

# Post-harvest fish loss assessment in small-scale fisheries

A guide for the extension officer



***Cover photographs:***

*Clockwise from top left:* a post-harvest fish loss assessment working group discussing a case of huge losses in dried fish; a beachside view of physical loss of fish; load tracking group exercise on smoked fish used here to quantify losses from the processing site to the market; a semi-structured interview by the post-harvest fish loss assessment working group with women fish processors (all courtesy of Ansen Ward).

# Post-harvest fish loss assessment in small-scale fisheries

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A guide for the extension officer

by

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## Preparation of this manual

Post-harvest fish losses are a major concern and occur in most fish distribution chains throughout the world. Not only do losses constitute lost income to fishers, processors and traders but they also contribute to food insecurity – a loss of fish means less fish available for the consumer.

This manual has been developed as a tool to guide fisheries extension workers and other development practitioners on ways in which to assess post-harvest fish losses and help plan reduction interventions in small-scale fisheries (SSFs). It is a product of almost two decades of extensive fieldwork and unremitting collaboration among individuals and institutions, particularly FAO and the Natural Resources Institute (NRI) of the United Kingdom of Great Britain and Northern Ireland, which was concluded by the Post-harvest Fish Loss Assessment (PHFLA) Working Group organized and facilitated by FAO from 2006 to 2008 within the regional Africa PHFLA Programme.

The PHFLA Working Group brought together post-harvest fisheries experts from several countries, including Cameroon, Chad, Côte d'Ivoire, Gambia, Ghana, Kenya, Malawi, Mali, Nigeria, Senegal, Uganda and United Republic of Tanzania, together with other international experts. The group held three workshops. The first one was held in Accra, Ghana, in June 2006, where participants reviewed and internalized available PHFLA methods before mapping out a programme of fieldwork in selected countries. A second meeting was also held in Accra in June 2007, followed by a third in Jinja, Uganda, in March 2008. The last two meetings deliberated on the results of fieldwork to assess losses and validate the methods used in PHFLA.

The PHFLA Working Group recommended that the work should be consolidated into a manual for wider dissemination to promote post-harvest fish loss assessment and reduction.

Assessing losses and understanding them is key to addressing the post-harvest fish loss problem. The purpose of preparing this manual has been to provide extension officers and development practitioners with an effective fieldwork tool that is easy to read and understand and one that shows them how to carry out their own assessments. This manual is not designed as a definitive guide to fish loss assessment but rather as a resource that can encourage greater efforts to understand and reduce losses in SSFs. With this in mind, the authors look forward to receiving feedback from those who use this guide, which can then be used to enrich it further.

We are grateful to Gloria Oriente for the layout design.

# Abstract

The field activities within the regional post-harvest loss assessment programme in small-scale fisheries in Africa (an FAO regular programme conducted from 2006 to 2008) tested and validated three key fish loss assessment methodologies that have been developed over the past two decades: the Informal Fish Loss Assessment Method (IFLAM), Load Tracking (LT) and the Questionnaire Loss Assessment Method (QLAM).

This manual describes these three methods in detail and provides practical guidelines on when they can be used and on how to use them to collect reliable data, be it for planning for an intervention to reduce losses in a particular area or at the country level or monitoring and assessing the effectiveness of a loss reduction intervention. While the IFLAM is used to generate qualitative and indicative quantitative post-harvest fish loss data that can be used to inform decision-making or to plan the use of LT and the QLAM, the latter are quantitative assessment methods. Load Tracking is used to quantify losses at stages along the distribution chain or losses related to specific activities, such as fishing, transport, processing and marketing. Key data related to the cause and effects of losses from an IFLAM study are validated using the QLAM before any suitable intervention is introduced. A combination of the IFLAM, LT and QLAM could then be used to monitor and evaluate the effects of an intervention. Illustrative examples and case studies are presented to facilitate the uptake and use of the methods in systematic fish loss assessment.

This fieldwork tool also enlightens the extension officer on how to communicate the data from the assessments and the design of loss reduction interventions to help policy-planners and decision-makers understand important issues facing fishing communities.

It is hoped that this manual will be of interest to all those involved in fisheries technology and development, field research, data analysis and reporting as well as participatory approaches to development.

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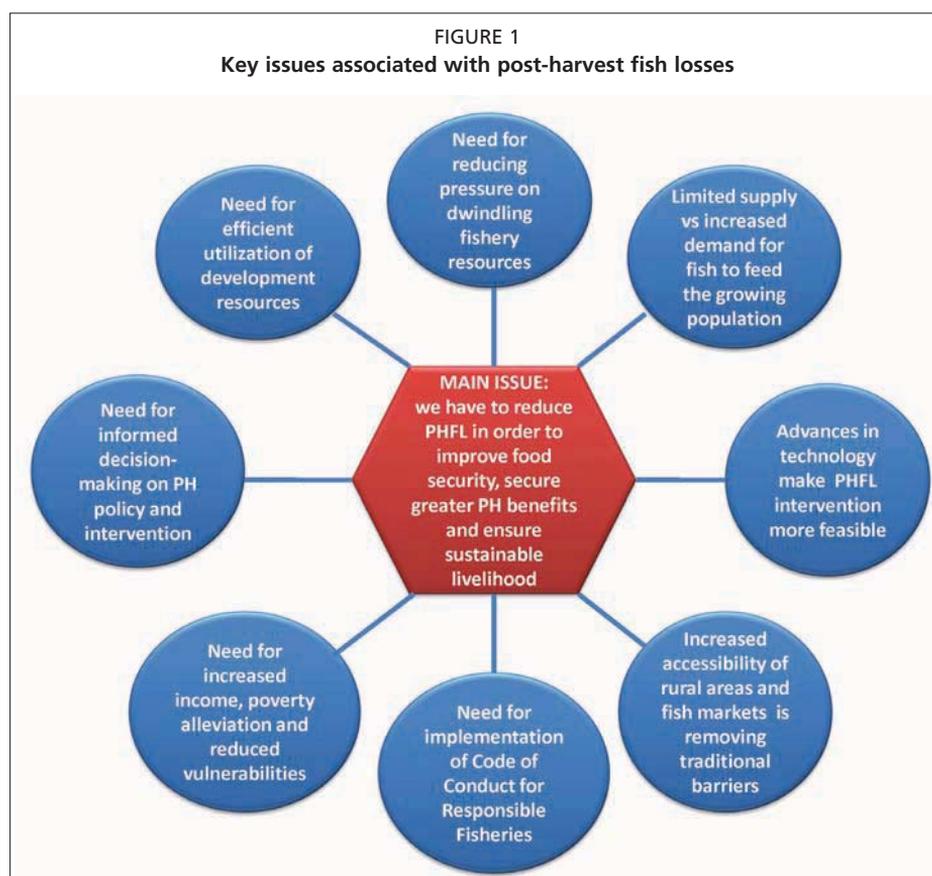
## Abbreviations and acronyms

<b>FD</b>	flow diagram
<b>IFLAM</b>	Informal Fish Loss Assessment Method
<b>IUU</b>	illegal, unreported and unregulated (fishing)
<b>kg</b>	kilogram
<b>KII</b>	key-informant interview
<b>LT</b>	load tracking
<b>NGO</b>	non-governmental organization
<b>PH</b>	Post-harvest
<b>PHFL</b>	post-harvest fish loss
<b>PHFLA</b>	post-harvest fish loss assessment
<b>PRA</b>	participatory rural appraisal
<b>QLAM</b>	Questionnaire Loss Assessment Method
<b>SSF</b>	small-scale fishery
<b>SSI</b>	semi-structured interview

# 1. Introduction

Small-scale fisheries (SSFs) account for more than half of total fish production in the world. The sector is a major source of food fish, income and employment to many millions of people, especially in developing countries. Despite their importance in terms of poverty alleviation and food security, SSFs are facing a host of challenges, including: overfishing, illegal unreported and unregulated (IUU) fishing, conflicts with industrial fisheries, and high levels of post-harvest fisheries losses (PHFLs).

Post-harvest fisheries losses are of great concern because they equate to a loss of valuable animal protein for consumers and lost income for fishers, processors and traders. Reducing losses is therefore an important development goal in the fisheries sector. Figure 1 summarizes the PHFL problem.



However, reducing PHFLs in SSFs is not straightforward owing to the multiplicity of species, fishing gear and methods, as well as numerous dispersed and inaccessible landing sites. The complexity is compounded by a diversity of products, long or fragmented fish distribution systems and the involvement of many different types of stakeholder socio-economic factors related to poverty, skills and knowledge, access to services, culture and traditions.

This manual describes three fish loss assessment methods: the Informal Fish Loss Assessment Method (IFLAM), Load Tracking (LT) and the Questionnaire Loss Assessment Method (QLAM). These methods have been developed through fieldwork over the past two decades. They have been used in the Gambia, Ghana, Kenya, Malawi, Mali, Nigeria, Senegal, Uganda and United Republic of Tanzania in Africa as well as in several Asian countries. These methods are seen as practical ways of investigating, understanding and measuring fish loss. They help identify significant losses affecting SSF operators and set the scene for interventions to reduce these. This manual is an output of the FAO Regional Programme in Post-harvest Loss Assessment in Africa. Annex 1 contains a list of those involved in the programme.

This manual provides practical guidelines on how loss assessment can be conducted to better understand and address the PHFL problem. The assessment methods will help identify different types of PHFLs, the causes of the losses, the magnitude of key losses and who is affected, where and how. The information from the assessments can help policy-planners and decision-makers understand important issues facing fishing communities and how these can be addressed.

The manual consists of chapters focused on:

- understanding fish losses;
- planning an assessment;
- using the IFLAM;
- using LT;
- using the QLAM;
- report writing and communication;
- intervention.

The manual will be of interest to anyone involved in fisheries technology and development, field research, data analysis and reporting as well as participatory approaches to development. Sources of further information on fish losses and fish loss assessment are provided at the end of the main text.

## 2. What are post-harvest fish losses?

### WHAT DOES “POST-HARVEST FISH LOSS” MEAN?

This chapter introduces the main types of PHFLs encountered in SSFs and the main causes of these losses. Generally speaking, PHFL refers to fish that is either discarded or sold at a relatively low price because of quality deterioration or owing to market dynamics. This means that fish operators (fishers, processors, traders, and other stakeholders involved in ancillary operations) lose potential income. It also means that less fish is available to consumers, or that consumers are supplied with low-quality fish and fish products (Figure 2). There are also important negative implications for food security.

Post-harvest fish losses are often caused by biochemical and microbiological spoilage changes that occur in fish after death. A live fish has natural defence mechanisms that help to prevent spoilage. However, once a fish dies, its defence mechanisms stop and enzymatic, oxidative and microbiological spoilage begins to cause quality deterioration.

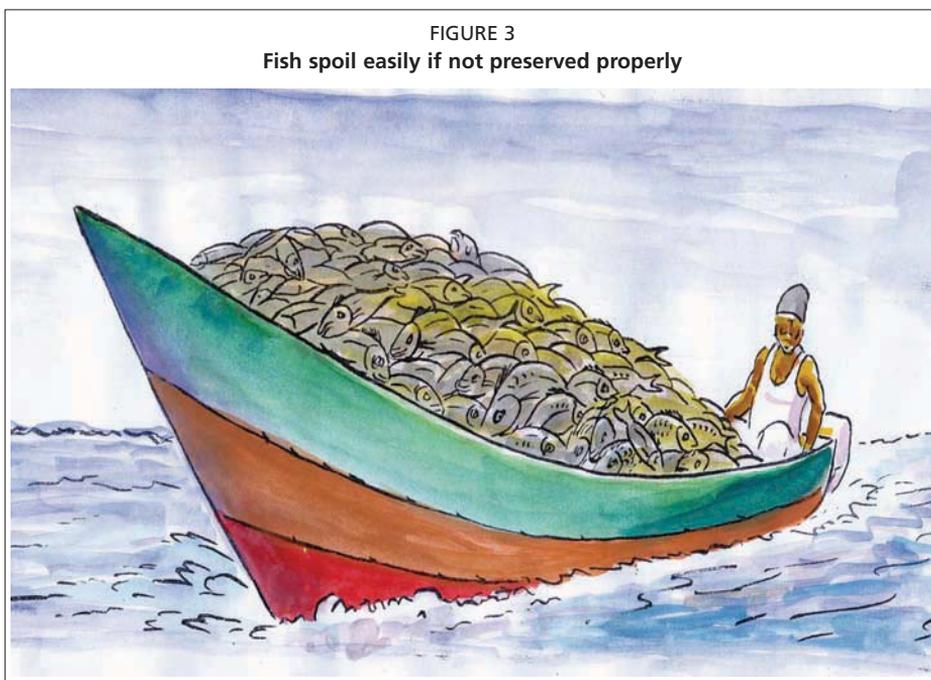
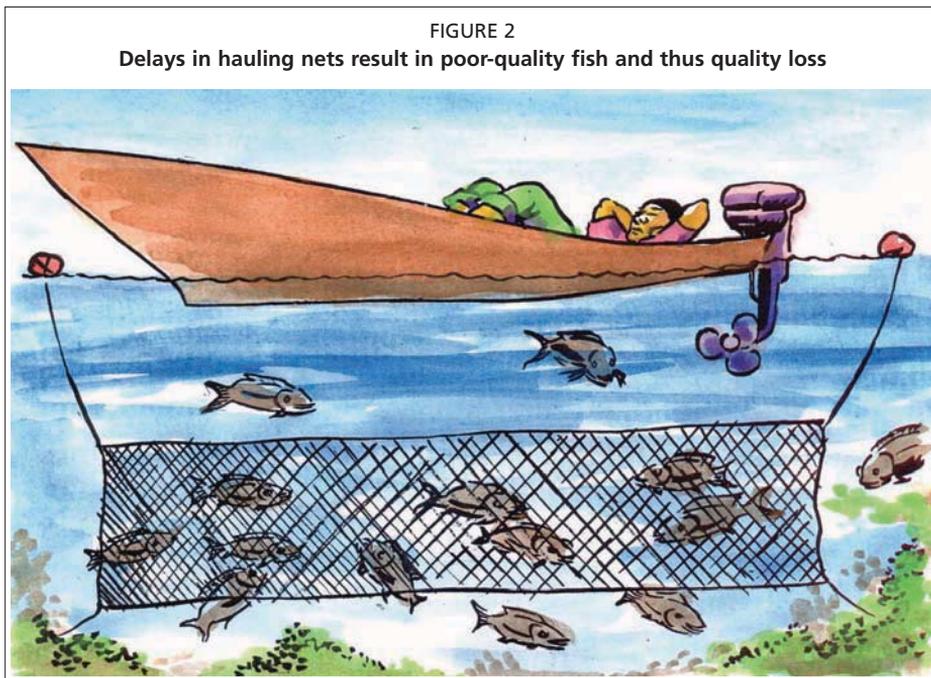
Several factors tend to influence the rate of spoilage of fresh fish:

- **Time** between death and final use or consumption (Figure 3): Even if fish are chilled using ice, they will gradually spoil over time; processed fish quality also deteriorates over time.
- **Temperature abuse:** High ambient temperatures, such as 20 °C, create favourable conditions for fish spoilage. Low temperatures, such as 5 °C and below, slow the action of bacteria and the rate of spoilage, helping to reduce losses.
- **Handling practices:** Poor handling practices lead to sustained and increased microbial contamination, hastening the spoilage rate of fish. Such practices include: using dirty canoes, equipment, fish boxes and baskets; not washing fish; washing fish in dirty water; placing fish on dirty surfaces; and physically damaging fish by throwing or standing on them.

Besides spoilage, PHFLs are caused by:

- discarding of bycatch at sea because fish is too small or not valuable enough to land for sale;
- poor processing techniques damaging fish;
- animal predation and insect infestation;
- inadequate packaging and storage practices leading to damage of the end product;

- market dynamics, especially fluctuations in demand and supply of fish and fish products, affect price and therefore income.



## MAIN TYPES OF LOSSES COVERED IN THIS MANUAL

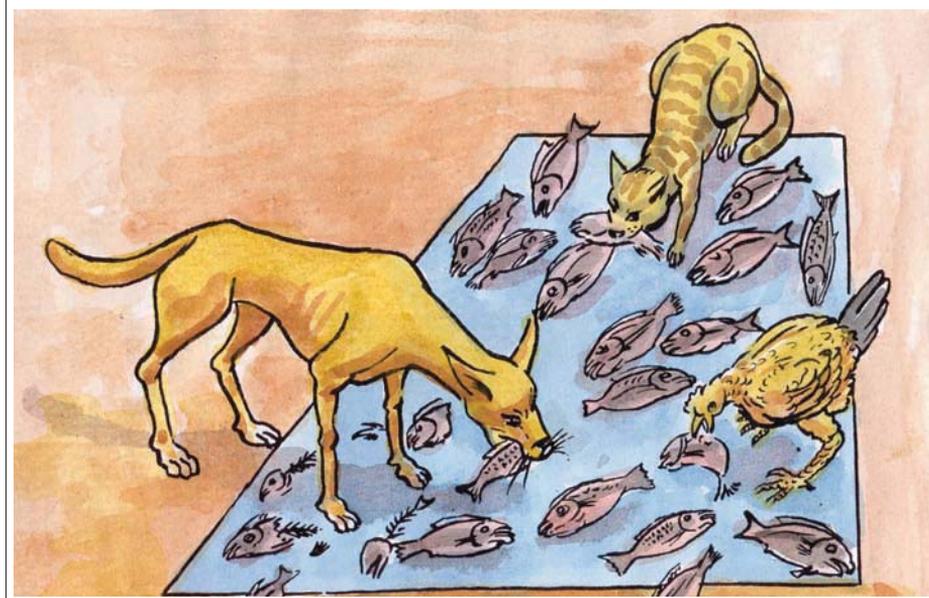
There are three types of loss considered in this guide that affect SSF stakeholders:

- physical loss;
- quality loss;
- market force loss.

### Physical loss

Physical fish loss refers to fish that, after capture or landing, is not used. It is either thrown away accidentally, voluntary or as authorized. Physical loss can be caused by theft, by insects eating the fish, or by bird or animal predation (Figures 4 and 5).

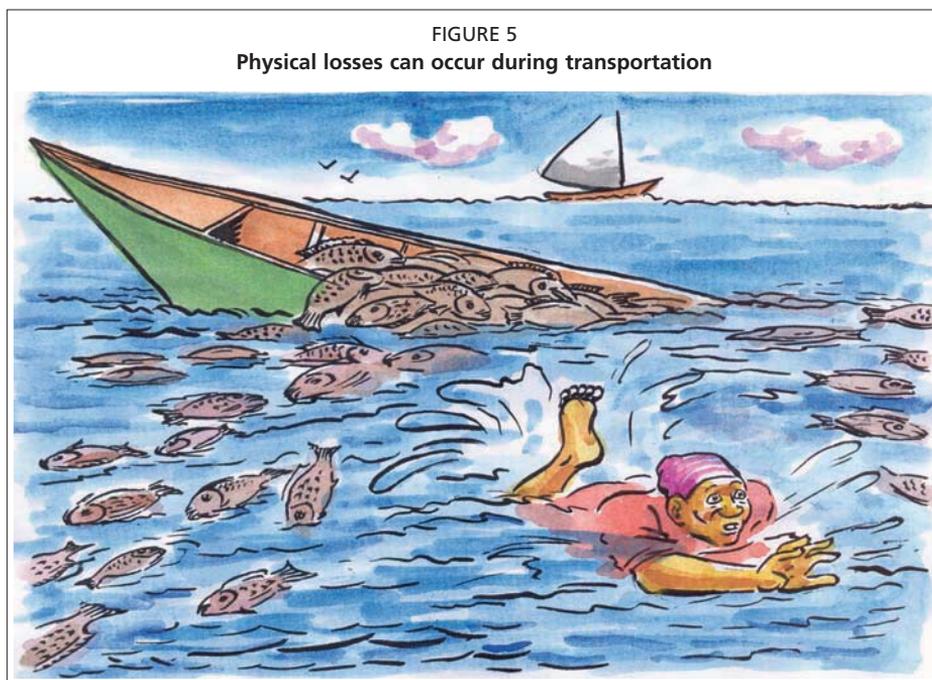
FIGURE 4  
Animal predation causes fish loss



### Examples

- Fish have spent many hours caught in the fishing gear (Figure 2). The fish have been dead in the water and have begun to spoil. By the time the fishing gear is hauled into the canoe, the fish have become too spoiled to fetch a good price and market and are not worth landing, and, therefore, they are thrown away at sea.
- In many tropical countries, small-sized fish such as sardine and anchovy are sun dried in the open air before being packed and distributed. When catches are high, e.g. during the rainy season, the fish cannot be dried properly and spoil. Severe spoilage means that the fish are often thrown away.

- Fishing for high-value species such as shrimp is often associated with high levels of bycatch. In some fisheries, most bycatch is discarded at sea as it consists of low-value, small fish that are not worth landing.



### Quality loss

Quality loss refers to fish that has undergone changes owing to spoilage or physical damage and has suffered quality deterioration (Figure 6). Such fish is sold for a lower price than that which would have been achieved if the fish were of “best quality”. This is the most common PHFL in many areas.

### Examples

- Poor transport as well as inadequate market information result in operators storing their fish and fish products for long periods. In the process, spoilage occurs and the quality of fish is degraded, leading to low selling prices.
- Some fresh-fish traders do not use ice. They buy fresh tilapia early in the morning and struggle to sell the bulk during the day. The fish is exposed to high ambient temperatures and sold for about US\$1 per kilogram in the morning, and the price gradually declines during the course of the day to less than US\$0.5 per kilogram in the evening (Figures 7 and 8). Any leftover fish at the end of the day has to be sold for less than US\$0.2 per kilogram to traditional fish processors. Given the situation, most customers wait until evening, when a fish seller is desperate for buyers as the quality is degrading

fast. If ice were available, the trader could slow the rate of spoilage and maintain quality, keeping the fish in good condition for a few days and hopefully obtaining more consistently higher prices for the product!

- In some communities, consumers think that fish that has been iced is not good quality and they are suspicious of such fish! Such customers prefer to buy fish that has been exposed to ambient temperatures. They need to be educated about the benefits of using ice and the positive effect it has on fish quality (Figure 9). Otherwise, it will be difficult to implement loss reduction interventions, such as good use of ice.
- The first-in, first-out rule is not always applied in many small-scale fish markets where the most recently arrived fish is the first to be sold and fish already in storage is left and can suffer quality deterioration, which will affect its eventual selling price. In such situations, good business practices and good storage practices can help to ensure good-quality fish.

FIGURE 6

**The use of chemicals in fishing affects the safety and quality of fish – posing a threat to consumers' health**

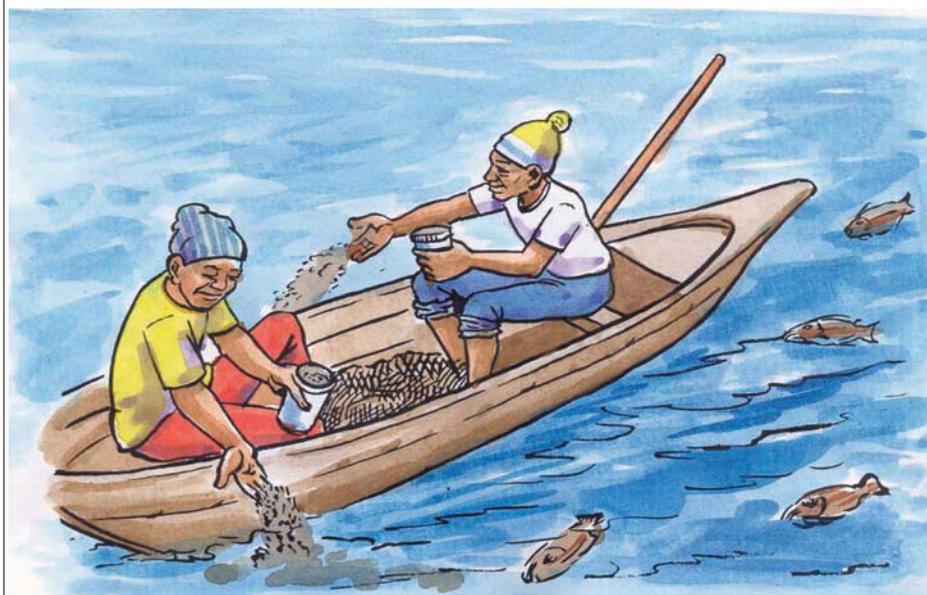


FIGURE 7  
Exposing fish to high temperatures can cause quality loss

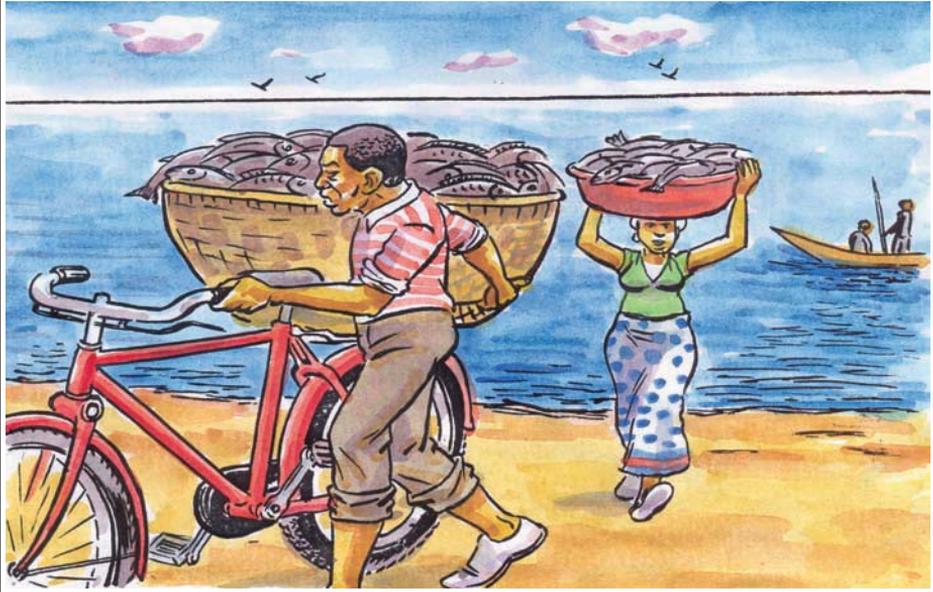
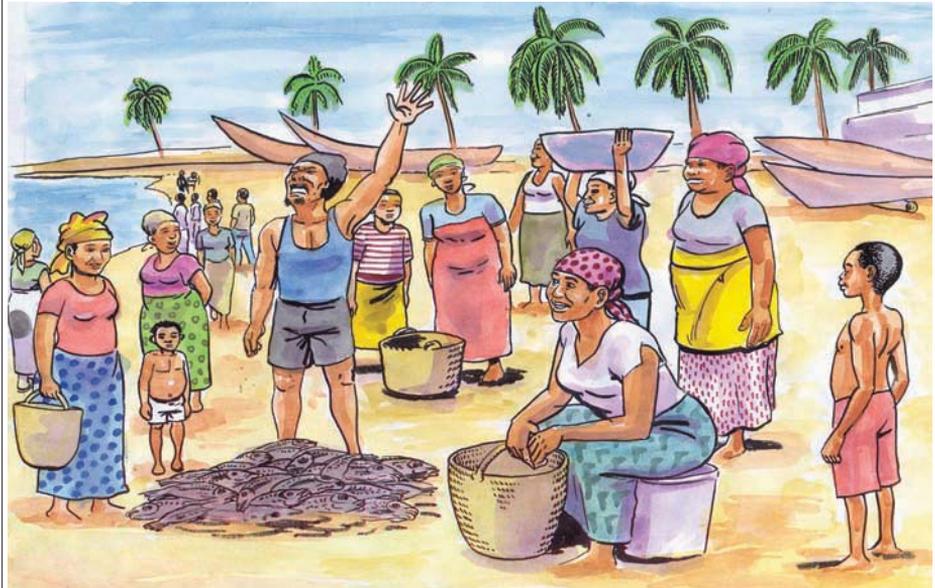
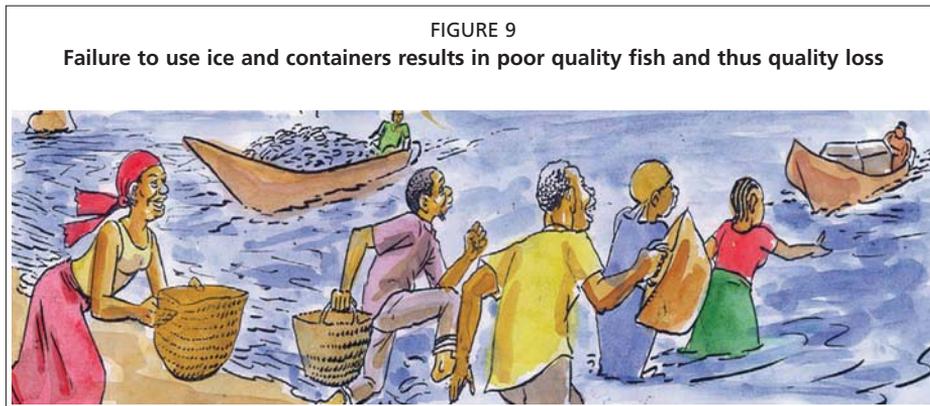


FIGURE 8  
The quality of fish exposed to high temperatures can affect price

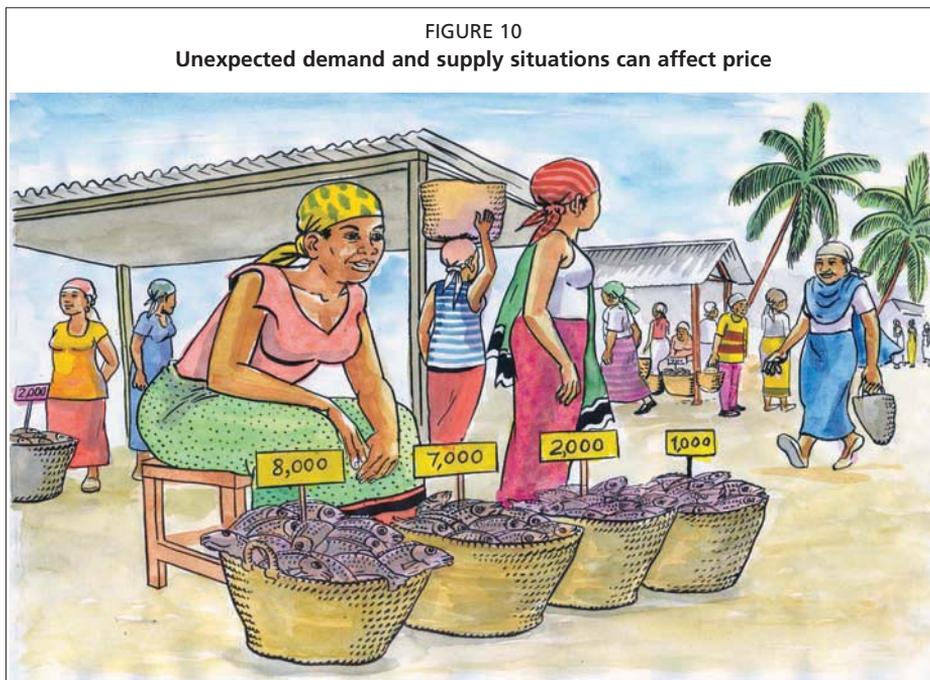


As a strategy to cut the price down, and knowing that fish spoils over time, buyers deliberately delay the purchase.



### Market forces loss

Market force loss is a loss caused by unexpected market demand and supply situations (Figure 10). These cause operators to sell their product at a price below expectations. The loss is the difference between the expected price and the actual price.



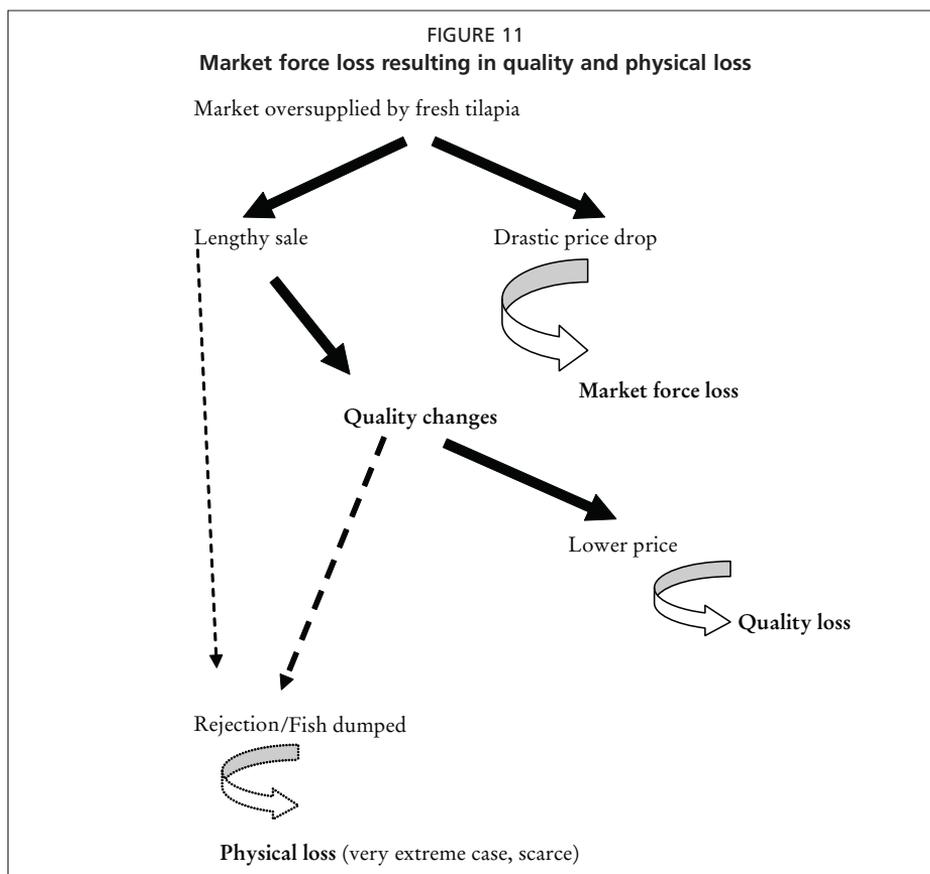
As new supply is coming, and customers are few, the price of old stock has to be reduced.

### *Examples*

- Increased supply during the peak season may flood the market with the fish, and the price can then fall regardless of its quality.
- Inadequate market information and barriers can prevent the producer from gaining access to the right market with the right product at the right time.
- Storing fish, whether it be fresh, frozen or smoked, will often incur costs, e.g. electricity, and storage rent. Hence, if not careful, the owner of the fish can end up making a loss if the fish is not sold quickly.
- Sometimes, marketing malpractices can lead to improper pricing or cheating. This can cause a loss to operators.
- Some of the rural fish markets operate on established market days only. On such days, more fish is supplied in the market and price is affected by supply and demand.
- Specific festive periods are celebrated with preference to particular foodstuffs. If these are vegetables and meat, the demand for fish will drop along with its price.

There are many things that can influence markets, demand, supply and fish price. Consequently, it can be difficult to determine or know the real reasons for a market force loss. Experience from loss assessments has shown that a market force loss may evolve over time into quality and/or physical losses. Figure 11 shows the relationship between market force, physical and quality losses, and Plate 1 shows one of the reasons for this process.





Source: Akande and Diei Ouadi, 2010.

### SUMMARY OF CAUSES OF DIFFERENT PHFLS

Physical, quality and market force losses occur throughout the post-harvest chain from harvesting to consumption. These result in lost income and contribute to food insecurity. Table 1 summarizes the main causes of the three types of loss according to different stages of the distribution chain.

TABLE 1

## Causes of post-harvest fish losses

Stage	Causes	Loss type
During fishing	Use of destructive/harmful methods of fishing, such as dynamite, poison, resulting in harvesting fish that is already damaged or of inferior quality	Physical, quality
	Falling from the net or discarded as bycatch	Physical
	Setting fishing gear for long periods, causing fish to spoil before the gear is hauled	Physical, quality
Holding fish on board	Delay returning to landing after fishing, and exposure of fish to high ambient temperatures at sea	Quality, physical
	Failure to gut (when practically feasible), wash and chill the fish on board	Quality
	Stepping on fish, causing physical damage	Quality
During unloading	Poor hygienic practices causing contamination	Quality
	Fish falling from the pan/crate/basket on to the shore	Physical
	Very long bargaining time at first point-of-sale, while fish is kept on the ground exposed to the sun at high ambient temperatures	Quality
	Theft at the landing site during offloading of fish	Physical
Fresh fish marketing	Inadequate application of ice, and no insulated container used	Quality, physical
	Limited preservation capacity during bumper catches, e.g. ice, processing equipment	Physical, quality
	No access to or lack of marketing information, with oversupply of market	Market, quality, physical
	Deliberate delay in purchasing the fish by traders	Quality
During processing and packaging	Processing of already spoiled/poor-quality fish	Quality, physical
	Processing fish under unhygienic conditions, allowing blowfly infestation	Physical, quality
	Inadequate control of heat intensity during smoking leads to oversmoking of fish and possible burning	Quality, physical
	Drying fish unsupervised, on ground, rocks or herbs	Physical, quality
	Breakage or damage owing to inadequate packaging method and materials	Quality, physical
	Oxidation of fatty fish leading to rancidity	Quality
During storage	Growth of mould causes spoilage and makes the fish damp	Quality
	Insects consume fish during storage	Physical, quality
	Discoloration owing to chemical changes	Quality
	Inadequate storage facilities	Quality, physical
During distribution	Delays owing to breakdown of transport vehicles and inaccessibility of production areas	Quality, physical
	Damage to fish during transportation	Physical
During marketing	Delays in selling	Quality
	Inadequate cold-storage facilities and warehouses and lack of ice	Quality, physical
	Supplying the market at the “wrong time”	Market
	Poor purchasing power of buyers/consumers	Market

## 3. Planning for the process of PHFLA

### WHICH LOSS ASSESSMENT METHODS TO USE?

This chapter introduces some of the key issues to consider when planning to carry out fish loss assessment. It discusses planning requirements and issues to do with the team that will carry out the assessment.

Post-harvest fish loss assessment (PHFLA) in SSFs requires the collection of data and their analysis. Assessments are carried out using qualitative and quantitative field assessment methods. This manual focuses on three methods: the Informal Fish Loss Assessment Method (IFLAM), Load Tracking (LT) and the Questionnaire Loss Assessment Method (QLAM).

The IFLAM is an informal method based on participatory rural appraisal (PRA) principles. It is used to generate qualitative and indicative quantitative PHFL data that can be used to inform decision-making or to plan the use of LT and the QLAM.

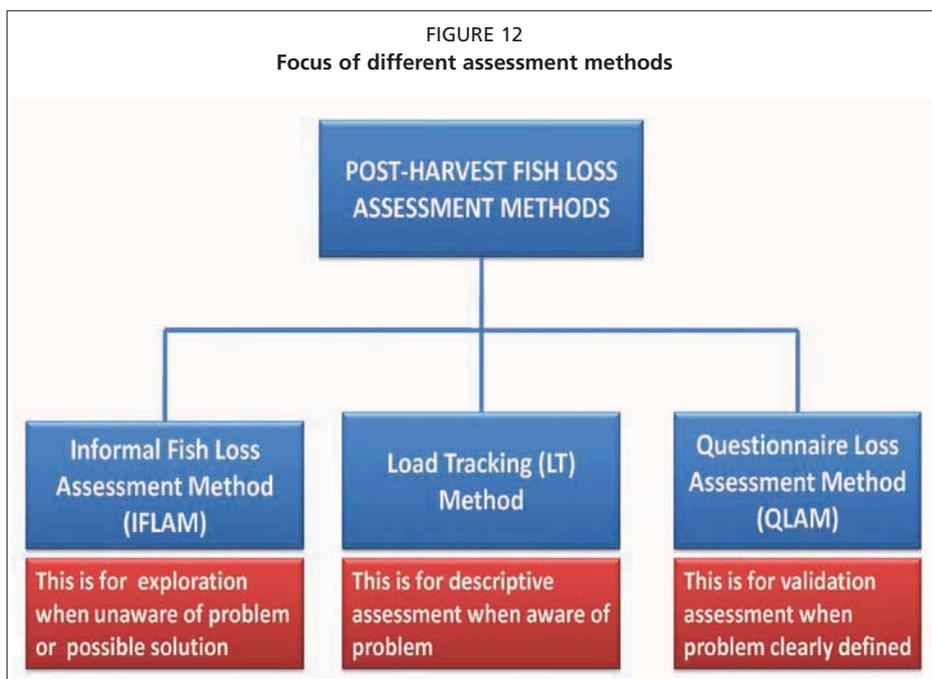
Both LT and the QLAM are quantitative assessment methods. The former is used to quantify losses at stages along the distribution chain or losses related to specific activities such as fishing, transport, processing and marketing. The latter relies on interviewing a population sample in a community or geographical area using a questionnaire to validate data generated by the IFLAM and LT. Figure 12 summarizes the focus of the three methods.

The three methods provide users with different ways of understanding fish losses. Good planning is key to successful application of the methods.

In order to plan, it is first necessary to know the objective of the assessment, and this will help to identify the methods to use. Extension officers or researchers may find themselves in a situation where any of the following may apply:

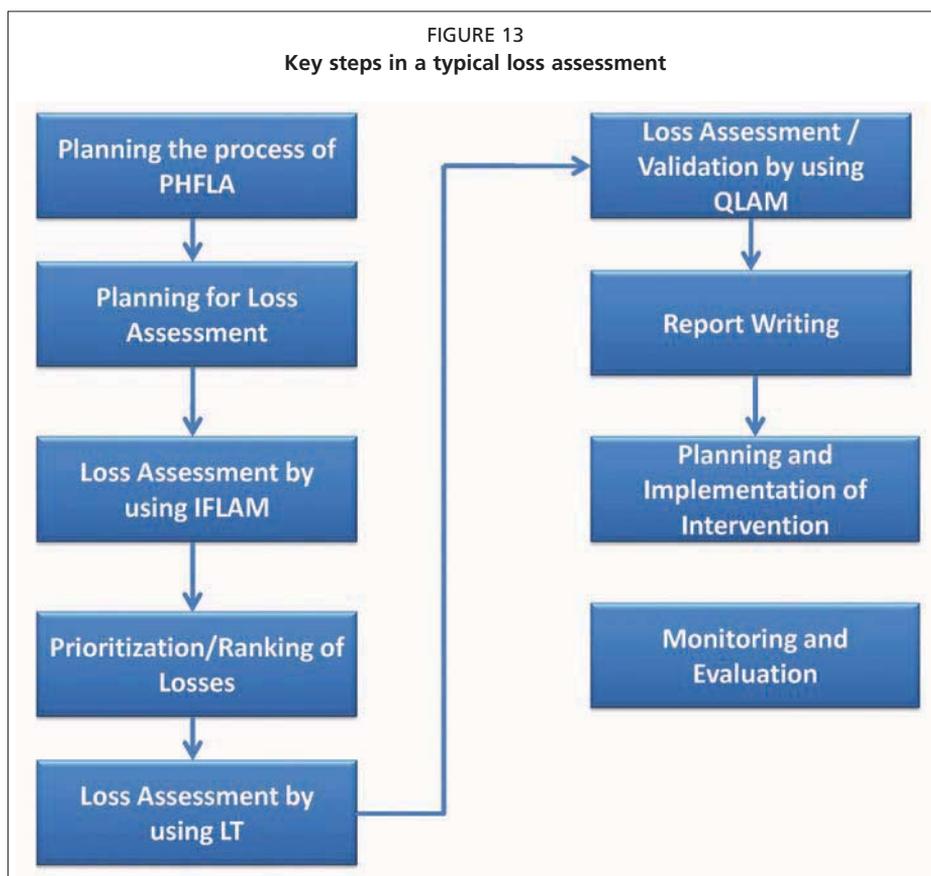
- Very little is known about losses in a given fishery/distribution chain (IFLAM to develop a general understanding of losses and identify those which are significant).
- Policy-makers and managers are not aware of the magnitude of PHFLs (IFLAM to develop the general understanding in key locations, LT to measure key losses and QLAM to validate the data over a wider geographical area).
- Information is required on losses occurring in a particular area for planning intervention (IFLAM to develop a general understanding, and QLAM to validate key findings over the area).

- Fishers want assistance to reduce post-harvest loss in their business (IFLAM to understand where the losses are occurring in the business, and LT to measure the key losses and the effects of interventions to reduce the losses).
- Exploring the potential for introducing an innovation or access new markets (IFLAM to understand the situation and potential opportunities).
- Monitoring and assessing the effectiveness of a loss reduction intervention (LT to measure losses before and after the intervention).



A typical assessment process employing all three methods is shown in Figure 13. In such a situation, the IFLAM is used to give a qualitative understanding of losses in a particular community/area. Key losses are then identified and measured using LT. Key data related to the cause and effects of losses are then validated using the QLAM before any suitable intervention is introduced. A combination of the IFLAM, LT and QLAM could then be used to monitor and evaluate the effects of the intervention.

Each loss assessment method is described in more detail in the following chapters of the manual.



### PLANNING FOR PHFLA

Whether for monitoring and assessing the effectiveness of a loss reduction intervention, or planning for an intervention to reduce losses in a particular area or at the country level, there are usually administrative and logistical issues to consider. A project proposal or write-up may be required to secure or justify funding and the allocation of resources. Planning and assessment will be helped by answering the following questions:

- What is the objective of conducting the assessment?
- Why is it important to conduct the assessment?
- Who will be the beneficiaries?
- Where is the assessment going to be conducted?
- Which methods should be used?
- When will the assessment be conducted?
- Are there different fishing seasons to consider in terms of data collection times?
- Who are going to conduct the assessment?

- Are those to be involved well trained?
- What type of additional training is needed?
- How is the assessment going to be conducted?
- How are the data going to be analysed?
- What are the needs, i.e. resources required?
- How will these needs be mobilized?

The answers to these questions will help to decide which methods to use and generally prepare for the assessment process.

Planning can also be helped by reviewing secondary data such as existing socio-economic and production information or literature on post-harvest losses in order to have a thorough background knowledge of key issues. Making initial contacts with a community through key individuals, such as local officials, community leaders or chief fishers, before conducting fieldwork is also an important part of planning. Establishing links like this will make it easier to identify operators for interviews.

To help plan an assessment, it is worth making a tentative list of requirements. This can help to clarify a budget. Table 2 provides a list of likely inputs based on previous experiences of assessments.

TABLE 2  
Budget considerations for assessments

Expenses	IFLAM	LT	QLAM
Stationery (writing pads, paper, marker pens, flip charts)	Yes	Yes	Yes
Transport and accommodation costs for loss assessors	Yes	Yes	Yes
Transportation and cost of samples	No	Yes	No
Communication and coordination costs	Yes	Yes	Yes
Payment for local interpreter	Yes	Yes	Possibly
Secretarial service, computing facilities	Yes	Yes	Yes
Safety gear (life jackets, torch, whistle)	Yes	Yes	No
Camping tent	Possibly	Possibly	Possibly
Hospitality and incidental costs	Yes	Yes	Yes
Camera	Yes	Yes	Not required
Cost of buying samples	No	Yes	No
Payment for enumerators	Possibly	Possibly	Possibly
Weighing scale and calibration weight	Yes	Yes	Yes
Packaging and tagging materials for samples	No	Yes	No
Tarpaulin or cover sheet for sample	No	Yes	No
Labour charge (loading, unloading, security)	No	Yes	No
Knife and scissors	No	Yes	No
Watch	Yes	Yes	Yes
Thermometer	Yes	Yes	No
Biometric support	No	Yes	Yes

### Where to carry out an assessment

An assessment will usually focus on a particular fishery or fisheries, or stage or activity in the supply chain (e.g. fishing, landing of fish, processing, storage, transportation and marketing). A fishery may be chosen because of its socio-economic prominence, e.g. because of its contribution to employment, food security, poverty reduction, or the generation of foreign exchange. A stage in the supply chain may be of particular relevance based on secondary data, its importance in terms of diversity of operators involved or information on existing losses. Completing Table 3 will help to decide on locations for an assessment.

TABLE 3  
Summarizing production information to help identify the focus of a PHFL

Supply source /fishery	Volume of fish (important: by species, if possible)	Number of people involved
<b>Inland:</b>		
Lakes		
Rivers		
Key landing sites		
<b>Marine:</b>		
List of key landing sites		
<b>Aquaculture:</b>		
<b>Imports</b>		
Key processing sites		
Key (fish) markets		

### Selection of loss assessment team

Another aspect of planning is to decide who will carry out the assessment process and what skills are required, who possess the skills and when they are available. For example, the IFLAM requires people who are experienced in PRA and participatory community approaches, while LT requires post-harvest fishery technical knowledge and skills as well as biometric support. On the other hand, the QLAM requires people experienced in questionnaire surveys. Ideally, a loss assessment team would consist of two or three individuals demonstrating a cross-section of skills or attributes indicated in Figure 5. Several such teams could be involved if the assessment is to cover a large area, or data are required quickly and resources for fieldwork are available. Table 4 highlights some of the key requirements for a loss assessment team.

TABLE 4  
Attributes required for a loss assessment team

Attributes
Able to communicate effectively with local community development
Positive attitude to the community members
Experience of and willingness to do fieldwork (e.g. in LT, the team should be ready to accompany fish products during distribution)

Awareness of gender-related issues is important. For example, the pivotal role of women in post-harvest fisheries is usually clear, but cultural norms may make it difficult for the team to interact and learn from women in a community. Having a woman in the assessment team could help overcome barriers like this.

Table 5 shows some important “dos and don’ts” for the assessment team when conducting fieldwork.

TABLE 5  
Dos and don’ts of loss assessment fieldwork

Don’ts	Dos
Do not waste people’s time	Find about taboos and norms (e.g. be able to detect and avoid sensitive situations, which may undermine trust)
Do not act in a superior way to the community	Assure fishers of the confidentiality of the information (not to be used against them, e.g. for tax collection)
Do not violate taboos and norms	Stimulate fishers to talk
Do not demand appreciation	Speak clearly
Do not use language that community members may find hard to understand	Provide facts and information
Do not interrupt, blame	Be neutral and objective
Do not raise people’s expectations	Build up a dialogue
Do not side with opinion leaders or agitate	Assist fishers to evaluate
Do not manipulate or create needs	Be patient
Do not be pompous	Be creative, adaptable and innovative
Do not discourage questions	Cross-check information
Do not make things too scientific	Listen and be interested
Do not speak too long	Respect fishers, their perceptions and their knowledge
Do not display little enthusiasm in what people say and do	

### Training before conducting a loss assessment

Those carrying out an assessment may require training or an orientation course in PHFLA. The training may focus on providing important knowledge and skills and on building up the appropriate attitude to work with communities. It is suggested that this manual can be used as a resource or guide to help plan and carry out training. The methods themselves are described in more detail in the later chapters, and Table 6 can help in deciding whether training is necessary and how it could be delivered.

**TABLE 6**  
**Important steps in organizing effective training for the loss assessment team**

No.	Step	Consideration
1.	Situation analysis/problem discovery	What problems are there in the current situation that requires the team mission?
2.	Training needs assessment	What attitudes, knowledge or skills are missing?
3.	Skills assessment	What are the characteristics of the selected team that may affect their learning?
4.	Content	What are the objectives of the training? What content should be covered?
5.	Preparation for training	What is the best way of presenting the training? How should the content be structured? What learning material must be developed?
6.	Delivery of training	Theory presentations? Discussions? Practicals? Fieldwork? Group work? Role plays?
7.	Evaluation	How will the training be evaluated?

Training should also aim to help the team to show interest, be objective, and avoid raising expectations of people. Effective ways of probing and the use of triangulation are equally important skills to know.

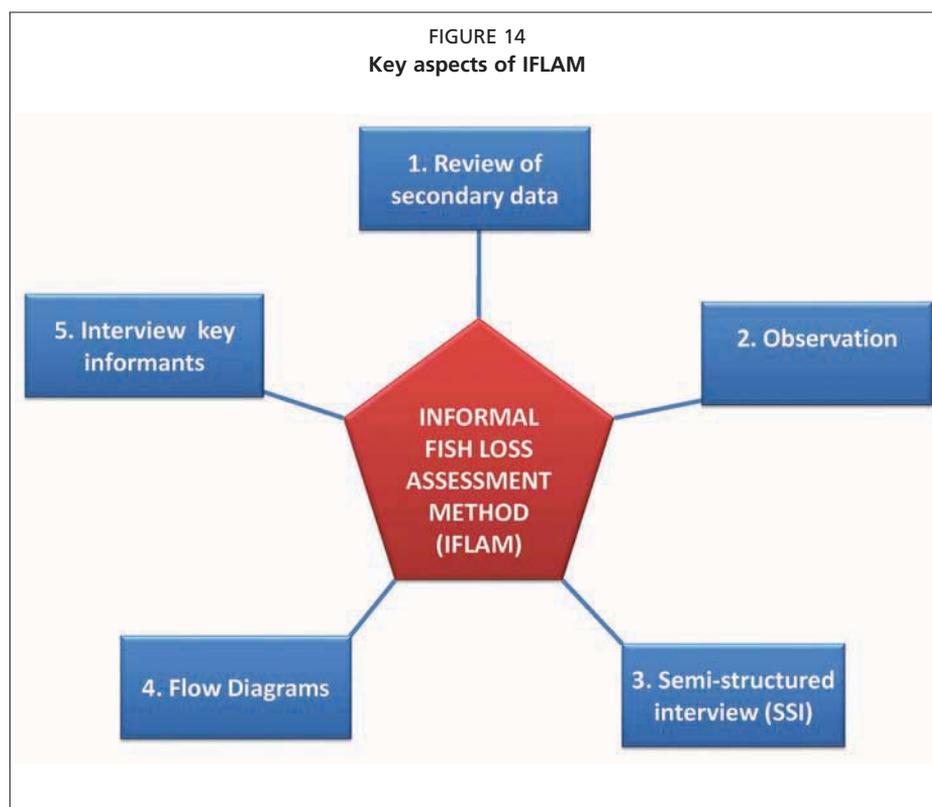
The training of the team could also provide a description of different types of losses and examples for each method (as outlined in relevant chapters of this guide). The section on sources of further information highlights material that can be used to help with this.



## 4. PHFLA using the IFLAM

### INTRODUCTION

This chapter describes the Informal Fish Loss Assessment Method (IFLAM) and how it can be applied. The IFLAM originates from community-focused, participatory development approaches pioneered in the 1980s. It is a method that tries to utilize local knowledge and understand local situations, and in this case it generates a good general understanding of PHFLs. Figure 14 highlights key elements of the IFLAM, which are described in more detail below.



The IFLAM relies on the active involvement and participation of fishery operators and others knowledgeable about the post-harvest sector and fish losses. The method helps to develop a qualitative understanding of losses and provides indicative quantitative data on PHFLs. It is especially good for understanding the following:

- type of losses, trends and seasonal variations in loss levels;
- causes of loss;
- variables that affect losses such as fishing gear type and processing method;
- stakeholders affected by losses, and how they are affected;
- perceptions of stakeholders about losses;
- ideas for loss reduction;
- initiatives being taken to reduce losses;
- important institutions involved in loss assessment research and reduction.

As shown in Figure 14, the IFLAM consists of several key elements: review of secondary data, observation, semi-structured interviews (SSIs), flow diagrams (FDs) and key-informant interviews (KIIs) (a type of SSI). These elements are described below. Akande and Diei-Ouadi (2010) provide examples of how the IFLAM has been used and the data that it can generate.

### **SUGGESTED IFLAM SCHEDULE**

The IFLAM process in a given location can take on average four days to complete. This includes the general introductory meeting, observations of activities, group meetings and interviews as well as KIIs. Before leaving location, it is good practice for the team to validate their findings through a short final meeting involving presentations of key findings to community representatives.

Furthermore, it is a good idea to pilot-test checklists and IFLAM tools, such as SSI and observation, before conducting a full-scale loss assessment. This provides an opportunity to demonstrate the reliability of methods and tools, determine the practicality of procedures, the availability of respondents, and the variability of observed events. After a pilot test, checklists and procedures can be fine-tuned if necessary, ready for the real assessment. A pilot test can help:

- familiarize the team with stakeholders and field scenarios;
- help validate secondary data;
- field-test checklists, the SSI process, FDs and observation tools to generate data that can help the full-scale PHFLA.

The following is a basic fieldwork process for the IFLAM, consisting of five key stages:

1. Review of secondary sources of data.
2. Identification of socially and/or economically important fisheries.
3. Identification of fieldwork locations.
4. Loss assessment fieldwork – primary data collection.
5. Reporting.

### Review of secondary sources

Review secondary sources of data, such as research reports, fishery sector reviews, development plans and policy frameworks, for information on PHFLs, including how losses are considered in national policy.

Sources of documents for a review include:

- local institutions, e.g. fisheries department and key contacts;
- libraries;
- non-governmental organizations (NGOs);
- international donor organizations;
- the Internet.

### Identify most important fisheries and/or distribution chains

The choice will be guided to a large extent by the priorities and objectives of the assessment. The choice should be justified in terms of the economic and social importance of the fishery. The contribution the fishery makes to national development objectives, such as employment, food security, poverty reduction and the generation of foreign exchange, can be used as indicators of importance – where such data are available.

A simple ranking approach could also be used to assist the decision-making process. This can involve the identification of different sources of fish supply at national level:

- inland,
- marine,
- aquaculture,
- imports.

For each source of supply, identify the volume of fish and the number of people employed according to different fisheries and/or products, e.g. different lakes, key landing sites, and imported frozen fish. Then rank the different fisheries according to highest volume or number of people who depend on the fishery.

For the most important fishery (or fisheries), develop an FD (or FDs) showing the main activities and stakeholders associated with each stage and/or activity from the point of capture to final consumption.

Use the FD to identify key locations where important activities take place, as these will be potential fieldwork sites.

### Identify key locations for fieldwork

As it is not possible for the IFLAM to be used in all locations associated with a chosen fishery and with all stakeholders, a sample of key fieldwork locations are selected. Using the knowledge generated from the review of secondary sources of data and the FD process, some of the following criteria can be used as a guide to choose locations for IFLAM fieldwork:

- diversity of post-harvest fishery stakeholders;
- evidence that losses are known to occur;
- volume of fish landed, processed and traded;

- varying range of and access to services and facilities, e.g. markets, landing sites, roads and electricity;
- rural or urban location, islands;
- comparable or different community population sizes;
- avoiding areas with a likelihood of research fatigue.

For the IFLAM phase of the FAO Regional Loss Assessment Programme for Africa, six locations were chosen for fieldwork.

### Loss assessment

Application of the IFLAM consists of the following activities over a six-day period at each location:

- Walk through the location and/or community to observe post-harvest activities and stakeholders (Day 1).
- Conduct a group interview with a cross-section of stakeholders from the location and/or community, during which the objectives of the work and the team are introduced and an FD is developed by stakeholders to identify key activities and stakeholders. An SSI is conducted to understand losses in general and who is affected (Day 1).
- Using information from the general group interview (above), undertake SSIs with groups of different stakeholders at the location to understand losses in more detail (Days 2 and 3).
- Carry out a series of SSIs with key informants to generate a detailed understanding of losses. Validate, cross-check and build on information from group interviews and provide case studies describing examples of the causes and effects of losses. It will be important to interview those who incur losses in order to understand causes and effects. Equally, it will be important to interview those who **do not incur losses** and understand why this is so. This can help identify existing loss reduction techniques and strategies that may be considered for dissemination (Days 4 and 5).
- Before leaving the location or community, hold a validation meeting at which the key findings are presented to a cross-section of stakeholders. The meeting should aim to cross-check that the team's findings are accurate, reflect the real situation and provide an opportunity for the team to discuss the data and address any knowledge gaps (Day 6).

### Reporting

Prepare a fish loss assessment study report. See Annex 2 for a suggested structure and content.

For the purposes of IFLAM data analysis and reporting, it is recommended that the team prepares daily reports based on the data collected. Data analysis should ideally be completed in the location while memories are still fresh. Daily team meetings held at the end of a data collection day, to analyse and validate the assessment findings, are recommended.

A good way to summarize the results of an assessment is to use a matrix like the one presented in Table 7. This covers key issues such as:

- types of loss;
- causes of loss;
- stakeholders affected by loss;
- time and/or season the loss occurs;
- impact of the loss;
- trend;
- perception of stakeholders;
- indicative quantitative data.

TABLE 7  
IFLAM summary result matrix of loss incurred at a fishing location in Uganda

Type of loss	Cause of loss	Stakeholders affected by loss	Time/season/trend of loss	Impact of loss	Perception
Physical losses in sardine fishery	Fish drying on bare ground washed away by rain	Women fish processors and consumers who cannot afford to buy high-value fish.	During rainy season  Erratic trend owing to climate vagaries and increasingly scarce funds to afford adequate processing facilities	Reduced income and food fish availability	People feel the Government is not doing enough to support them in addressing the problem
Quality loss in table-sized fish	Inadequate icing on board canoe and at beach side  Deliberate delay by fresh-fish buyers (low purchasing power) in order to cut the price  Long collection time associated with unreliable transport	Fish traders, crew, transporters and consumers	All year round  The losses are increasing as a result of increased poverty within communities and ever-weakening organizational and technical capacities of fisher	The loss is huge as the volume of fish involved is important. It affects income, food supply and livelihood in communities	People feel that something must be done to improve the situation. More ice plants and cold rooms should be put in strategic areas
Market forces loss	Huge supply of local markets during festive periods when vegetable, and meat are a delicacy and demand for fish is particularly low	Poor fishers and canoe owners; fish traders, fish processors	During harvesting season of vegetables  No signs of declining	This loss can bankrupt businesses	There must be efforts to improve processing and storage methods in order to keep fish for a longer period to enable access to cross-border markets

The inclusion at the final validation meeting of fisheries department staff and local government officials is an effective way of raising awareness about a PHFL. It also provides an opportunity for discussing loss reduction interventions and encourages support to follow up actions on the findings.

The report should identify key losses that require further investigation or intervention. The nature of post-harvest losses, the number of people affected and the impact of the loss on the population are some of the criteria that can be used to help decide where to focus further efforts. Indicative quantitative data generated from the assessment show the level of losses and can be used to categorize losses into high, medium or low levels of significance. A suggested report structure is presented in Annex 2.

## PRACTICAL PROCESS OF THE IFLAM

### Review of secondary data

The IFLAM generates an understanding of PHFLs using primary data and secondary or historical data. Primary data are generated from first-hand discussions with fishery operators using SSIs and observations in the field (described below), whereas secondary data are taken from previous studies, reports and statistical information.

A secondary data review is used to provide background information on a fishery sector, stakeholders involved and consolidate any existing data on losses. The data help those conducting a loss assessment (the team) to develop a general picture with regard to any loss problem and choice of locations for fieldwork for primary data collection. Table 8 highlights sources of secondary data that can be used in a review for loss assessment.

TABLE 8  
Sources of secondary data for fish loss assessments

Sources of data to look for	Where to find these
Research reports	Local institutions, e.g. fisheries department and key contacts
Fishery sector review papers	Libraries
Development plans	Non-governmental organizations
Policy frameworks	International donor organizations
Project documents	Internet
Statistical reports	Media sources
Reports from previous surveys and/or assessments	Commercial sources
Related unpublished documents and/or personal communications	

It should be noted that the term “post-harvest fish losses” may not always be used in literature. Therefore, when reviewing, it is important to see losses in the

context of fish quality, utilization, wastage, hygiene, sanitation and food safety issues, market access and price variations.

Secondary data can help understand trends, seasonality, key events and the magnitude of any PHFL problem.

Tables 9 and 10 provide examples of data over time and how this can be presented. Such data can give an understanding of trends and quantities of fish in a particular location, in this case related to fishing effort and fish traded at a wholesale fish market.

TABLE 9

**An example of secondary data on fishing effort from fisheries annual reports**

Variable	2006	2007	2008	2009
Total number of landing sites	168	151	315	634
Total number of fishers	18 953	22 741	56 321	98 015
Total number of fishing vessels	6 799	6 022	16 911	29 732
Number and type of fishing gear				
Number of gillnets	107 243	99 850	208 079	415 172
Number of traps	0	5	87	92
Number of hand lines	6 570	4 869	24 040	35 479
Number of long lines	716 754	1 177 882	2 240 752	4 135 388
Number of beach seines	288	333	1 054	1 675
Number of scoop nets for lake sardine	880	108	6	994
Number of cast nets for lake sardine	8	18	4	30
Number of lift nets for lake sardine	12	52	306	370
Number of purse seines for lake sardine	448	1 252	3 143	4 843
Others (unspecified)	0	1	37	38
Engines				
Number of outboard engines	1 211	1 037	4 168	6 416
Number of inboard engines	0	0	0	0

Source: Government of country X.

TABLE 10  
Data on the supply of dried sardine at wholesale market

Month/Year	2004	2005 (kg)	2006	2007
January	1 952 310	3 220 350	4 070 340	2 055 408
February	2 751 780	2 643 300	2 755 830	2 020 309
March	2 110 890	1 741 650	2 182 290	2 007 308
April	1 077 300	2 404 860	1 379 850	2 002 497
May	1 504 290	4 036 500	2 408 520	2 000 188
June	1 865 910	3 663 540	2 375 374	905 630
July	2 351 100	2 470 500	2 076 180	904 600
August	2 849 250	3 017 760	2 065 170	905 700
September	2 414 280	2 672 790	2 976 155	611 400
October	3 621 450	2 894 070	2 070 270	2 970 600
November	3 903 600	4 070 340	2 074 146	2 024 730
December	1 608 300	3 877 740	2 070 359	1 104 450
Total	28 010 460	36 713 400	28 504 484	19 512 820

Source: Usagari market statistics.

Similarly, mean and percentage composition of fish landings in different areas, based on annual reports, are shown in Table 11. Such data can be analysed to provide an understanding of the magnitude of losses in terms of different species and areas.

TABLE 11  
An example of secondary data on fish landing from fisheries annual reports

No.	District	Nile perch	Lake sardine	Tilapia	Others	Total
1	Kizi	2 679.40	964.3	1 487.60	1 075.10	6 206.40
2	Kibaoni	3 795.40	1 425.60	728.6	273	6 222.60
3	Usevya	5 254.70	8 716.30	2 643.60	923.90	17 538.50
4	Mbede	5 279.30	360	2 465.30	2 173.70	10 278.30
5	Majimoto	5 383.20	6 160.80	1 549.20	4 231.50	17 324.70
6	Mambo	697.90	473.50	430.30	823.70	2 425.40
7	Kilida	13 156.10	37 860.30	4 498.50	3 128.60	58 643.50
8	Usoke	14 864.10	17 997.90	6 697.80	1 968.30	41 528.10
9	Ndono	4 271.70	8 134.00	2 962.40	521.20	15 889.30
10	Ibiri	24 224.10	25 883.30	27 800.90	1 630.30	79 538.60
11	Mpungu	11 141.20	15 480.20	5 816.70	22 929.50	55 367.60
12	Usagali	19 295.70	73 746.00	23 836.10	3 215.10	120 092.90
	<b>Total</b>	<b>110 042.80</b>	<b>197 202.2</b>	<b>80 917.00</b>	<b>42 893.90</b>	<b>431 055.90</b>
	<b>% of total</b>	<b>25.5</b>	<b>45.7</b>	<b>18.8</b>	<b>10.0</b>	<b>100.00</b>

Source: Government of Country X.

Secondary data can provide factors to help extrapolate primary data loss assessment methods. This can help in gaining an understanding of losses in relation to geographical areas, particular fisheries or even countries.

In conclusion, secondary data are low cost, and are available from diverse sources. A secondary data review, while it depends on the quality of the available data, can be a useful way of generating background information for the assessment and the implementation of fieldwork or primary data collection.

### **Locations for IFLAM primary data collection**

General information on site selection is given in Chapter 3. Here, the focus is on some issues related to the IFLAM. Because of resource and time constraints, it is usually difficult or even impossible to conduct loss assessment in all locations associated with a chosen fishery and with all stakeholders. Therefore, a sample of key fieldwork locations should be selected. Potential sites include fishing villages and communities, processing sites and markets.

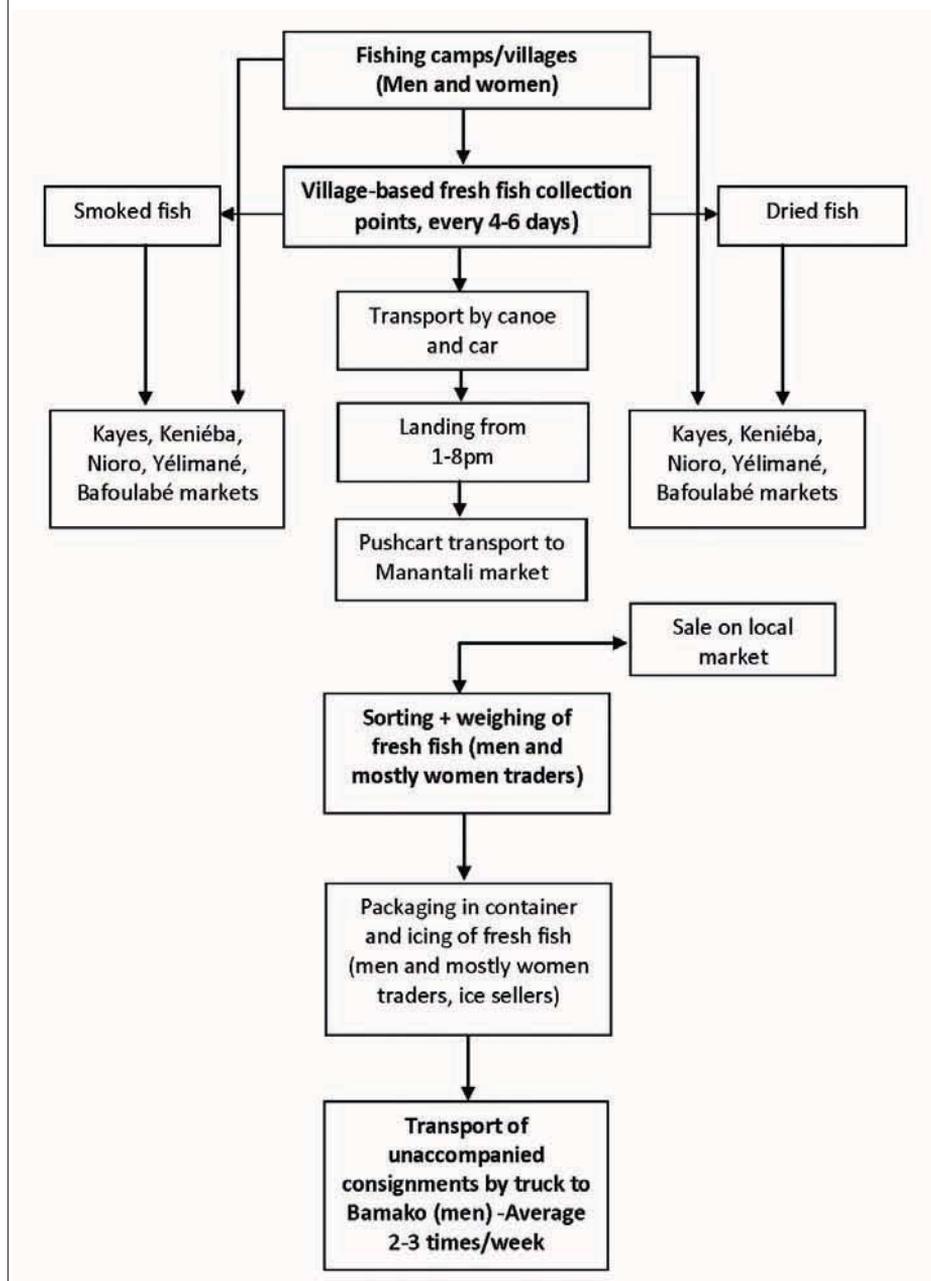
Knowledge generated from the secondary data review and a general FD can be used to select fieldwork locations. Useful criteria for choosing locations include the number of fishers, diversity of post-harvest operations/activities, volume of fish landings and, where available, existing information on losses. Figure 15 is an example of an FD and highlights potential key locations for IFLAM fieldwork, e.g. fishing camps, fresh-fish collection sites and markets.

Sites may be selected because they are known to be locations where development is required or are home to particularly vulnerable post-harvest stakeholders. Isolated remote locations are also important as they are often where high losses can occur compared with more easily accessible locations with good roads. Table 12 will help in the choice of locations for IFLAM primary data collection, assuming that the data for the table are available.

TABLE 12  
Data to help identify IFLAM locations

	Fisheries operations and stakeholders	Site A	Site B	Site C	Total no.	Remarks
1	Volume of fish landings					
2	Skipper					
	Fishers onboard/crew					
	Canoe owners					
	Engine owners					
	Fishing gear owners					
	Those unloading fish					
	Brokers					
	Boat-makers					
	Net repairers					
	Fish smokers					
	Fish driers					
	Other fish processors					
	Fresh fish traders					
	Cured fish traders					
	Transporters (bicycles)					
	Transporters (pushcarts)					
	Transporters (motor cycles)					
	Transporters (canoes)					
	Transporters (others)					
	Warehouse owners					
	Guards					
3	Total number of people					
4	Diversity of processing methods					
5	Distance from main/feeder road to the site					
6	Access to markets					
7	Access to landing site					
8	Access to roads					
9	Rural/urban location					
10	Evidence that losses occur					
11	Extension workers					

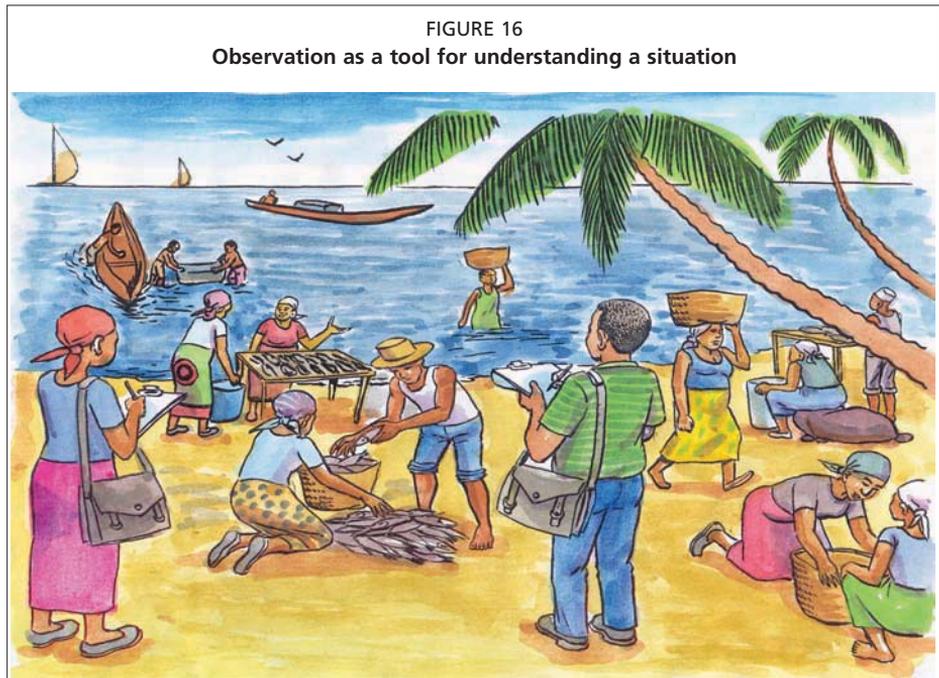
FIGURE 15  
 Example of a general flow diagram of main fisheries activities in a fishing area in Mali



**Observation**

One of the ways to understand activities and losses in a location is simply to observe what goes on and learn from what you see (Figure 16). Information from

observations can be cross-checked or validated during subsequent SSIs (see next section).



Walking through the location and/or community is a good way to observe activities of fishers and other operators as they go about their work. Simple equipment such as a thermometer can be used to check the temperature of fresh fish in order to assess the effectiveness of any chilling method or temperature abuse. Weighing scales can be used to measure traditional units of measurement and weights used. This can help when updating indicative quantities of fish and losses later on. A camera can help record important observations, activities and losses seen in the field. Table 13 presents some of the advantages and disadvantages of observation.

**TABLE 13**  
**Advantages and disadvantages of observation**

Advantages of observation	Disadvantages of observation
Communication with respondent is not necessary	Cognitive phenomena cannot be observed
No need to rely on respondent's memory	Observation cannot tell anything about why fishers are behaving that way
Non-verbal behaviour data may be obtained	Not all activity can be recorded
Certain data may be obtained more quickly	Only short periods can be observed, hence difficulty in capturing entire job cycle
Environmental conditions may be recorded	Observer bias possible
May be combined with semi-structures interviews and key-informant interviews to cross-check data	Possible invasion of privacy

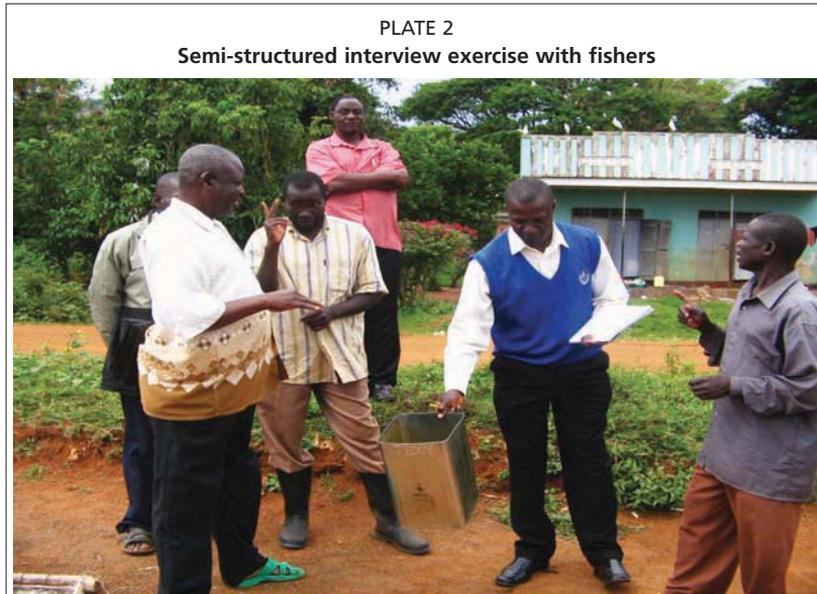
A checklist such as the one presented below, can be used to guide the observation process:

- Are sanitary conditions adequate?
- Are there animals wandering freely where fish are handled or processed, etc.?
- Is personal hygiene of crew, handlers and processors adequate?
- Are fish isolated from potential contaminants?
- Are fish protected from the sun?
- How are fish protected from the rain?
- Are fish iced before and after landing?
- Are fish placed on the ground or auction room floor or on clean mat or tarpaulin?
- Are fish stored in an insulated hold or boxes?
- Are fish boxes insulated, easy to clean and in good condition with drainage?
- Are fish landed and offloaded without delay?
- Are oil and fuel kept separate on canoes?
- Are fish handled carefully to avoid damage?
- Is potable water used to wash fish or equipment?
- What are the different types of fish and fishery products available or produced?
- What are the measurement units used for fish and fishery products?
- How are fish transported and does this cause any damage or other loss?
- What processing methods and equipment are used?
- Are fish being processed adequately?
- Are fish being dried on the ground or on raised racks?
- Is there a large number of blowflies where fish are handled, sold or processed?
- Is fish packaging done hygienically and with care?
- Are fish storage facilities adequate?
- What coping strategies are being used at the site to control losses?
- How effective are loss reduction measures?

### Semi-structured interviews

The key primary data collection tool used in the IFLAM is the semi-structured interview (SSI). An SSI is a process designed to informally understand and learn from people about a certain topic (Plate 2 and Box 1). The interview or discussion is normally conducted with an individual or group of people who are knowledgeable about the topic of interest. In the case of a PHFLA, the knowledgeable people are typically fishers, processors, traders and community leaders. Semi-structured interviews are particularly useful for interviewing those who incur losses in order to help understand causes and effects. Equally, interviewing those who do not incur losses helps understand how losses can be avoided or reduced. An SSI can also be combined with other data collection methods, such as FDs and

observation. Usually, an SSI is guided by a checklist of key issues, and during the SSI someone in the team takes notes to record the information generated.



**BOX 1**

**The underlying SSI philosophy in loss assessment**

Fishers may have little formal education, but they will have acquired a lot of knowledge and skills from various sources through socialization; they or she will know more about certain practical activities than the PHFLA team members do. When you work with fishers, let them know that you respect them and value their knowledge and respect their views.

Table 14 summarizes some of the advantages and limitations of SSIs.

TABLE 14  
Advantages and limitations of semi-structured interviews

Advantages	Limitations	Suggestions
Rapid way of collecting qualitative data	Lengthy if process not properly controlled	Good facilitation skills needed in order to be focused and control timeframe and people.
Allows for freedom of expression	Monopolization of discussion by individual or more vocal members can occur	Keep discussion lively and try to involve everyone in the discussion.
One question gives useful information and can give rise to several answers and help cross-check data	Could be time-consuming because group needs to be organized for properly run interview	The meeting needs to be arranged in advance and the team should be vigilant by asking questions that demand facts and opinion.
Spontaneity in the expression of ideas	High risk of deviation from the discussion	Ensure that each question is answered before proceeding to the next. Notes should be taken if possible.
Strengthens the interactions within the group		Do not interrupt people when they are answering. Listen to all views.

Semi-structured interviews are used to interview groups and individuals. An SSI with a group of representatives from a location can be a useful way of understanding the general situation before looking at losses in more detail. The team can then go on to interview specific groups in more detail about losses and related issues. Before conducting an SSI, it is best to fix an appointment with the respondents through their local leadership systems, such as chief fisher, associations or leadership. It is important to make sure that the meeting is convenient for the respondents.

A few things to remember when using SSIs are:

- **Time value:** The team should know the value of time. For example, the team should always be punctual for meetings and interviews and not keep people waiting or plan to have an interview when they are very busy with their day-to-day activities. An interview or meeting is best kept to less than two hours because people may grow tired or not be able to spend a long time away from their daily activities.
- **Interview setting:** An interview or meeting is best conducted somewhere convenient for the people concerned, and the location can be chosen in discussion with the local community.
- **Awareness of potential biases:** There are many different biases to be aware of when conducting an assessment. People interviewed may have their own biases and may not necessarily cooperate fully. Therefore, cross-checking or triangulation of data is required. There can be a tendency for fieldwork to take place in locations that are easily accessible. Such locations may not be representative of the true picture. These may also be locations where people have experienced a lot of researchers, leading to what is called

“research fatigue”. There can also be a gender bias if only men or women are interviewed; again the true picture of losses may not emerge.

- **Note-taking techniques:** Record the notes of interviews and meetings in a careful and discreet manner. Notes from interviews and meetings will help capture the key information and help the team to remember the important issues. Note-taking is not always easy as some people may be suspicious of you writing down everything that they say. Overcoming the suspicion may require a level of trust that has not been established if the team is new to the community. If in doubt, always ask if it is okay for someone to take notes. If this is not possible, then the team should meet as soon as possible after the meeting and have a note-taking session to capture as much information as possible.
- **Politeness:** Always be polite and friendly with the community in order to create a friendly atmosphere. This will greatly facilitate the assessment process and any follow-on work with the community.
- **Make a pleasant introduction:** Let respondents know what the purpose of the PHFLA is. Provide as much information as possible about the loss assessment initiative. The team can narrate success stories, if any, of operators who were in similar situations but are now better-off. Let respondents know that the information they will provide will not be used against their interest, e.g. for revenue collection purposes.
- **Create a relaxed atmosphere and probe:** Try to create a friendly and relaxed atmosphere for the interview or meeting. The PHFLA team has to make sure that they probe for detailed information.
- **Questions:** Open-ended questions are useful, such as “Tell me about ...”, “Can you explain more about that?”, and some arise naturally during the interview “You said a moment ago ... can you tell me more?”. Participants should be allowed to ask their own questions to the team.
- **Thank respondents for their assistance:** Do not forget to thank respondents for their time and cooperation. Failure to do so may be perceived as a lack of appreciation for their involvement.
- **Afterwards:** The team should consult among themselves to identify others to interview and fix appointments for the interviews. As a useful guide to this process, an FD of activities at the site can be developed, one that shows the operations identified by the respondents and where losses are likely to occur (see below).

Table 15 presents some more general guidance for conducting SSIs.

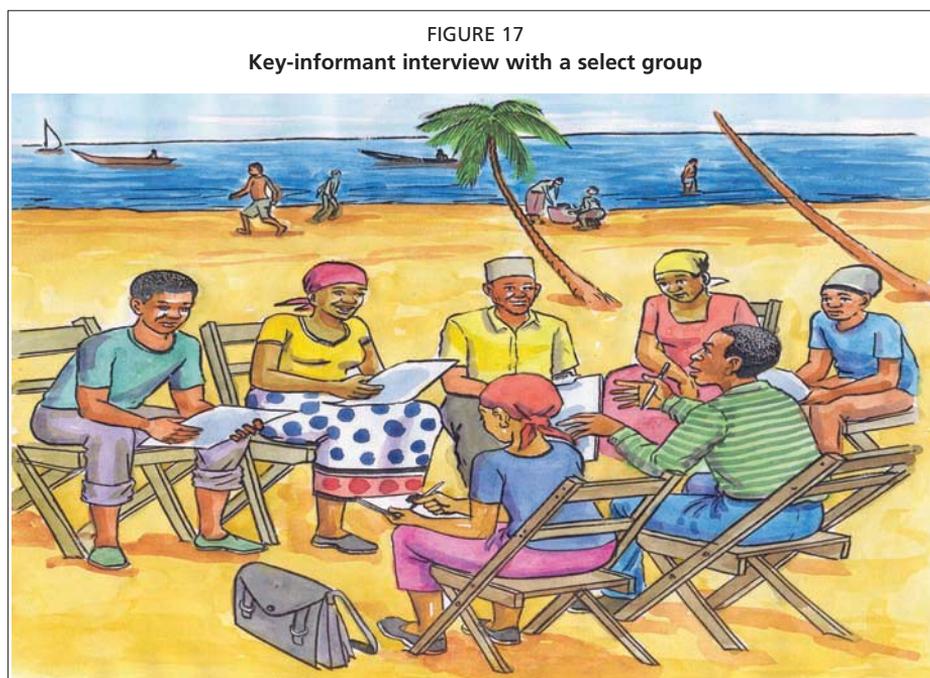
TABLE 15  
General guidance for semi-structured interviews

Dos	Don'ts
Always be pleasant and patient	Do not interrupt when someone is talking to you
Maintain neutrality and objectivity	Do not approve or disapprove of what people say
Probe to encourage people to elaborate on information	
Make encouraging remarks or gestures	
Point inconsistencies politely	

A general introductory SSI at a location is best followed by further SSIs with specific groups of operators in the location. Make appointments with various target groups of operators who incur losses or with ones who do not have losses at all. These may be fishers associated with certain types of gear, or fish species, processors using particular methods or particular types of trader. An SSI with a group of operators follows the same mode as a general SSI meeting, except the questions are likely to be different and more focused on losses (see checklists).

### Key-informant interview

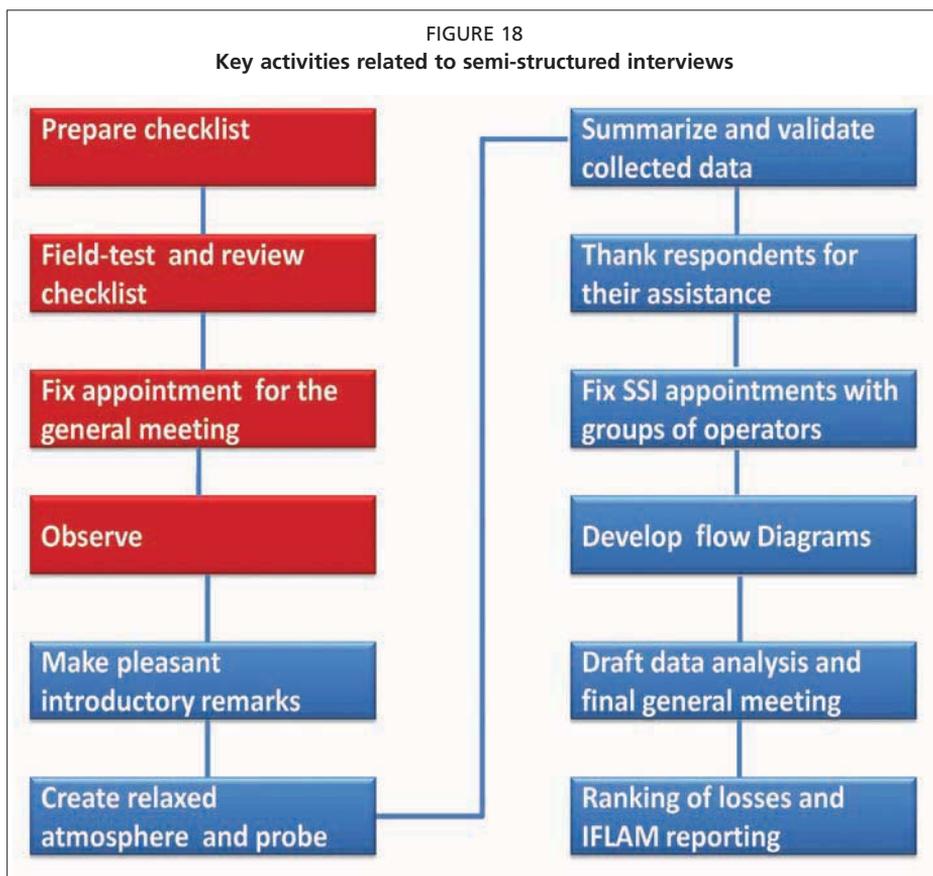
A key-informant interview (KII) refers to an SSI that is conducted with an individual or select group of people who are especially knowledgeable or experienced about fisheries practices of the area, have adequate local knowledge and are conversant on PHFLs (Figure 17). Such key informants can be identified with the help of community leaders and other operators.



The main purpose of a KII is to generate detailed data on losses, validate, cross-check and build on information from group interviews, from observation and provide case studies describing examples of the causes and effects of losses.

It is difficult to say what the appropriate number of respondents should be for a group interview; however, the aim should be to have different views and experiences represented. Interviews can also be conducted by telephone and e-mail if necessary. As with SSIs in general, a successful KII depends much on careful use of a checklist to address focus issues.

Figure 18 shows some of the general steps associated with conducting SSIs.



### Checklists for semi-structured interviews

To conduct an SSI well requires the preparation of checklists to guide the interview process. Checklists help the assessment team to internalize questions and focus on the required issues during fieldwork. A checklist for a general introductory meeting with key stakeholders at a location is shown in Table 16.

TABLE 16

**Example of checklist for general introductory meeting at a loss assessment location**

Sample of questions for a general meeting
What is the population in this community?
What are the fisheries operations here?
How many fishers are there in this community?
How many are fishermen?
What are the fishing methods and prevailing gear?
How far is the village/location/landing site from the fishing ground?
How long does it take to reach the fishing ground?
What is the volume of landings in the area?
What are the major fish species landed in the area?
How many people are engaged in processing, in trade, in loading?
What are the major processing methods?
What are the major fish products?
Where do fishers sell their products and how do they travel there?
How long does it take to travel to the market, or how far is the market?
How often does one send the product to the market?
What are the indicative price of products
What types of fish loss is experienced?
Which types of operation or operator incur more losses?
Who is most affected by the post-harvest fish losses (PHFLs)?
What causes the loss?
How often does the loss occur?
What is the estimated quantity of loss?
When (time/season) do high losses occur?
What is the impact of the loss?
What is the trend regarding PHFLs (variation over years)?
What is the perception within the community?
What coping strategies are used to control PHFLs?
What kind of interventions are or have been made or planned?
What do you think is the potential solution to the problem?

Checklists are also developed specifically for SSIs with different stakeholder groups, e.g. fishers, handlers, processors, or traders. Table 17 is an example of a more specific checklist for SSIs with different groups.

TABLE 17  
Checklists for different groups

Semi-structured interviews with various groups of operators – sample questions	
Objective	To understand post-harvest losses in detail and identify loss reduction ideas
Targets:	
Fishers	<p>What are the major fish species caught?</p> <p>What are the major types of fishing gear and methods?</p> <p>How are the fishing operations conducted?</p> <p>How long does it take to set and haul the fishing gear?</p> <p>What is an average catch per day/season? (unit)</p> <p>How is the fish handled and stored on board?</p> <p>What is the proportion of bycatch and discards?</p> <p>How long does it take to sail back with fish?</p> <p>How long does it take to land and sell your fish?</p> <p>How often and why does a canoe with fish capsize?</p>
Fish processors	<p>Where do you purchase your fish?</p> <p>Which species do you purchase often?</p> <p>What is the average weight/quantity you purchase?</p> <p>How much do you pay for the fish?</p> <p>How long does it take to reach your processing site?</p> <p>How do you travel there/transport the fish?</p> <p>What is the average weight of fish being processed per day/week (unit)?</p> <p>How is the fish processed?</p> <p>How long does it take to complete processing?</p> <p>At what stage (stages) of processing do you incur loss?</p> <p>What is the cost of inputs during processing?</p> <p>What is the output during processing?</p> <p>How is processed fish stored?</p> <p>What is the selling price?</p> <p>What type (types) of smoking oven do you use?</p> <p>Where do you sell the bulk of your processed product?</p>
Fish traders	<p>Where do you obtain your fish?</p> <p>What is the average weight/quantity of your purchase?</p> <p>How do you preserve your fish?</p> <p>How long does it take to reach the market?</p> <p>What marketing monopolies exist?</p> <p>How long does it take to sell out the load?</p> <p>What kind of storage techniques is used?</p>

TABLE 17 (continued)

Semi-structured interviews with various groups of operators – sample questions	
Common questions to all operators/targets	Why do you ever have to sell your fish for a low price?
	If there is anytime you cannot sell your fish entirely, give the reason
	What is the average quantity you lose?
	How much does the loss cost?
	What do you do with the unsold fish?
	When do you most incur loss?
	What do you think is the cause of the loss?
	How do you try to control the loss or stop the loss from occurring?
	What other livelihood activities are you and your household engaged in?
	How have the losses you incur or see changed over time, why?
	Who has tried to help you or others reduce losses? Explain what, when, where, how and the impact of help
	Tell us about yourselves (average age, number, experience, ethnicity)

### Flow diagrams

Flow diagrams (FDs) are an important IFLAM tool. They help outline all the steps involved in a fish supply or distribution chain from fishing to consumer. Presenting all the steps and activities in a location like this helps an SSI process and enables information to be generated quickly. The development of an FD is best done as a participatory process involving the group of operators as much as possible. Activities and stakeholders can be represented using appropriate visual aids such as coloured cards with drawings on and locally available materials. Not everybody in the group may be literate and, therefore, symbols or pictures are a good way of representing different activities.

An FD process enables the team to discuss important issues such as: different post-harvest activities, time taken for each step, stakeholders involved in different activities, estimates of volume of fish/products involved, and where losses occur and who is affected. Figure 19 shows an FD plan.

It is important that the team probes for details related to each step outlined in the FD. The data and information generated by the discussions associated with an FD should be captured as part of the SSI note-taking process (Figure 20 and Plate 3).

FIGURE 19  
Flow diagram plan

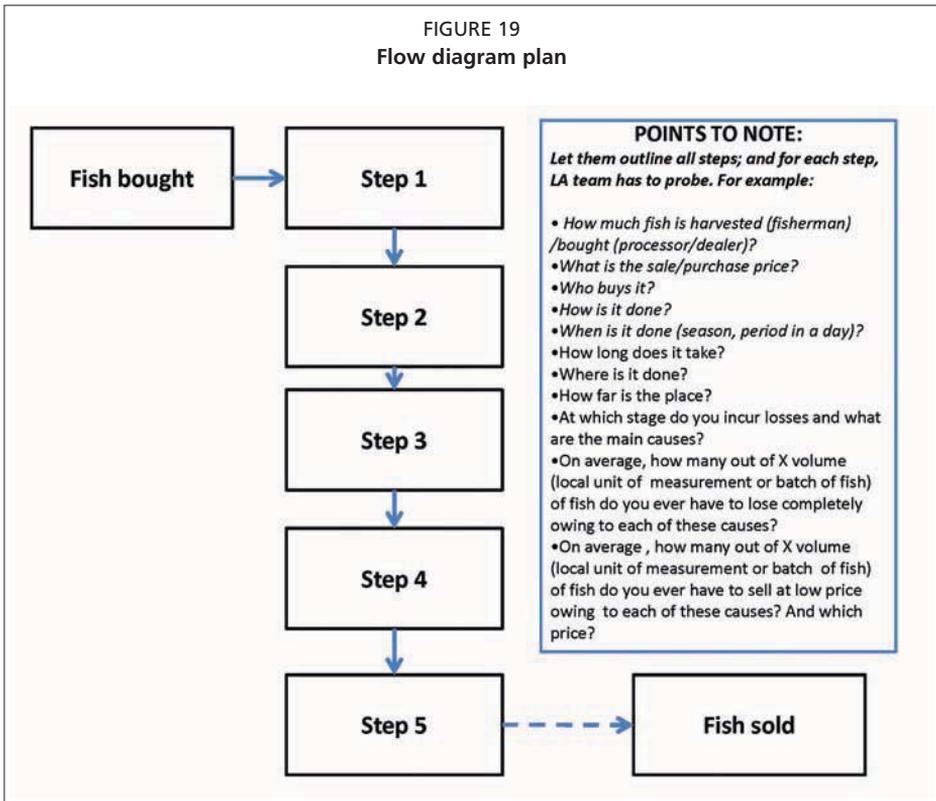


FIGURE 20  
Note-taking during a semi-structured interview

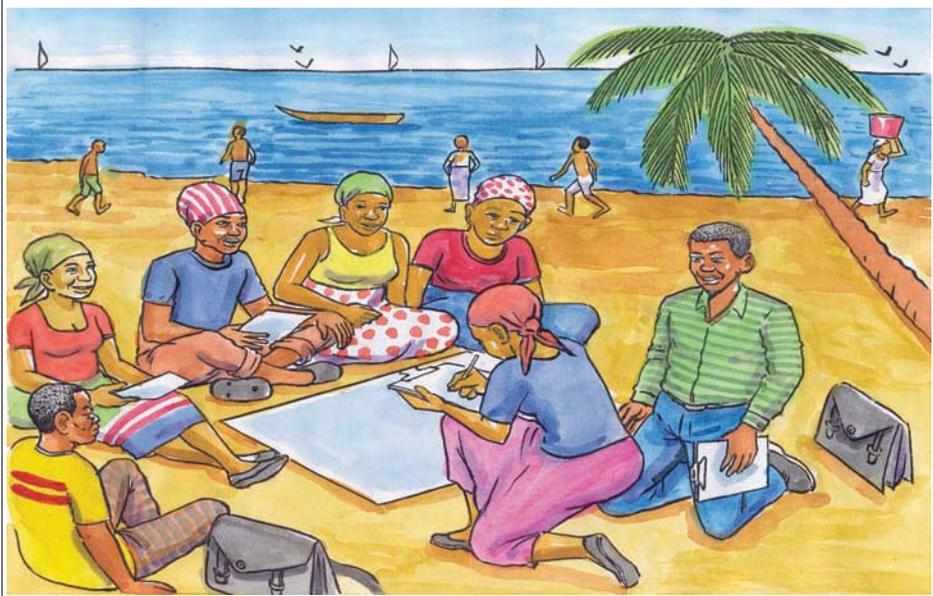


PLATE 3  
Loss assessment in the field: IFLAM with a group of fishers





## 5. PHFLA using load tracking

While the IFLAM provides an understanding of key losses, load tracking (LT) is a method that is used to measure specific losses (Figure 21). It is typically used to measure losses during fishing, processing, transportation or marketing (Figure 22). The method relies on evaluating the quality and/or weight of a sample of fish as it moves through a supply chain under conditions that are as near as possible to the same as “normal” practice.

In summary, LT can be used to:

- assess how fish quality and/or quantity can change within a distribution chain;
- identify why and where losses occur;
- estimate the value of losses in monetary terms;
- measure the effect of interventions to reduce losses.

Figure 21 shows some of the losses that LT can be used to measure.

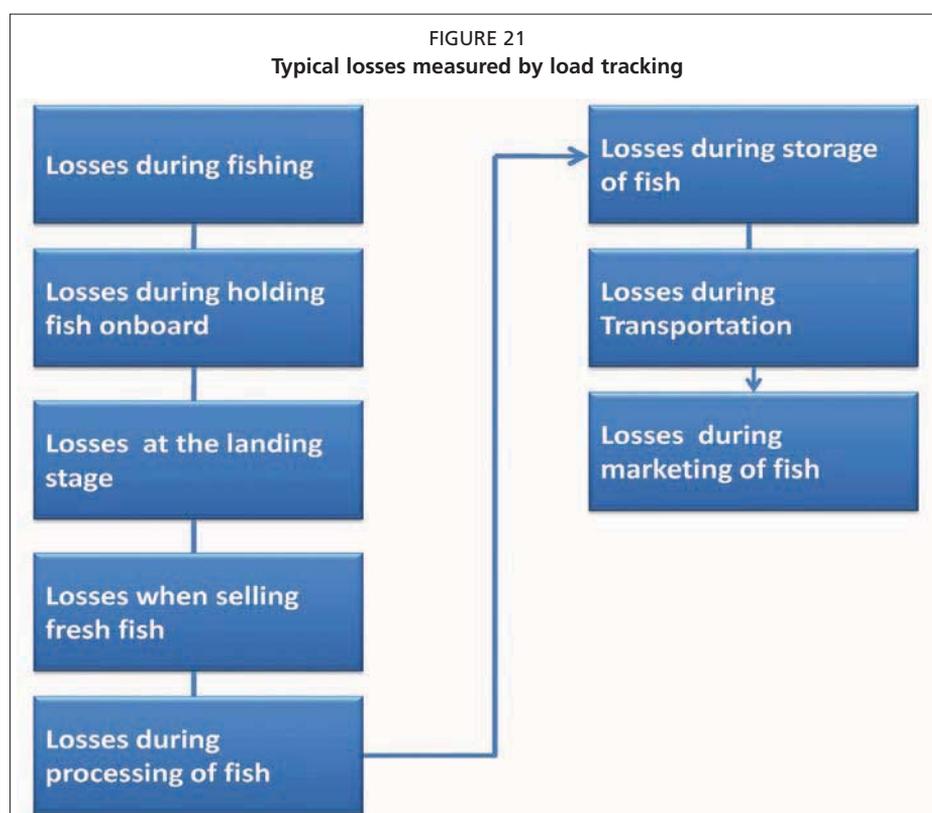
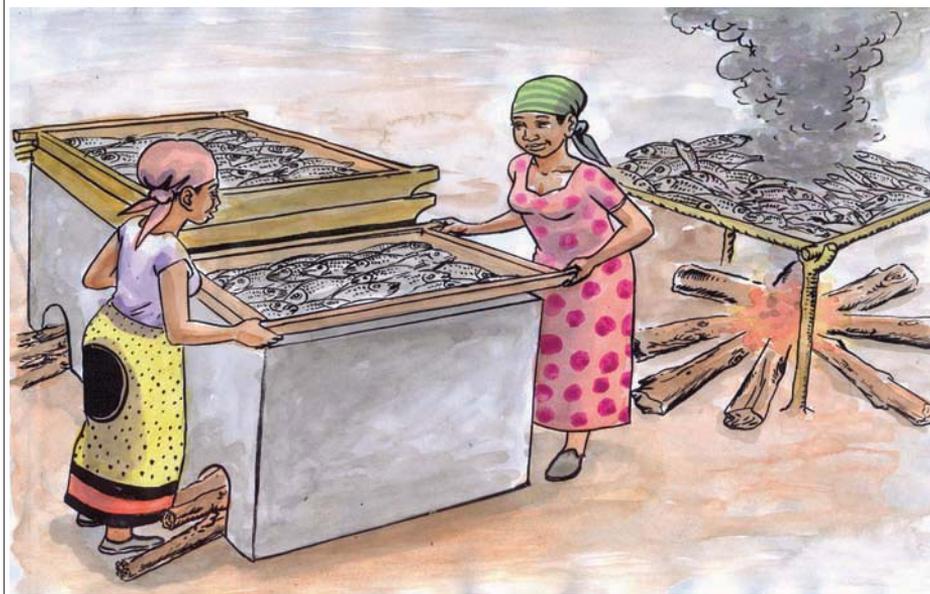


FIGURE 22  
Example of when load tracking can be used



LT is a quantitative loss assessment that usually requires biometric support or skills for the design and data analysis. The method consists of the following key elements that need to be considered in design and implementation:

- IFLAM report and data;
- setting the objective;
- unit of measurement;
- sampling;
- replication;
- response;
- analysis.

Table 18 summarizes key aspects of some of the main LT elements.

TABLE 18  
Load tracking loss assessment design

Element	Notes
Sampling	A sample has to be random and representative of the whole for the sake of rationality and extrapolation. A sample size of 30% could be an ideal sample. For example: picking at random 2 pans per canoe for 10 different canoes. An alternative in this example would be to select 20 canoes at random and then take 1 pan at random from each canoe on landing.
Replication	The number of replications has to consider a balance between cost and available resource, without compromising the accuracy of the assessment. "20 times (samples)" Either option in this example will mean that 20 units will be measured. Usually, a replication of 12–20 units is ideal.
Response	The response has to be pointed out clearly. "Weight" i.e. the weight of good-quality and poor-quality fish assessed using an objective assessment method, or weight of fish discarded/sold at low price.
Analysis	Point out how the data are going to be analysed. For example: Statistical central tendency, such as mean and range or percentages? Or using a specific software?

Examples of how LT has been used and the type of data and results generated can be found in Akande and Diei-Ouadi (2010) and in Ward and Jeffries (2000). Later in this chapter, case studies are presented as examples that help explain how LT can be applied.

Findings from the IFLAM help identify prioritized losses that could be investigated further by LT. The findings can also help identify where these losses occur and who is affected by the particular loss and, therefore, who should be involved or contacted about participating in an LT activity.

The following describes key elements of LT activity. Unless the assessment team has the required skills and knowledge, it is worth employing the services of a biometrician to help plan an LT activity. Although there are many different situations where LT is applicable, the design, sampling and analysis approaches are similar.

### OBJECTIVE FOR LOAD TRACKING

In common with any research or assessment activity, it is important to define clearly the objective of the exercise. The objective of LT can be derived from IFLAM findings. The objective must be desirable and achievable. For example:

- "Quantify the physical and quality fish losses of fish species X along the distribution chain Y."
- "Quantify the physical losses during packaging and transportation of sundried sardine."
- "Measure the physical losses during the smoking stage."

### UNIT OF MEASUREMENT OR EXPERIMENTAL UNIT

Load Tracking relies on measuring physical and quality losses before and after the event. In common with any experiment, consideration should be given to the definition of the experimental unit. Ideally, a unit of fish used in an LT activity should not consist of a single fish; however, given the practical difficulty of

measuring all fish at a particular point in the supply chain belonging to a particular operator, it is usually practical to form a unit of fish from a random sample, e.g. selecting a number of fish from a larger unit such as a box or sack. For many LT experiments, a container of fish makes a natural choice for the experimental unit, e.g. a small basket or bag. Different units of fish quantity measurement are often used in SSFs. Units such as “pieces”, bundles of fish, boxes, crates, baskets, tins, bags, heaps and, of course, the conventional kilogram are used. It must be possible for the team to use consistent units in order to sample for and measure losses. If it is not practical to use a container of fish as the unit, then the alternative is to use a randomly sampled group of fish as the unit. A group of fish should ideally have at least five fish in it, to try and avoid the experiment measuring differences between fish.

In order to obtain valid estimates of the losses, it is vital to use designs that track the experimental units through the distribution chain or between stages in the chain. The most common design incorporating this approach are paired t-tests, which are a common LT design feature.

## **SAMPLING**

The purpose of a designed LT activity is to provide data suitable for statistical analysis from which information about losses in general can be inferred. This wider inference relies on the fact that the data obtained on losses have been so obtained using random sampling. It is often necessary for practical reasons to use a two-stage sampling process, whereby there is an initial systematic selection of units followed by random sampling. Common sense should prevail in the choice of a sampling scheme as there is no definitive method.

As mentioned above, for practical reasons it is often necessary to use a two-stage sampling process with a systematic selection followed by random sampling. A sample size of 30 percent of the population would be an ideal sample, if this is practical, for example: picking at random 2 sacks of fish from each of 10 different canoes selected out of a total of 30 canoes in the study location. Another example would be to pick 3 pieces of tilapia chosen out of 15 from every group of 10 traders.

Normally, a sample of operators is involved in an LT activity. Because of cost and time implications, it is difficult to involve everybody in a location in LT, particularly if there are many people. To provide statistically accurate data, a sample chosen must be representative of the location. A random sampling approach is therefore a good method and can be used to identify potential operators to be involved. However, not everyone that is chosen may wish to participate. Therefore, a mixture of random and purposive sampling may be more practical.

## **REPLICATION**

The purpose of LT is to obtain an accurate estimate of losses. The precision of an LT activity is determined by the amount of replication of the experimental

unit. Although there is no prescriptive rule for determining the correct level of replication, a number of guidelines can be used. The major issues are:

- Too little replication will result in inaccuracy, and a small number of units replicated may not be representative.
- Too much replication may result in a waste of resources and be expensive.

Conducting many LT activities can be time-consuming and expensive. However, only doing one LT activity in a location may not provide representative results. Too small a sample, and the conclusions based on the sample evidence might be inadequate. The number of units to be tracked or replications has to consider a balance between cost and available resources, without compromising the precision of the assessment. Load Tracking activities often involve a replication of 12–20 units; this can be used as a guide.

## RESPONSE

The response is what is actually measured in an LT activity. The most appropriate measurement is a non-subjective measurement such as the weight. This gives a more accurate estimate of losses, although it is often necessary to convert this to a percentage or a monetary value in order to express the results in a form more easily recognized by decision-makers. For example, the response could be “the weight of fish discarded, or weight of fish sold at low price”.

To quantify physical loss, one has to measure, for example, the weight of the units at the beginning and at the end of each stage or activity being assessed. The difference between before and after measurements is used to calculate the loss. For example, you can weigh the amount of processed fish after processing and do the same when the sample is being packaged for transportation. The difference in weight will give you the amount lost between the processing and packaging stage.

Weighing in order to quantify physical loss is relatively straightforward. However, the situation becomes complicated when quantifying quality loss because one has to assess fish quality and then evaluate different qualities separately to calculate changes in quality. Determining quality can be subjective and is best done based on the operators’ experience and understanding of quality.

Factors that can be used to determine product quality include:

- damage to the stomach area (“belly burst”);
- damage to the fish;
- insect infestation damage;
- discoloration;
- presence of moulds or decay;
- smell;
- breakage and physical damage.

Sensory assessment score sheets can be used to help determine **acceptable** and **unacceptable** quality or **good**, **average** and **poor** quality fish and fish products. Tables 19–22 provide examples of sensory assessment score sheets that could be adapted to suit different scenarios.

TABLE 19  
An example of a merit score sheet for fresh fish

Parameter	Quality		
	Good (2)	Average (1)	Poor (0)
Body appearance	Shiny	Slightly dull	Dull
Gills	Colour	Red	Red-brown
	Mucus	Absent	Moderate
	Smell	No smell	Slight off smell
Eyes	Pupils	Clear	Slightly cloudy
	Blood	No blood	Slightly bloody
	Shape	Convex (bulging)	Slightly sunken
Skin	Firm	Loose	Soft
Scales	Firm	Slightly loose	Loose
Slime	Firm	Thick	Creamy
Texture	Firm	Loose	Soft
Belly	Firm	Soft	Burst

TABLE 20  
An example of a merit score sheet for smoked fish

Parameter	Quality		
	Good (2)	Average (1)	Poor (0)
Colour	Golden brown	Dark brown	Black
Taste	Meaty/smoky flavour	Bland	Sour/bitter
Physical state	Whole (head/tail intact)	Head/tail dangling	Broken(head/tail off)
Dryness	Brittle	Slightly dry	Soft
Burnt	None	One side	Both sides
Skin	Intact (no peeling off)	Part peeling off	Completely peeling off

TABLE 21  
An example of filled-in merit score for fresh fish

Parameter	Merit scoring	
	At landing site	At smoking site
Appearance	2	2
Gills	2	2
Eyes	2	2
Skin	2	2
Scales	2	1
Slime	2	1
Texture	2	2
Belly	2	1
<b>Total score</b>	<b>16</b>	<b>13</b>
<b>Price</b>	<b>US\$2/kg</b>	<b>US\$1.5/kg</b>

TABLE 22  
An example of filled-in merit score for smoked fish

Parameter	Merit scoring	
	After smoking	After transportation
Colour	1.9	1.6
Taste	1.8	1.8
Physical state	2.0	1.6
Dryness	2.0	2.0
Burnt	1.9	1.8
Skin	2.0	1.9
Total score	11.6	10.7
Price	US\$4/kg	US\$3/kg

The score and price differences obtained will provide an indication of loss levels.

A conventional organoleptic or sensory assessment evaluation form can also be used, and an example is shown in Table 23.

TABLE 23  
Organoleptic assessment score sheet

Observable aspect	General appearance (5 marks)	Score
Eye, skin, slime, gills, belly flaps, blood, muscle along backbone	Eyes perfectly fresh, convex black pupil, bright red gills, no bacterial slime, no bleaching	5
	Eyes slightly sunken, grey pupil, slight opalescence of cornea, some discoloration of gills and some mucus, outer slime opaque and somewhat milky; loss of bright opalescence and some bleaching	3
	Eyes sunken, milky white pupil, opaque cornea; thick knotted outer slime with some bacterial discoloration	2
	Eyes with completely sunken pupil; gills showing bleaching or complete discoloration and covered with thick mucus	0
	Odours (5 marks)	
Gills, guts, body cavity, muscle	Fresh seaweedy odours	5
	Loss of fresh seaweediness odours, shellfish odours	4
	Slight musty, mousy and like odours	3
	Strong ammoniacal and sulphide odours	2
	Indole, faecal, nauseating, putrid odours	0
	Texture (5 marks)	
Rigor mortis, fingerprints, muscle, belly flaps	Firm, elastic to the finger touch	5
	Softening of the flesh, some grittiness	3
	Softer flesh, definite grittiness and scale easily rubbed off skin	2
	Very soft and flabby, retains the finger indentations, grittiness quite marked	1
	Total score	

TABLE 23 (continued)

Observable aspect	General appearance (5 marks)			Score
Score from the three categories	General appearance			
	Odour			
	Texture			
	Total score			
Sensory evaluation – total score range				
		Average price/kg	Amount (kg)	% of the whole
Good	12–15			
Average	6–11			
Poor	Below 6			

Please note that organoleptic or sensory assessments can be subjective as the results will depend on the judgement of the individual who carries out the assessment.

### LOAD TRACKING DATA ANALYSIS

There are some key ways in which the data from LT can be analysed and presented. These include:

- initial data analysis and summary statistics;
- graphical methods;
- analysis of variance.

Biometric or statistical knowledge and skills will ease the data analysis process. Software packages and computers are also helpful in data analysis. Some general guidelines on data analysis are given below.

#### Initial data analysis and summary statistics

Summary statistics can be calculated by hand and do not necessarily require a computer. The most common summary statistics to use are the mean and variance. Table 24 provides an example of tabulated data. Example 1 in the case studies later in the chapter also provides an example of tabulated data.

TABLE 24  
**Example of tabulated load tracking data**

No.	Variable	%	Fresh weight (tons)	Dry weight equivalent (tons)	Financial loss (million Shillings)
1.	Estimated lake sardine landing	100	197 200		
2.	Physical damage during fishing	0.9	1 775	621	1 242.40
3.	Animal predation	2.0	3 944	1 380	2 760.80
4.	Discarded after prolonged rain	4.0	3 155	1 104	2 208.60
5.	Theft	0.1	197.2	35	70.00
6.	Sinking sacks during transportation	0.7	1 380	520	1 040.00
7.	Presence of bycatch	2.5	4 930	1 750	3 500.00
8.	Quality degradation through rain	11.0	22 400	7 840	14 112.00
9.	Change in colour before being sold	30.0	59 160	21 000	10 500.00
10.	Fragments (broken particles)	8.0	15 776	5 600	10 080.00
11.	Total physical and quality loss				45 513.80

### Graphical methods

The simplest method for visualizing the results of LT is to present the data in table form showing means and totals, and then using these data to draw bar and line graphs. Histograms are also useful for examining the distribution of a response.

### Analysis of variance

If the techniques in the above sections have been followed, the researchers should by now have a clear idea of the inference from the experiment. Biometric help can now be employed to carry out statistical analysis of the data.

### CASE STUDIES

To help understand some of the practical issues concerning the application of LT, two case studies are presented below. Reading these through will give you an idea of how to implement LT and also of the things you need to do and what equipment is required. These basic approaches can be adapted to suit different scenarios and all measuring losses associated with different activities and stages of the distribution chain. The case studies can also be used for training purposes. Further examples of LT assessments are provided in Ward and Jeffries (2000), which also provides more detail on statistical design, analysis and data presentation.

#### Example 1: Dried fish losses at market

Jurung is an important fish landing site and processing centre in the Gambia. The main processing method for fish used by women fish processors is sun drying. The fish normally take two days to dry if conditions are good and there is no disruption from rain.

In 2008, a team from the fisheries department in the Gambia applied the IFLAM to retail markets in the area. The team identified that a significant proportion of dried fish on sale was of poor quality and was usually sold by traders for 50 percent of the price of good-quality dried fish.

The team decided to measure the loss more accurately using LT. With the help of local staff, the team first held discussions with processors and traders to explain the process and build up a good relationship. As a result some processors and traders allowed the team to work with them for the purposes of LT. The team also assembled the equipment needed to measure losses, e.g. weighing scales, rope, and plastic sheet. They then undertook the following process:

1. Weigh sack of dried fish on arrival in the market.
2. Sack unpacked by the trader and spoiled fish graded out.
3. Spoiled fish weighed in a box used for collection.
4. Empty box weighed = 0.4 kg.
5. Sack and other packaging material weighed.
6. Weight of fish and spoiled fish calculated.
7. Percentage of spoiled fish out of the total weight of fish calculated.

The data recorded are summarized in Table 25.

TABLE 25  
Data recorded during load tracking in Jurung

Weight of dried fish and packaging	Weight of packaging	Weight of dried fish	Weight of spoiled fish and box	Weight of empty box	Weight of spoiled fish	% of spoiled fish
			(kg)			(%)
41.0	4.60		4.00			
47.0	4.90		2.80			
49.0	4.12		2.11			
48.0	4.14		2.30			
43.0	5.14		3.90			
47.0	5.15		3.70			
Av. 40.5	4.00		6.50			

Calculations were then made to arrive at the percentage of spoiled fish (Table 26) as follows:

- Weight of fish + packaging – weight of packaging = weight of fish
- Weight of spoiled fish + box – weight of box = weight of spoiled fish
- Weight of spoiled fish / weight of fish × 100/1 = percentage of spoiled fish

TABLE 26  
Processing of data recorded

Weight of dried fish and packaging	Weight of packaging	Weight of dried fish	Weight of spoiled fish and box	Weight of empty box	Weight of spoiled fish	% of spoiled fish
		(kg)				(%)
41.0	4.60	36.40	4.00	0.40	3.60	10.0
47.0	4.90	42.10	2.80	0.40	2.40	5.7*
49.0	4.12	44.88	2.11	0.40	1.71	3.8*
48.0	4.14	43.86	2.30	0.40	1.90	4.3*
43.0	5.14	37.80	3.90	0.40	3.50	9.2
47.0	5.15	41.85	3.70	0.40	3.30	7.9
Av. 40.5	4.00	36.50	6.50	0.40	5.70	15.6

\* Fish not as well dried as the other samples of fish measured.

There are a number of reasons why a significant proportion of dried fish is spoiled by the time it reaches the markets. The fish may have been spoiled before drying. The drying process may not have been quick and, therefore, the fish took a long time to dry and quality deteriorated in the process. Weather conditions can affect the efficiency of sun drying. The dried fish may have been held in storage at the market for a prolonged period leading to quality deterioration during storage.

The implications of reducing the amount of spoiled fish are that, in theory, the trader in the market will receive a high price because the quality of the fish is good. If the fish quality is good when the fish arrives in the market, then the processor should also gain from a higher price. Therefore, reducing losses could lead to an increase in income. However, those relying on low-quality processed fish that is cheaper will have to pay a higher price for fish or seek alternative cheap sources of protein.

Conclusions drawn from the data indicate that further measurements are required in order to improve the accuracy of the results. However, the data showed that the proportion of spoiled fish ranged widely from 3.8 percent to 15.6 percent. The figures marked with an asterisk (\*) in Table 26 are for dried fish that was not as well dried as the other samples of fish measured. This suggests that the less dried the fish, the less spoilage and vice versa, as the other samples were drier and associated with a greater proportion of spoilage.

Work could be undertaken to improve the quality of dried fish and the results measured using LT and compared with the data in Table 26.

### **Example 2: Measuring loss of fish quality (caused by bad handling) with traders**

First, seek agreement with fishing vessel owners and traders regarding the LT activity. Explain to them what you would like to do and the benefits in order to gain their cooperation, e.g.:

- LT will help identify opportunities to improve quality and generate higher prices and more income for fishers and trader;
- LT can help improve the quality of fish for consumers;
- LT can help increase post-landing storage life of fish to give fishers and traders more control over the selling process.

Implement the LT activity requires the following equipment:

- weighing scale;
- net for holding the fish in while weighing;
- notepad and pen for recording data;
- money in case fish has to be purchased or the fishers and traders require compensation for participating in the activity.

The fishers land their fish in boxes. Traders buy and sell their fish also in boxes. Therefore, the obvious unit to choose for an LT activity is a box. It is not practical to weigh and assess the quality of all the fish in a box as each box can contain 30 kg of fish and the fish, in this example, are small in size. Therefore, in this case, the fish in the box is weighed and then 30 percent of the fish are selected at random. The quality of each fish selected is assessed by the traders who are buying the fish using their own understanding of quality. The good-quality and poor-quality fish are weighed. The response is, therefore, the weight of good-quality and poor-quality fish. As a box contains about 30 kg of fish, a sample of 10 kg is taken at random from a box. If 2 kg of this is poor quality, then the quality loss is estimated to be 20 percent.

In this case, at the landing site there were 9 vessels, so to understand quality loss levels at landing or first point of sale, 30 percent of the vessels were chosen at random and then 5 boxes of fish were sampled at random from each vessel once during a week. This meant that three vessels were sampled in the week. Not all the sampling was done on one day as the vessels would land on different days. Table 27 shows the data collected and the quality loss levels.

TABLE 27  
Processed data from tracking of fresh fish loads

Vessel	Box	Weight of fish in box	Weight of 30% sample (kg)	Weight of good quality fish	Weight of poor quality	% quality loss (%)
A	1	28	8.4	7.3	1.1	13
	2	32	9.6	7.5	2.1	22
	3	35	10.5	10.0	0.5	5
	4	30	9.0	9.0	0.0	0
	5	32	9.6	9.0	0.6	6
Average		31.4				9
B	1	35	10.5	9.2	1.3	12
	2	37	11.1	9.5	1.6	14
	3	37	11.1	9.8	1.3	12
	4	38	11.4	9.8	1.6	14
	5	35	10.5	9.0	1.5	14
Average		36.4				13
C	1	29	8.7	8.0	0.7	8
	2	28	8.4	7.9	0.5	6
	3	29	8.7	8.4	0.3	4
	4	26	7.8	7.3	0.5	7
	5	25	7.5	7.3	0.2	3
Average		27.4				6

As well as the data on quality losses, certain other information was also collected:

- name of vessel captain;
- species of fish;
- size of fish;
- whether fish was chilled on board and, if so, ratio of ice to fish used;
- fishing area;
- duration of fishing trip;
- prices of fish – good and poor quality.

### *Observations*

Each vessel caught the same species of fish and fished the same fishing grounds, and the duration of the fishing trips was similar. Onboard handling was also similar for all vessels; no ice was used on board. The results show an interesting relationship between the level of quality loss and the quantity of fish in a box – the larger the average quantity of fish per box, the higher the average level of quality loss. This indicates that controlling the amount of fish per box may have an influence on the level of quality loss. The other observation is that quality loss may have occurred generally because of the lack of chilling on board. Further

LT work could be done to assess the effect of ice on the overall quality loss, and fishers could be encouraged not to overfill the boxes with fish.

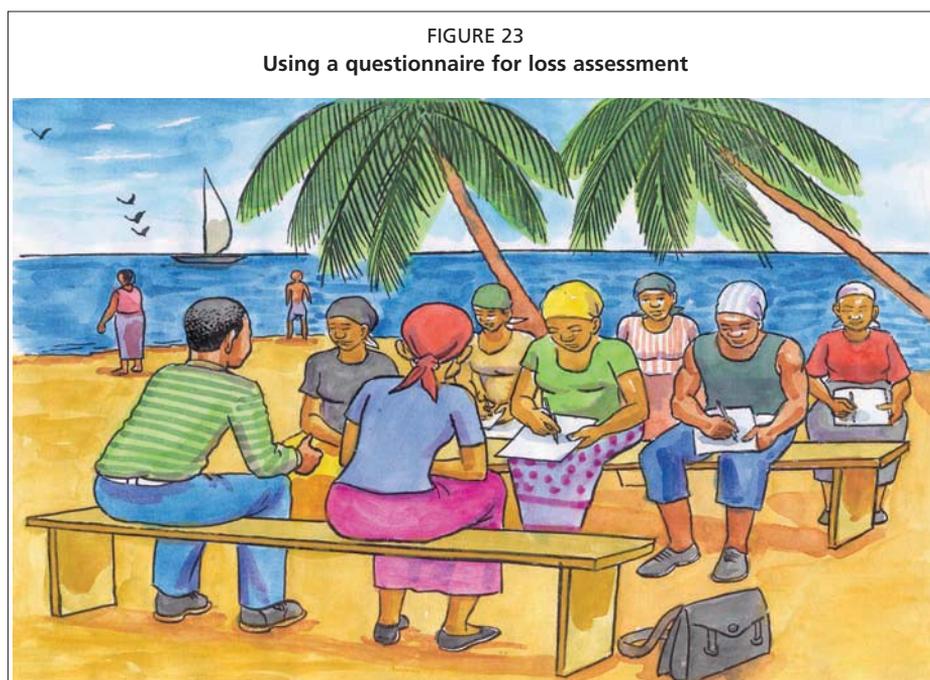
This approach could be used to measure quality loss from fishing to landing, and also from landing to market. For the former, it is likely that the extension officer or researcher would need to travel on board the fishing vessel to carry out the measurements and quality assessment. In this example, the quality was assessed based on the understanding of the fishers. However, the sensory assessment schemes described above could also be used.

## **REPORTING**

It is important to document and present the results of LT to decision-makers and other development practitioners, particularly, if follow-on support is required for loss reduction. Ward and Jefferies (2000) provide ideas on data presentation and report structure. In addition, Annex 3 gives an example of a report structure and content that could be used. More information on reporting is provided in Chapter 7.

## 6. PHFLA and validation using the QLAM

The Questionnaire Loss Assessment Method (QLAM) is a formal questionnaire survey approach used to quantify and validate key loss data. The method relies on the administration of questionnaires (Figure 23) that focus on information generated by the IFLAM and LT. The QLAM can help determine how representative data are over a wide geographical area or across different communities or locations.



The QLAM helps generate statistically valid data on the following:

- type of loss;
- reasons for loss;
- frequency of loss;
- variables that affect losses, such as fishing gear type, seasonality, livelihood activities and profile of those affected by fish loss.

This chapter considers:

- objective setting;
- where the QLAM is conducted;
- who is involved in terms of respondents and enumerators;
- issues to do with questions and questionnaires to use;
- pilot testing;
- data analysis and reporting.

It is recommended that a biometrician is involved in the design of the QLAM assessment and is involved in data management and analysis. Biometricians can advise on the locations for interviews, sampling and the sample size. They can also help develop a database for storing and analysing the data from the interviews. More information on the QLAM can be found in Ward and Jeffries (2000).

### **OBJECTIVES**

Important information that can be used to design and determine the focus of QLAM includes the following:

- types of fish loss;
- causes of fish loss;
- frequency as well as seasonality of losses;
- changes in losses over time;
- losses at different stages of the distribution chain, e.g. fishing, landing, processing, storage, transport, trading;
- financial consequences of losses;
- interventions to reduce losses;
- effects of intervention;
- stakeholders' perceptions;
- the magnitude of fish loss in the fishery;
- the number of operators affected by the losses;
- ideas for reducing losses.

Much of this information, if not already available, will come from the IFLAM and LT studies. Generally, the QLAM is used to validate or cross-check data obtained from the IFLAM and LT. The issues highlighted above often become the focus of questions in a QLAM questionnaire.

Typical objectives for QLAM include:

- “Validate qualitative data on losses incurred by fishermen, processors and traders, in particular geographical area”.
- “Quantify key data on the causes of losses associated with a particular fishery in a geographical area”.

### **LOCATIONS FOR USING THE QLAM**

A location where the QLAM is used is the place where the questionnaires are used to interview fishers, processors, traders and others about losses. Typical locations include fishing villages, fish landing sites, fish processing areas and storage areas,

markets and places where fish are traded as well as key transport points where fish is loaded and unloaded.

If the QLAM is used to validate IFLAM or LT data for a particular geographical area, then a number of sites will be required for interviews. It is unlikely that it will be possible or practical to conduct interviews with everyone at every site, and there may be a large number of sites to cover. Therefore, sampling is used to select locations and then within the locations, the people that will be interviewed. Ideally, locations should be chosen randomly, and then within the site those to be interviewed should also be chosen using a random sampling approach, based on the size of the sample population (the number of operators, e.g. fishers, processors and traders). A biometrician will be able to advise on site selection and sampling.

## RESPONDENTS

The QLAM is used to verify data related to stages within the post-harvest chain: fishing, unloading, processing, storage, transportation or retailing. As a consequence, different questionnaires can be used to interview specific groups of operators, such as:

- fishermen and/or fisherwomen;
- fish handlers (those unloading fish);
- processors;
- traders;
- transporters;
- retailers.

We use the term respondents to refer to those that are interviewed using the questionnaire.

## ENUMERATORS

Enumerators are the people who carry out the interviews. They are usually recruited for the survey and may be resident or already working near the survey location. Typical enumerators include government fisheries staff, including extension officers and researchers, as well as local residents who have the ability to conduct such surveys. Enumerators must be aware of whom they should interview, when is the best time to come to the interview and how to conduct interviews properly. If necessary, they should undergo training to help them with their tasks. Interview techniques are covered in more detail in Chapter 4; these issues also apply to interviews conducted for the QLAM.

## QUESTIONNAIRES

A questionnaire consists of several different types of question that require the respondents (e.g. fishers, processors and traders) to recall information about their activities and losses. The answers are either recorded on the questionnaire by the enumerator or are coded and recorded on a separate answer form. Questionnaires should be short and be in the language best understood by the enumerator and respondents. The questionnaires can also include prompts for the enumerators to

help them with the interview process. The sorts of questions to include are those that:

- identify the source of the data, e.g. the respondent's name and contact details, in case follow-up is required;
- make sure the respondent has the information required and that you are asking the right person the questions;
- seek to find out the reasons for or causes of losses;
- find out about the frequency of loss or how often the loss occurs;
- help understand the variables that affect losses, such as fishing, processing, transport method, packaging materials and methods, and duration of activities.
- investigate coping strategies and how people try to reduce losses;
- ask about socio-economic factors related to the respondents to determine whether losses affect a certain socio-economic group.

Some “dos and don'ts” relating to questionnaires are shown in Table 28.

TABLE 28

**“Dos and don'ts” of the Questionnaire Loss Assessment Method**

Dos	Don'ts
Use simple language	Do not use complex jargon
Avoid challenging and complex questions	Do not use leading and loaded questions
The length of the questionnaire should be kept short to encourage responses and facilitate easy analysis	Do not be ambiguous Do not make assumptions
Frame questions that will draw maximum amount of information from respondents	Do not use burdensome questions
Define clearly the information required	Do not use open-ended responses that are difficult to code and analyse
Develop questions whose answers will meet the objective	Do not ask more than one question at the same time
Pre-test the questionnaire on a pilot sample of respondents	
Make the necessary changes to the questionnaire on the strength of the pilot survey	

Some important issues to consider when formulating questions are:

- What should be asked?
- How should each question be phrased?
- In what sequence should the questions be arranged?
- What questionnaire layout will best serve the assessment objectives?
- How should the questionnaire be pre-tested?
- Does the questionnaire need to be revised after testing?

Here we describe some of the issues related to the content and type of question to include in a loss assessment questionnaire. Four types of question are discussed.

Each of these types of question can be used in a questionnaire.

- simple choice;
- multiple choice;
- open-ended questions;
- semantic or Likert scale.

### Simple choice

In simple choice questions, the respondent is normally given two options for the answer, for example: Do you incur post-harvest fish losses? ( ) Yes ( ) No

Similarly, “true or false” questions can be used, depending on the situation. Such questions are usually used to confirm a particular issue.

### Multiple choice questions

A multiple choice question provides the respondents with a choice of answers. For example:

1. Please indicate approximately what proportion of your catch spoils before landing.
  - 1 crate out of 10 crates ( )
  - 2 crates out of 10 crates ( )
  - 3 crates out of 10 crates ( )
  - Above 3 crates out of 10 crates ( )
2. Please indicate approximately what proportion of your fish load is damaged upon reaching the market
  - 1- 3 kg out of one sack ( )
  - 4-6 kg out of one sack ( )
  - 7-6 kg out of one sack ( )
  - 10 kg and above out of one sack ( )
3. Please indicate approximately the storage time of your processed fish before sending to the market.
  - 1 day ( )
  - 1 week ( )
  - 2 weeks ( )
  - 1 month ( )
  - More than a month ( )
4. Please indicate approximately how long it takes to get to the market
  - Few hours ( )
  - 1 day ( )
  - 1 week ( )
  - More than a week ( )
5. When do you mostly incur losses?
  - During fresh fish handling ( )
  - During processing ( )
  - During storage ( )
  - During distribution ( )

6. During which season do you incur high losses?

- During January ( )
- During April ( )
- During July ( )
- During October ( )

### Open-ended questions

Open-ended questions allow the respondents to provide descriptive answers. Such answers are not particularly easy to analyse and, thus, there is a need for short but precise responses. For example:

1. What are the three major problems facing your community?
  1. \_\_\_\_\_
  2. \_\_\_\_\_
  3. \_\_\_\_\_
2. What are the three major fish species caught in this area?
  1. \_\_\_\_\_
  2. \_\_\_\_\_
  3. \_\_\_\_\_
3. What are the top five major causes of fish loss in this community?
  1. \_\_\_\_\_
  2. \_\_\_\_\_
  3. \_\_\_\_\_
  4. \_\_\_\_\_
  5. \_\_\_\_\_
4. What are the two major problems facing post-harvest operations?
  1. \_\_\_\_\_
  2. \_\_\_\_\_
5. Describe how people have tried to reduce losses.
  1. \_\_\_\_\_
  2. \_\_\_\_\_
  3. \_\_\_\_\_
  4. \_\_\_\_\_
  5. \_\_\_\_\_

### Semantic or Likert scale

This is a method of recording results from a respondent on a scale graduated between opposite descriptions of values of respective factors. Table 29 provides an example.

TABLE 29  
Scale for graduated responses

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
1) Long hours of setting gear before hauling causes high post-harvest quality loss	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2) Fishers from distant fishing grounds land large quantities of spoiled fish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) On average, two crates of fish are found spoiled on landing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4) Unloading takes quite a long time causing quality losses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5) High post-harvest fish loss occurs during rainy season	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Guidance notes

Questionnaires can include notes for the enumerators to help them with the interview process. These notes, written on the questionnaire in between questions, will often remind the enumerators of what to say or do. The following are some examples:

- At the beginning of the questionnaire, it can be useful to include a note that says something like: “Explain to the respondents that the interview will take about 15 minutes and that the assessment will be used for the purposes of research to help improve people’s income and food supply.”
- Remember to insert an appreciation note at the end of questionnaire forms to acknowledge cooperation of a respondent, e.g. “Remember to thank the respondents for their time and useful information.”

### PILOT TESTING

Before conducting a full survey, it is recommended that you pilot test the questionnaires and the sampling and interviewing processes. Table 30 provides a simple plan that can be used to help pilot testing as well as an actual survey.

Ideally, a draft questionnaire should be pilot tested prior to an actual survey in order to test the understanding of the questions by respondents and enumerators – evaluate the responses, and then revise as necessary. Pilot testing involves interviews with fisherfolk at a convenient location.

TABLE 30  
**Example of plan for pilot testing**

Aspect	Elements
Who	QLAM team loss assessors, fishers, one local guide (translator), statistician and/or biometrician
What	Establish the number of fishers directly affected by quality (and physical) losses in peak season. A minimum of 30% of fishers to be interviewed.
Where	Landing site
When	Second week of August
How	Direct interview of fishers. Data analysis based on number of respondents (n) and corresponding percentage of respondents for each attribute.

## DATA ANALYSIS AND REPORTING

Before the answers to questions are analysed, certain data management tasks have to be performed. These are the inputting of the raw data from the questionnaires into a computer and checking that the data have been entered accurately, organizing the data into an appropriate form for analysis, and archiving the data in the computer so that they remain available for future use, e.g. creating and saving a database. Ideally, a database should be designed before the survey, and it can be used to store and analyse data during pilot testing.

Data analysis converts raw data from questionnaire interviews into quantitative information on PHFLs. The information from the analysis process can be used by policy-makers and planners to make informed decisions regarding intervention strategies to reduce losses or improve the livelihoods of those affected by losses.

Data analysis can be used to provide quantitative information on such issues as:

- frequency of losses;
- reasons for different types of loss;
- relationship between losses and variables;
- livelihood issues of people affected by loss;
- coping strategies used to overcome loss.

Following data management, the analysis process generally consists of the following steps:

- initial analysis giving basic summary statistics, e.g. means or averages, and basic graphs;
- extraction of meaningful cross-tabulations;
- examination of variable relationships using scatter plots and correlations, t-test, standard deviation;
- formal statistic analysis (requiring biometric knowledge and skills), e.g. significance testing, multiple regression and interpretive multivariate methods.

Statistical analysis can be used to quantify the accuracy of data and investigate the relationships between variables. Examples of QLAM data analysis and further information can be found in Ward and Jeffries (2000).

Table 31 is an example of tabulated data generated by question using a five-point Likert continuum. Analysis involved calculating percentages from the raw data.

TABLE 31  
A presentation of analysed data

Value statement	Percent responses (n*)				
	1 = Disagree strongly	2 = Disagree	3 = Neither	4 = Agree	5 = Agree strongly
More than 5% of bycatch is discarded at sea	18	10	2	30	40
More than 2% of fish landed is discarded over quality problem	5	6	9	65	15
More than 40% of fresh fish is sold at half the price of best quality fish	8	10	6	40	36

\* Number of respondents.

Based on the analysis in Table 30, one would not be wrong to suggest that the fishery is experiencing discards or bycatch of more than 5 percent at sea and more than 2 percent at the landing site, and that the quality loss is very high with more than 40 percent of the fish volume being sold at less than 50 percent of the best price.

As with the IFLAM and LT, it is important to write up the QLAM survey results for reference and dissemination purposes. A suggested report structure to use as a guide, including content ideas, is presented in Annex 3. More information on reporting is given in Chapter 7.



## 7. Report writing and communication

Presenting information on PHFLs in a clear and concise way is a key part of the assessment process. This chapter discusses the format and content of a proposed report structure that you can use to present and disseminate the assessment results. A report should ideally contain some standard sections to help readers easily find relevant information. While examples of IFLAM, LT and QLAM report structures are presented in Annexes 2 and 3, the following headings, including content ideas, are seen as key to any assessment report. Examples of data and how these are presented can be found in previous chapters as well as in Akande and Diei-Ouadi (2010) and Ward and Jeffries (2000). The basic content of a loss assessment report should include:

### **Executive summary**

- Brief description of the PHFLA.
- Brief summary of key results including comparisons with previous assessments or estimates and trends over time and implications for fishery operators and communities.
- Key results should be expressed very clearly for the benefit of the target group, and should include clear presentation of the statistical significance of the results.

### **Introduction**

- Background description of previous PHFLA if applicable.
- Identification of any ways this assessment differs from previous assessment initiatives.
- Description of the primary objectives for PHFLA and of the where, when, who and how.

### **Material and methods**

- PHFLA design.
- Methods used in data collection (IFLAM/LT/QLAM).
- Data analysis and approach used.
- Limitations that could have affected the PHFLA process.

### **Results**

Present results in narrative form, supported by tables, summary matrix losses, flow diagrams and graphs. Key results should be presented such as:

- types of losses;
- causes of losses;
- locations where losses occur;
- stakeholders affected by the losses;

- prioritizing of losses and where these are;
- physical loss frequency and levels;
- quality loss frequency and levels;
- market force losses frequency and levels;
- estimated financial losses;
- trends over time of losses;
- seasonality;
- stakeholders' perceptions of loss reduction measures;
- initiative being taken to address the PHFL problem.

### **Discussion**

The discussion should include key learning and implications of the results, focusing on the goal of PHFLA, including the following:

- Discuss the results in relation to the key technical considerations and their socio-economic impact in terms of food security and poverty alleviation.
- Compare current results with any past estimations.
- Compare with data from other places if data are available.
- Point out the limitations that you feel could have affected the findings.
- Describe potential loss reduction interventions, if applicable.

### **Conclusion**

Conclusions may focus on the extent of the PHFL problem, the assessment process and the need for follow-on initiatives and what these could be.

### **Recommendations**

Recommendations could relate to the following:

- Promoting the use of appropriate technology.
- New processing and value-added techniques.
- Cost-reduction initiatives.
- Policy changes related to loss reduction, food security, livelihoods.
- Further PHFLA.
- Raising awareness of PHFL issues, extension and awareness raising.
- Capacity building of the different stakeholders (public and private sector) in loss assessment and loss reduction.
- Networking and information sharing.
- Monitoring and evaluation of losses and reduction initiatives.

Communicating the results to the target audience is important in terms of raising awareness about losses and encouraging follow-on initiatives if these are seen as needed. The information can then be used to demonstrate to policy-makers, and to the public, the importance that reducing PHFLs should be given.

As not everyone will have the time or inclination to read through a complete report, especially busy decision-makers, presenting a summary of key findings can be a good way of communicating the message. A summary can be developed into a short presentation that can be given to decision-makers, policy-makers and others during meetings or workshops. It can also be a very good way of feeding back the results to SSF operators and development practitioners and, in the process, initiating discussions of follow-on action, e.g. loss-reduction initiatives. Summary

presentations like this can also be turned into a handout or briefing note to aid the dissemination process. Another useful media for presenting the results of an assessment process is radio, which is often an important source of news for fishing communities.

Good communication is dependent upon timing. In other words, it is important to present the information at the right time to the right people. Governments, whether at the national or local level, as well as donors and NGOs, tend to work to budgets and work plans and make key decisions about what activities should be funded at certain times of the year. Understanding these planning cycles is important so that, if funding for loss-reduction initiatives is required, then the request or the ideas are presented to decision-makers at the time when they can be included in a work plan or budget.



## 8. Planning implementation and monitoring of loss-reduction interventions

The main reason for assessing losses is to determine whether they are significant and whether they can be reduced, and what benefits this is likely to bring. The PHFL report should provide the information required to determine the significance of the problem and to begin planning the next step in the light of national policy, the expected impact of intended interventions, the activities necessary for achieving objectives and the inputs required for implementation.

In most developing countries, national policies related to PHFLs are usually focused on poverty reduction and food security. Hence, an initiative to reduce PHFLs will often be compatible with national objectives. It is important for policy-makers to be able to see how a proposed loss-reduction initiative supports national policy, and other instruments such as the FAO Code of Conduct for Responsible Fisheries and the achievement of the Millennium Development Goals.

Loss-reduction interventions can take many forms. They can be related to capacity building in skills and knowledge in good fish handling, hygiene, sanitation, processing, marketing and business management. They can involve improved access to markets and services, improved access to technology, access to credit, improved implementation of appropriate legislation and value addition.

Setting objectives is one of the most important elements of a planning process. The objectives should always be **specific, consistent** and **attainable**. To be specific it must clearly state what is to be accomplished, and how it will be measured. To be consistent, an objective must be compatible with existing policies. Some basic potential loss-reduction objectives that can be adapted are:

- quality of fish improved;
- discard level reduced;
- value of fish product added;
- safety and quality requirements met;
- new product developed;
- trade opportunity captured and/or market niches developed.
- new innovation introduced.

Interventions are successful when the target group see the benefits of changing their attitude, skills, and knowledge. The concept of “seeing is believing” is very important in trying to convince people to change. Key questions to answer when planning an intervention are:

- Why do we need to intervene?
- What are the expected benefits?
- Are there likely to be any negative effects of the intervention?
- Has this idea been tried before and, if so, what can we learn from this?
- Is it socially and culturally acceptable and what do the beneficiaries think of the idea?
- Is the intervention technically sound?
- Do we have the resources?
- Are the right experts and fieldworkers available?
- If it is such a good idea, why has it not been done before?
- Who should be involved and who will implement the idea?
- Has consideration been given to how the market will react to the intervention and vice versa?

Make sure that you:

- are confident with the assessment information and findings;
- have good consultation with all stakeholders in the identification and planning of the loss-reduction initiative
- make accurate assumptions related to what you are going to do;
- ensure that any technical intervention is appropriate in terms of cost, labour requirements, cultural acceptability and product acceptability;
- secure and use sufficient resources to carry out the initiative properly;
- have a sound work plan.

Difficulties can often be reduced through good communication with all stakeholders during the planning and implementation process. Participation of the community is one of the requirements for successful intervention.

Try to develop a work plan to help guide an intervention. A work plan will show timings, provide ways for performance monitoring and control, and show the activities required to achieve the objective, the required resources and budget and who will be involved. See Table 32 for an overview of key planning issues.

TABLE 32

**Issues to consider for loss-reduction planning**

Inputs	Activities	Output	Outcome	Impact
People	List all the activities required for achieving the goal	Improved knowledge, skills and value	Reduced vulnerability	Sustainable livelihood in fishing communities:
Time		Improved quality	Increased income, income generation	
Equipment	Set time frame	Reduced loss		– income generation
Space/land				– food security
Material				– poverty alleviation
Money				

General adoption of an intervention will depend on issues such as whether stakeholders are aware of the intervention idea, the benefits, the investment costs, the ease of uptake in terms of work practices and cultural acceptability. However, the key point is that planning and developing interventions with the intended beneficiaries can be an effective way of ensuring that the ideas are acceptable and sustainable.

Always remember during an intervention to monitor and evaluate continually, changing things if necessary.



## Sources of further information

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## ANNEX 1

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## ANNEX 2

# Fish loss assessment report: structure and content

This is an outline of the structure of the national fish loss assessment study reports that are to be produced by loss assessment researchers. The structure is designed to:

- guide the report writing process;
- facilitate the production of standard and comparable outputs for each country;
- guide the review and editing of the reports by FAO.

Draft checklists are included as annexes, these are to be adapted and developed by researchers.

### 1. Title page

### 2. Contents

### 3. Acknowledgements

### 4. Abbreviations

### 5. Summary

*An overall summary of the study, highlighting findings and conclusions (bullet listed).*

- Are losses important and why?
- What are the most important types of loss and why? Who is affected and what is the impact of these losses?
- Any product and/or processing scheme related loss patterns?
- Change and losses – how are losses changing over time and why?
- Ideas for loss reduction.
- Observations on the loss assessment process.

### 6. Introduction

*This section provides an introduction to the FAO loss assessment initiative and information on the current national perspective of fish losses.*

Overview of post-harvest losses, definition of losses, their importance and objectives of the study.

International perspective on losses ... FAO, Code of Conduct for Responsible Fisheries (the Code).

National policy and post-harvest fisheries and losses, food security – does policy adequately address losses? Which policy documents?

Institutions involved in fish and/or food loss assessment and reduction – national, local, public, private, non-governmental organizations (NGOs), academic, research.

National perspective ... data on losses from previous studies?

(Include references)

## **7. Method**

*This section provides a description of the fish loss assessment method used.*

Brief description of the focus of the study, the approach used, methodology and research tools used, dates, locations for fieldwork and why these were chosen.

Include a description, where appropriate, of criteria and techniques used for sampling.

Include a description, where appropriate, of any statistical techniques applied to data collection, methods of cross-checking, triangulation or validation.

Include maps, where appropriate, indicating locations of important activities associated with fishery and fieldwork locations.

(Include references)

## **8. Post-harvest fish losses**

(Develop and use checklists to guide semi-structured interviews [SSIs] for this section.)

### Study focus – economically and socially important fisheries

*The focus of the FAO loss assessment initiative is on losses associated with socially and economically important fisheries. This section provides an overview of the fishery of focus and how this was identified.*

Process used to identify important fishery.

Flow diagram showing activities and stakeholders at each stage of distribution and/or marketing chain (or chains).

Description of the most important fishery and why. Include species, fishing methods, processing methods, products, markets, stakeholders involved – who (gender, ethnicity, wealth status, locations), populations of different stakeholders. Changes taking place. Interventions. Information from secondary and primary sources used, e.g. from group interviews, key stakeholders, reports.

Describe the choice of fieldwork locations for loss assessment – where, why and criteria used.

### Summary matrix

*To facilitate the uptake and understanding of the different losses that have been identified, a summary matrix is used to present key data.*

Include a matrix that provides a summary of the key issues associated with each type of loss. This is used to highlight quickly and simply key issues as well as assist the prioritization process. For example:

Type of loss	Cause of loss	Stakeholders – who, ethnicity, wealth status, population in general, location(s)	When does loss occur? Seasonal or all year? How often does loss occur?	What impact does the loss have? E.g. livelihoods, food security	Change in loss over time?	What do people think about the loss?
		The more we know about the target group, the better we can design and target interventions. An intervention may be targeted at particular groups, e.g. small-scale women processors.	A loss that occurs for only a short time may not be as important as one that occurs all the time. Helps prioritize, but also when to target intervention.	Understanding impact is important in terms of importance of loss and prioritization.	If losses are reducing over time, then there may be less urgency for intervention. Vice versa.	Understanding people's perceptions can indicate how important they see a loss and how they feel about wanting to address it.

Use general checklist to establish whether and where losses are occurring and where they are not occurring.)

For each type of loss identified

*This section of the study report provides a detailed description of the different fish losses that have been identified and who is affected. This information helps identify the most important losses that can be the focus of quantitative loss assessment work and loss reduction initiatives.*

(Use losses checklist to understand specific losses in more detail.)

Describe the stakeholders effected by a particular type of loss (e.g. fishers, processors, wholesale traders, retailers), the cause of loss and impact on livelihoods, food security, environment (include examples, case studies, indicative quantitative data if possible – loss of income, quantities).

Describe different losses in terms of:

- species and products;
- different fishing methods and/or gear;
- preservation and processing methods – fresh fish, smoking, salting, drying ... quality of raw material;
- packaging – breakage – quality of raw material;
- transport methods – breakage;
- time – fishing, transport, storage, etc.
- temperature – ice;
- storage – temperature, insects, mould.

Describe how losses are associated with particular types of stakeholder, e.g. old, young, women, men, large-scale operators, small-scale, supplier to export-oriented processing units? ... and why/reasons.

Describe the locations where losses occur and estimate the number of different types of stakeholders who are likely to incur the loss.

Describe when losses occur and how often they occur – seasonality, frequency according to activity (case studies, examples, seasonal calendar).

Provide a description of people’s perspectives on losses – what do those effected and those not affected by losses think of the cause, effect, solutions, etc.

Describe how different stakeholders try to control, avoid and/or reduce losses – how successful or unsuccessful are they and why? (For this, it is important to interview stakeholders that incur losses and those that do not incur losses.)

Describe how each loss is changing over time – how are the levels and frequency of different types of loss changing over time – describe how losses are increasing or decreasing and why.

Provide an estimate in terms of range of the macrolevel impact of loss, e.g. loss of revenue, weight of fish lost in one year.

#### Minimal losses

*Understanding why losses are particularly low and how stakeholders are able to control and keep losses to a minimum is important in terms of identifying loss-reduction initiatives.*

Describe which activities and stakeholders are associated with very low or negligible losses and why this is so. This can help identify where resources do not need to be focused and provide ideas for loss reduction.

#### Loss-reduction initiatives

*Understanding what loss-reduction initiatives have been undertaken and any current initiatives that are taking place will be important in terms of identifying and planning any future loss-reduction process.*

Describe any national, local government, NGO, private-sector initiatives past, present and future to reduce losses. This should include: how successful past initiatives have been; what impact current initiatives are having; and what stakeholders think about how any losses can be reduced. Include any observations or ideas you have based on your understanding and experience. Justify any ideas you suggest.

#### Prioritized losses

*It is unlikely that development practitioners will be in a position to address all losses identified in the study because of time and resource constraints. It may also not be cost-effective to reduce certain losses. In order to make choices as to which losses to focus interventions on, and hence make the best use of finite development resources, it is helpful to be able to understand which post-harvest fish losses are important and which ones are less important in a given situation. This will help policy-makers and planners, projects and fisheries departments be able to focus or prioritize interventions to address the most important losses.*

The following are potential criteria to assist the prioritization process:

- Are many people affected by the loss?
- Does the loss have a high negative impact on livelihoods or food security?
- Are those affected by the loss poor?
- Is the loss all year round or seasonal?
- Is the loss reducing or increasing over time?

Based on the data available, prioritize the losses identified and describe the criteria used and the reasons for the choice.

#### Loss-reduction ideas

*Once an understanding of important fish losses is in place, the next step is to determine how best to reduce these losses and facilitate a loss-reduction process.*

Based on available information, describe practical loss-reduction initiatives for key losses. These may be based on existing coping strategies, ideas from you the researcher and may be related to technical change, socio-economic change, capacity building, market intelligence (marketing information, linking), research, etc. Justify why these are likely to be successful. Indicate which organizations should be involved.

(Include references and sources of information – who provided the information? For example: “A group of women processors in ..... said that ...”, “It was observed that ...”. Where possible give examples, case studies, quotes from stakeholders.)

#### **9. Loss assessment process**

*An important aspect of FAO’s loss assessment initiative is to develop normative guidance for the Code and to finalize a manual on fish loss assessment methods. To inform this process, it is important to understand how the methods have been used and whether there is scope to adapt or apply the methods differently in future.*

Describe how the Informal Fish Loss Assessment Method (IFLAM) process used was adapted to suit local conditions and how it could be used differently in future. What worked well, what not so well?

Describe any difficulties encountered in the research and limitations of research findings, key information gaps and recommendation for further research to address this.

(Include references and sources of information if appropriate)

#### **10. References**

#### **11. Annexes**

Study itinerary – who, what, when, where (include institutional or personal contact details where appropriate).

Checklists used.



## ANNEX 3

# Load Tracking (LT) and Questionnaire Loss Assessment Method (QLAM) report: structure

This report structure is designed to:

- guide the reporting of LT and QLAM activities;
- facilitate the production of standard and comparable outputs for each country;
- assist the review and editing of the application of LT and the QLAM by FAO.

Guidance on reporting is also presented in the Fish Loss Assessment Manual. If only LT or the QLAM has been used, then the structure should be adapted accordingly.

### 1. Title page

### 2. Contents

### 3. Acknowledgements

### 4. Abbreviations

### 5. Summary

*An overall summary of the study highlighting findings and conclusions (bullet listed).*

Describe briefly:

- losses quantified using LT and results of the QLAM;
- type of statistical analysis used for LT and the QLAM;
- key results in table form;
- description of key conclusions;
- observations on the loss assessment process and the use of the tools.

### 6. Introduction

*This section provides an introduction to the quantitative phase of the FAO loss assessment initiative and the link between this and the previous qualitative phase.*

Highlight that this is a follow-on phase that builds on the Informal Fish Loss Assessment Method (IFLAM) work.

Overall objective of the LT and QLAM phase of the programme – why are these loss assessment methods being used and for what purpose?

Description of the losses that are the focus and why they have been chosen. This should highlight the link between the IFLAM work and the use of LT and the QLAM. It should include an overview of the prioritization process from the

IFLAM, macrolevel indicative data on the loss level, description of the activity associated with the loss, the stakeholders (who, how many, where) involved and their perceptions and key knowledge gaps, if these are relevant.

Description of who undertook the work, including biometric support.

Refer to annexes as required.

## 7. Method

*This section provides a description of the LT exercises.*

### Load Tracking

How many LT exercises completed, where and when.

Fish species and/or product, quality and price information.

Type of loss measured.

A description of the overall design of the different LT exercises according to OUSRRA:

- Objective.
- Unit – what, why.
- Sampling – how, why, where, who.
- Replication – how many and why.
- Response - what was measured ...?
- Analysis – how was the data analysed, what methods were used?

### QLAM

Objective.

Design of the QLAM survey.

Sampling.

Questionnaires – copies in annex.

Pilot phase.

Analysis process used.

Include maps, where appropriate, indicating locations of important activities associated with fishery and fieldwork locations.

(Include references)

## 8. Post-harvest fish losses – results

Description of the fieldwork activities.

Results of data analysis should be summarized and details of the analysis process including the raw data presented in an annex.

Quantitative data on post-harvest fish losses.

Data from the use of the QLAM.

Additional (new) qualitative information on post-harvest losses (use the IFLAM as a guide).

Identify any follow-on activities based on the results.

## 9. Tools

*An important aspect of FAO's loss assessment initiative is to develop normative guidance for the Code and to finalize two manuals on fish loss assessment methods (one for the post-harvest operator and extension worker, and the other for the researcher). To inform this process, it is important to understand how the methods*

*have been used and whether there is scope to adapt or apply the methods differently in future.*

Describe how LT and the QLAM were adapted to suit local conditions and how they could be used in the future. Identify what worked well and what not so well during the fieldwork.

Describe any difficulties encountered in the research and limitations of research findings, key information gaps and recommendations for further research to address these.

(Include references and sources of information if appropriate.)

## **10. References**

## **11. Annexes**

Study itinerary – who, what, when, where (include institutional or personal contact details where appropriate).

Data from the fieldwork and analysis.

QLAM questionnaires.

Post-harvest fish losses are a major concern and occur in most fish distribution chains throughout the world. Not only do losses constitute lost income to fishers, processors and traders but they also contribute to food insecurity – a loss of fish means less fish available for the consumer. This manual is the result of field testing and validation activities by FAO of three key post-harvest fish loss assessment methodologies developed over the past two decades. Meant as a working tool for extension officers, it describes these methods and provides guidance on when and how they can be used in the process of planning an intervention to reduce post-harvest losses or monitoring and the effectiveness of a loss reduction intervention. This document also provides the information on data communication and the design of loss reduction intervention to give policy-planners and decision-makers a better understanding of issues facing fishing communities.

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