



Training Activities

Global Strategy to improve Agricultural and Rural Statistics

Measurement of Post-Production Losses

Recommendations on the design of a Harvest and Post-Harvest Loss Statistics System for

Food Grains (Cereals and Pulses)

Training Material – User Guide

2018

1. Background

The improvement of methods for estimating post-harvest losses (PHL) was identified by FAO member countries as a research priority topic, given the importance attributed to the reduction of food losses in the Sustainable Development Goal (SDG) agenda and in several regional initiatives, such as the Malabo Declaration. Hence, between 2014 and 2016, the Global Strategy to improve Agricultural and Rural Statistics (GS) undertook research activities to develop and recommend cost-effective methods to PHL for food grain.

As part of these research activities, field tests were conducted in 2016. Specifically, several measurement approaches were tested on a sample of farmers and fields in Ghana. Furthermore, a desktop study was conducted with data from Malawi to improve the analysis approaches. The results of the research activities and recommended approaches are being documented in practical, easy-to-use guidelines that will be disseminated in the first semester of 2018. **The methodological approach developed by the GS and documented in these guidelines corresponds to FAO's recommended method for monitoring the component of SDG 12.3 on food losses along production and supply chains (up to and excluding the retail level).**

In addition, to facilitate the transfer of knowledge and development of skills on the recommended techniques and methods to measure PHL, the GS has produced this user guide, which was used during the delivery of country-level technical assistance in Malawi, Namibia and Zimbabwe. Communications and advocacy material will also be disseminated in mid-2018. To date, a number of documents have already been published and are available for free on the GS website (<http://gsars.org/en/resource-center/>):

- Field Test Report on the Estimation of Crop Yields and Post-Harvest Losses in Ghana (available in English only)
- Gaps Analysis & Improved Methods for Assessing Post-Harvest Losses (English only)
- A Review of Methods for Estimating Grain Post-Harvest Losses (English only)
- Training material for in-classroom training on the measurement of Post-Production Losses (Harvest and Post-Harvest Losses) (available in English and French)

In the coming months, the GS will publish the following documents, which will be available free of charge and in hard copies:

- Guidelines on the measurement of Post-Production Losses (Recommendations on the design of a Harvest and Post-Harvest Loss Statistics System for Food Grains: Cereals and Pulses) (in English and French)
- An eight-page communications and advocacy brochure on PHL statistics (in English and French)

Other manuals and tools have been or will be developed to guide countries in the compilation of SDG target 12.3, which goes beyond losses strictly speaking and grains, the focus of the documents mentioned above. Additional work is currently done by FAO on the measurement of losses for livestock and fish products, a topic which, despite the importance of these commodities in food diets and the typically large amounts of losses suffered by these perishable products, have been less studied than grains and perishables such as fruits and vegetables. Another stream of work led by the UNEP in collaboration with FAO currently concerns the estimation of waste at the retail and consumer levels. The results of these research which will complement the GS guidelines will be available at the end of 2018 or early 2019.

The training material contributes to the GS's goal to improve the capacity of national statistical systems to produce the minimum set of core agricultural data. It was meant to be sufficiently

generic to respond to most training needs, and can be adapted to local realities or complemented with experiences from different countries.

This user guide describes the intended goals, content and target audience of the training material. It also outlines the structure of the training material and provides recommendations on organizational aspects.

2. Objectives of the training

The main objective of the training is to provide trainees with strong knowledge and develop their skills on how to produce PHL statistics for better policy decisions and in all aspects related to post-harvest statistics: advocacy, designing studies and surveys to measure PHL, data analysis and reporting.

3. Learning outcomes

By the end of the training, trainees are expected to be able to:

- Discuss and promote the benefits of assessing harvest and post-harvest food losses for decision-making and policy development;
- Define the different concepts and definitions related to PHL losses statistics
- List the various data sources and methods used to measure on-farm and off-farm grain losses;
- Provide guidance on and apply various methods to the measurement of on-farm and off-farm grain losses;
- Provide guidance on and apply adequate sampling designs and estimation methods to measure PHL for food grain;
- Provide guidance and perform analysis on PHL.

4. Course material

The course package includes:

- This user guide, which can be used as a course syllabus
- A set of six PowerPoint presentations on the following topics:
 - 1) Conceptual framework and definitions
 - 2) Measuring grain losses on the farm
 - 3) Analyses of losses at the lab
 - 4) Sampling design
 - 5) Loss assessment through experimental design or field trials
 - 6) Loss assessment through modelling
- Two examples of questionnaires used to measure on-farm and off-farm PHL

5. Target audience

The course is designed for data producers and users interested in PHL statistics. The training should therefore be open to decision-makers, survey managers, trainers of field staff, data analysts, researchers, teaching staff and students in statistical or agronomy training centres. Core stakeholders are officers from national statistical offices, statistical departments in local government and ministries of agriculture that are responsible for the production of agriculture and food security statistics, as well as teachers and students in agricultural statistics.

All of these actors may follow all sets of slides, except for the fourth one on sampling design. This may be more relevant to statisticians and professional staff dealing with survey design and data collection in the field.

6. Course content

The content of the proposed training consists of a judicious mix of lectures, group discussions and country examples. It is organized around six training sessions (listed below). The proposed training content can be modified to integrate additional knowledge-sharing activities on country practices and methods. At the end of each session, it is recommended to discuss the content covered and let the participants discuss how the concepts, definitions, proposed methods and collection tools apply to the country's realities and data needs. The discussions

should also take into account current practices at the country level and discuss their adequacy and possible improvement based on the training content.

Session 1: Conceptual framework and definitions

The goal of this module is to introduce the concepts used in food loss measurement, and inform the audience about the benefits of and need to assess losses through the value chain of a chosen crop.

Outline of the session:

- a) Introduction
- b) Concepts and definitions
- c) Identifying loss “hotspots” or critical loss points
- d) Example of other loss assessments

Session 2: Measuring grains losses on the farm

This session tackles the different methods and approaches to measure grain losses on the farm occurring during the different stages and operations executed by the farmer. It also briefly discusses the approaches to measuring losses after the grains leave the farm (that is, off-farm losses). Three different approaches – which could also be used in combination with one another – are developed in this session: farmer declarations approach, physical measurements approach, and visual scales method.

Outline of the session:

- a) Introduction
- b) Overview of measurement methods
- c) Measuring losses based on farmer declarations
- d) Measuring losses based on objective measurements
- e) Measuring losses based on visual scales
- f) Overview of approaches to off-farm loss measurement

Session 3: Laboratory analysis of losses

This session deals with the objective measurements and analyses of losses performed in laboratories. It presents the different methods and formulas used to calculate losses once the grains taken from the farms reach the laboratory. It also discusses the selection of grains that arrives at the laboratory and the different formulas that could be applied after the selection is done.

Outline of the session:

- a) Introduction
- b) Standard Volume/Weight Method (SVM)
- c) Conventional count and weigh or gravimetric method
- d) Modified count and weigh method
- e) Thousand Grain Mass Method (TGM)
- f) Converted percentage damaged method

Session 4: Sampling design

The main objective of this session is to discuss the different farm-level and off-farm sampling approaches (processors, millers etc.). It presents the methods used to select farmers, fields, and crops, and describes the crop-cutting method used in objective measurements. It also covers sampling methods for grain at the storage stage.

Outline of the session:

- a) Introduction
- b) Sampling approach at farm-gate level
- c) Off-farm sampling approach

Session 5: Loss assessment through experimental design or field trials

Field trials or experimental designs are approaches adopted to assess losses for specific grains or for specific stages or methods used by the farmers. It is used by research stations in certain circumstances to test methods, types of seeds or other inputs, to reduce the losses

experienced by farmers. This session explains how this approach can be used to produce better statistics on PHL.

Outline of the session:

- a) Introduction
- b) Concepts and definitions
- c) Statistical designs
- d) Loss assessment at different stages
- e) Example: Ghana

Session 6: Loss assessment through modelling

This session should not be considered as a self-standing one. To be able to apply models, data is required. The data often originate from surveys with farmers (session 2) or specific studies (for example, field trials). This session is mainly used to improve the analysis once the data is obtained, such as by providing the link between losses and the practices followed by farmers. In this session, different models are presented, with examples.

Outline of the session:

- a) Introduction
- b) Concepts and type of data
- c) Regression analysis: general linear regression model
- d) Example: Pakistan

7. Course design and delivery

Delivery mode

The course should be delivered using a combination of the following:

- Lectures on specific technical topics;
- Country experiences and examples;
- Practical exercises on measurement methods in the field, using examples of crops that are grown in the country

- Practical discussions on how farm operations are performed by farmers (harvesting, threshing/shelling, cleaning/winnowing, drying, storage, transport, etc.)

To enhance learning, it is important to ensure interaction between the trainers and trainees and among the trainees themselves. For this reason, questions, interventions and peer-to-peer discussions are encouraged and expected to be part of the training.

Some country examples have been included in the training material. However, trainers are invited to select and emphasize case studies and country examples that are particularly relevant to participants' needs, as practical examples for demonstration and discussion of the various aspects of PHL. In the guidelines, case studies and country examples are provided in the main text and in the annex, and may be selected and reviewed in detail as part of the training.

The participants will need to familiarize themselves with some documents prior to and during the training. The documents can be found on the GS website (<http://gsars.org/en/resource-center/>) and are listed in the annex. Furthermore, trainees should be encouraged to develop their knowledge and skills in other agricultural statistics topics through the other resources, training material and guidelines available on the GS website (www.gsars.org).

Finally, the participants should be given an evaluation sheet at the end of the training, on which they will be able to give feedback on the course and identify the areas where further training could be provided.

Length of the training

The training material has been designed to support a course of three to four days, depending on whether questionnaires are discussed and detailed examples are given. However, it is flexible enough to allow for a shorter course.

Number of trainers and requirements

Given the nature of the training material, one trainer is enough to conduct the training. However, for better results, the trainer should have broad experience in general agricultural

data collection such as surveys and censuses, good knowledge of in-field data collection methods (in particular, crop-cutting techniques), a very good understanding of the concepts relating to value chains, and possess data dissemination and reporting skills. The trainer should also have developed good knowledge of PHL measurement through formal or informal training. Experience in the measurement of food losses is an asset, but not a requirement.

Number of trainees

The number of trainees depends on the training's objectives and targeted audience. It also depends on the resources available for the training and its venue. Generally, to achieve the objectives of in-classroom training having such a format, it is advisable to accept a maximum of 15 to 25 participants. Indeed, this group size is small enough to ensure adequate interaction among trainees and with the trainer, as well as to organize group discussions. In addition, it is sufficiently large to include all the stakeholders involved in PHL statistics and their reduction and, therefore, allow for mutually beneficial exchanges.

8. References

Global Strategy to improve Agricultural and Rural Statistics. Forthcoming, 2018. *Guidelines on the measurement of Post-Production Losses (Recommendations on the design of a harvest and Post-Harvest Loss Statistics System for Food Grains: Cereals and Pulses)*. GSARS Guidelines: Rome.

2017. *Field Test Report on the Estimation of Crop Yields and Post-Harvest Losses in Ghana*. Technical Report no. 29. Global Strategy Technical Report: Rome. Available at: <http://gsars.org/wp-content/uploads/2017/11/TR-14.11.2017-Field-test-Report-on-the-Estimation-of-Crop-Yields.pdf>.

2017. *Gaps Analysis & Improved Methods for Assessing Post-harvest Losses*. Working Paper No. 17. GSARS Working Paper: Rome. Available at: <http://gsars.org/wp-content/uploads/2017/05/26.04.2017-WP.-Gaps-Analysis-Improved-Methods-for-Assessing-Post-Harve....pdf>.

2015. *Improving Methods for Estimating Post-harvest Losses - A Review of Methods for Estimating Grain Post-Harvest Losses*. GSARS Working Paper No. 2. GSARS Working Paper: Rome. Available at:

http://gsars.org/wp-content/uploads/2015/09/WP-Review-of-Methods_for_estimating_grain-loss-160915.pdf.

Annex

Example of a four-day training agenda

Time	Topics
Day 1	
08 h 00 – 09 h 00	Registration
09h 00- 10 h 30	Opening Session/Photo session - Welcome remarks - Opening remarks - Orientation: workshop objectives, structure and expected results - Introductions (participants, resource person and support team, if any) Group photo
10 h 30 – 11 h 00	Coffee break
11 h 00 – 12 h 30	Session 1: Conceptual framework and definitions Discussion
12 h 30 – 14 h 00	Lunch break
14 h 00 – 15 h 30	Session 2: Measuring grain losses on farm (part I, to be continued) Discussion
15 h 30 – 16 h 00	Coffee break
16 h 00 – 16h 45	Discussion on the outcomes of the day
16h 45	End
Day 2	
09h 00- 10 h 30	Session 2: Measuring grain losses on farm (part II, continued) Discussion
10 h 30 – 11 h 00	Coffee break
11 h 00 – 12 h 30	Discussion on examples of crops: the different operations in the fields, the constraints upon the data collection approaches related to the crops etc.
12 h 30 – 14 h 00	Lunch break
14 h 00 – 15 h 30	Session 3: Analysis of losses at the laboratory Discussion on the availability of laboratories, material and expertise on PHL in the country
15 h 30 – 16 h 00	Coffee break
16 h 00 – 16h 45	Discussion on the outcomes of the day
16h 45	End
Day 3	

Time	Topics
09h 00- 10 h 30	Session 4: Sampling design Discussion
10 h 30 – 11 h 00	Coffee break
11 h 00 – 12 h 30	Session 5: Measuring losses through experimental design/fields trials Discussion
12 h 30 – 14 h 00	Lunch break
14 h 00 – 15 h 30	Session 6: Measuring losses through modelling Discussion
15 h 30 – 16 h 00	Coffee break
16 h 00 – 16h 45	Discussion on the outcomes of the day
16h 45	End
Day 4	
09h 00- 10 h 30	- Presentation of examples of PHL questionnaires - Discussion
10 h 30 – 11 h 00	Coffee break
11 h 00 – 12 h 30	- Presentation of examples of PHL questionnaires - Discussion
12 h 30 – 14 h 00	Lunch break
14 h 00 – 15 h 30	Summary of the workshop and conclusions Evaluation
15 h 30 – 16 h 00	Coffee break and end