn J, Ward A R, Smith M, Cheke R A (2000) FishLoss: a database of post-harvest fish losses. (CD ref: FLOSSuser1.mdb). (The user manual is CD ref: FlosuMAN.doc)

The losses table is the main table in the database. It contains codes to identify the data sources referring to the losses, the name of the fish associated with the losses, the location at which the loss was recorded as well as estimates of the losses themselves and the main reason for loss. The losses table is linked to tables which define the fish name, location at which the loss was recorded, and the source of the data in more detail (Fig 1). Since the database has a relational structure these details only have to be entered once. The links between the tables mean that they may be referred to many times in different loss records. Value details are contained in the losses-finance table.

Each loss record also has associated with it a record in one of the loss stage tables of fishing details, process details, transport details and storage details, depending on the stage in the distribution chain at which the loss was recorded. These contain details such as the duration of the stage and temperature which affect the degree of loss observed. These correspond to the sectors for which separate loss assessments were carried out by Ward (1996) and have also been used in the modelling exercises linked with this database.

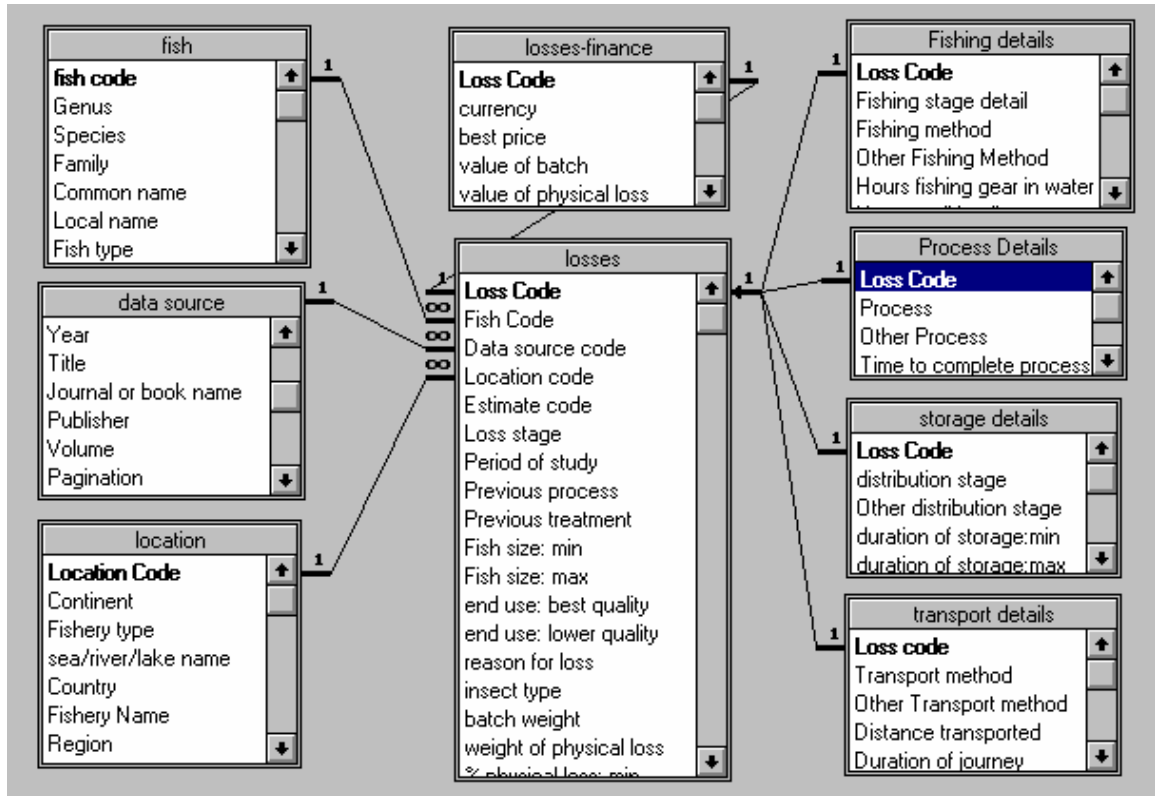


Fig 1. The primary tables in the database and their relationships.

One of the main problems in developing this database was to allow for the different levels of detail in the data, and the different ways in which losses have been defined. In Tanzania Ward (1996) classified losses as physical losses where fish had to be thrown away, or quality losses where fish had to be sold at a reduced price. We have maintained this classification in the fish losses database and losses can be entered as the % (by weight) of physical or quality loss. In addition absolute weights can be entered and also details of the value of quality and physical losses. Other workers have not distinguished between physical and quality losses hence it is also possible to enter the total value of losses. Losses can also be entered as % of fish losing quality by number, another method which has been commonly employed to assess fish losses.

In many cases the information known on location may be no more than the country and whether the fishery was marine or freshwater. In other cases we are given the town or village name. The location table therefore contains a number of different fields for geographical units from continent down to co-ordinates so that the location can be specified to the level of detail known. Entering details of fish taxonomy provided similar problems. *Carangoides armatus* is thus a different record in the fish table to *Carangoides*. To prevent ambiguity all taxonomy, with the exception of local name, has been standardised to that used in FishBase (ICLARM, 1995). Where taxonomy is not known to species level then another name in English or the local language can be entered in the local name field which may distinguish fish of the same genus or family.

Contribution of Outputs

Ultimately, the use of the outputs will lead to a reduction in post-harvest fish losses. Reducing loss will contribute to the improved utilisation of resources, improved food security, and improved livelihoods of those working in the sector. Improved utilisation is desirable in that wastage is reduced and income maximised. The latter being a positive outcome in terms of the livelihoods of the poor and/or vulnerable, who dominate the communities of many fisheries in Africa and Asia. Nevertheless, unless sustainable resource management is also practised, improved utilisation on its own may reap short term benefits, but may result, in the longer term, to increased pressure on resources, leading to long term socio-economic and environmental concerns.

Reducing waste and loss and improving quality will make more fish protein available, of a higher quality and with a longer shelf-life, to consumers. This will contribute to national, regional and potentially international food security. Especially as per capita consumption of animal protein is regarded as low in many areas of West Africa and Asia. All things being equal, the incomes of those who incurred loss will rise as they are able to sell more fish. Better prices may be received for improved quality product. Consumers may benefit by having access to an increase in available protein at affordable prices. However, reducing quality loss, in other words improving quality, may lead to higher selling prices and increased income to the seller – improving their livelihood, but at the same time this may result in low-income consumers being unable to afford to buy fish.

In order for the contributions to be realised the outputs need to be made available to and used by secondary stakeholders such as research institutes, NGOs, fisheries administrations and other development practitioners. The results of the use of the outputs then need to be used for planning and implementing loss reduction initiatives. These could be in the form of direct activities at the micro level such as training courses for primary stakeholders in issues related to loss reduction. Alternatively the information should be used to inform government policy. Either to influence policy or to initiate indirect activities – macro economic initiatives, which will lead to loss reduction. An example of this would be a situation in which a research team use the outputs and identify that poor transport to and from a region or community is identified as a constraint. Poor market access leads to both quality and physical losses. This information is communicated through the relevant government channels in order to raise awareness with a view to stimulating improvements in transport. Furthermore, use of the outputs may identify researchable constraints, which relevant institutions may be in a position to follow-up.

As well as secondary stakeholders using the outputs and then planning, implementing, or stimulating loss reduction initiatives, the use of the outputs will also lead to awareness raising amongst primary stakeholders. This itself may lead to initiatives by primary stakeholders. Furthermore, bearing in mind the institutional weaknesses at secondary stakeholder level (funding), it would be worthwhile exploring the development of stand alone loss assessment guides for primary stakeholders, based on the draft produced by the project.

The project has provided some secondary stakeholders in Africa with the outputs. It has also produced a small cadre of former users and resource persons in West Africa. This group would provide potential trainers in future.

The DFID PHFRP recognises the importance of promoting the outputs to secondary stakeholders and as a result have funded a promotional workshop in Ghana and intend to fund two more – one in East Africa and one in India. The Programme will also undertake other dissemination and promotion activities, including providing seed funding to assist potential users put together project proposals.

This last point is key to uptake and use of the outputs. Secondary stakeholders will need access to resources if they are to use the outputs and then act on the results. This especially applies to the Manual which involves training and field research. Funds are seen as a major constraint to uptake and sustained use by secondary stakeholders. There are two immediate sources of funds: national government; or external – donor funds. Uptake of the outputs at the donor level would increase the likelihood of funds from this source. FAO have already endorsed the Field manual and the primary stakeholder manual concept. This will add to the credibility of the outputs and aid not only long term promotion but also uptake by secondary stakeholders. Getting loss assessment and loss reduction into national development plans and research and development budgets is seen as a priority.

At the time of writing however three organisations plan to incorporate the field based loss assessment methods into future work programmes. The West African Association for the Development of Artisanal Fisheries have included training in and use of the methods in a proposal for loss reduction in the Gambia. The College of Visayas in the Philippines has secured funding to implement a programme of loss assessment based on the three methods. The Nigerian Institute for Oceanography and Marine Research plan to include a loss assessment programme based on the methods within their 2001/2 budget.

Discussions with ICLARM regarding their uptake of FishLoss will continue after the project under a follow-on contract. This activity will be necessary in order to facilitate the incorporation of FishLoss into FishBase. This would ensure wide scale promotion of FishLoss by ICLARM via the internet and CD Rom. Key to the long term sustainability of FishLoss will be its update, perhaps on an annual basis. Discussions with ICLARM are expected to reveal a way forward for this. But it may require resources. The inclusion of a form which the user fills in giving secondary source information and/or primary data on fish losses would be one useful additional feature of FishLoss. This form could be made available electronically and in hard copy. The responses would form the basis of updating.

WADAF were key collaborators as well as a target institution. Although, initially funded by the EU, the NGO is now autonomous, but its long term future is likely to be reliant on donor support. The potential influence WADAF has on the promotion and uptake of the outputs by secondary stakeholders in West Africa should not be underestimated. Funds permitting, its influence is likely to grow in future and, because of its post-harvest mandate and experience in the use of the outputs, it should be seen as the key target institution in West Africa. Providing WADAF with copies of the outputs for distribution and short term technical support in running training

courses should be considered as necessary follow-up by DFID. WADAF would act as the main contact point in the region for loss assessment. They should be encouraged to distribute the outputs to other key regional target institutions such as INFOPECHE, FAO and the DFID SFLP. The availability of French versions of the outputs would significantly increase uptake and use in West Africa. Assistance with the translation of the outputs into French should be explored. Although FAO intend to produce French and Spanish versions of the Manual, translations would assist FAO to complete this early.

In terms of wider fisheries development goals, the project has contributed to the objectives of the FAO Code of Conduct for Responsible Fisheries. Developed through international negotiation by FAO in response to over-exploitation of fish stocks, international fisheries conflicts and economic loss, the voluntary Code provides a set of principles and standards of behaviour and good practice, which aim to ensure sustainable exploitation of fishery resources through effective conservation and management. It seeks to promote equity, safety and sustainability in fish production, processing and marketing and includes specific guidelines on fisheries management, fishing, aquaculture, the post-harvest sector and research.

Guidelines or standards for the State, individuals, groups, business and organisations whose livelihoods depend to an extent on the post-harvest sector are concentrated in Article 11.1 of the CCRF which is Responsible Fish Utilization (RFU) (FAO 1998). The project contributes specifically to Article 11.1.8 a) States should encourage those involved in fish processing, distribution and marketing to reduce post-harvest losses and waste.

PROPOSED FOLLOW- UP ACTIVITIES

A number of follow-on activities are envisaged which would either develop the outputs further or further promote and disseminate the outputs to facilitate uptake. These are as follows:

1. The primary stakeholder guide, which is seen by WADAF as compatible with their ethos of self-help, should be validated in the field. A short programme involving participatory research with a number of communities in West Africa should be sufficient to determine its potential and effectiveness and the need for modifications. If successful, a series of similar guides should be produced based on different products and distribution stages.
2. The outputs should be translated into French to facilitate wider dissemination in West Africa.
3. A paper which links the outputs to the Livelihoods Approach (LA) would update the work, which was conceived before the LA was embraced by DFID. This would aid promotion and uptake by DFID and other donors which use the LA, such as UNDP.
4. Use of the loss assessment field-based methods as a monitoring tool for post-harvest initiatives under the DFID SFLP should be emphasised to key project personnel via communications and meetings/short presentation.

5. The development of a macro level loss assessment approach is seen as a next stage of development. Demand for such a tool has been expressed in a number of countries such as Senegal, Uganda, Zambia and the Philippines.

6. Further promotion of the outputs at secondary stakeholder level is required via workshops, training courses and assistance in the development of project proposals. Support should be provided to FAO, if required, in order to facilitate their publishing the Manual.

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APPENDIX 1 LIST OF KEY INDIVIDUALS INVOLVED IN R7008

Name	Organisation	Role
Ansen Ward	NRI	project leader
Prof. Robert Cheke	NRI	development of Model
Dr Jon Venn	NRI	software development
Dr David Jeffries	NRI	biometrician
Dr Roger Stern	University of Reading	biometrician
Sian Floyd	NRI	biometrician
Ulrich Kleih	NRI	socio-economist
Ann Gray	NRI	socio-economist
Derrick Akintade	NRI	socio-economist
Dr Demba Yeum Kane	WADAF	project co-ordinator
Joseph Ndenn	WADAF	socio-economist
Mercy Akeredolu	WADAF	socio-economist
Dr Amadou Tall	INFOPECHE	project co-ordinator
Dr Paul Anoh	University of Cocody, Côte d'Ivoire	research team leader
Boubacar Diakité	Instiut de Technologie Alimentaire, Senegal	research team leader
Nicholas Ntiamoah	Wenchi Farm Institute, Ghana	research team leader
Dr Pearl Amankwa	Food Research Institute, Ghana	collaborating scientist
Gladys Nerquaye-Tetteh	Food Research Institute, Ghana	collaborating scientist
Gbola Akande	Nigerian Institute for Oceanographic and Marine Research	research team leader

APPENDIX 2 PROJECT DOCUMENTS ON CD

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