

# Harvest and Post-Harvest Losses module (HPhL-AG): A Guide to Integration into the 50x2030 Survey System

## Introduction

Harvest and post-harvest losses<sup>1</sup> can be incurred at multiple stages of the value chain, from crop maturity, harvesting and threshing to storage, transportation, marketing, processing and consumption. The wide array of causes for post-harvest losses, the various stakeholders that may be affected by the losses at each stage, the different timing at which losses may occur, the variety of agro-ecologies and management practices render post-harvest losses extremely difficult to measure accurately. Yet, in order to assess the available food supply, for example, post-harvest loss measures are essential, as are the mechanisms through which losses occur and for whom the impact may be greatest. The globally recognized importance of these losses is reflected in SDG 12.3 which aims “to halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses”.

The Harvest and Post-Harvest Losses (HPhL-AG) rotating tool collects data on food losses occurring at the harvest, post-harvest and processing stages at the farm level for grains (cereals and pulses), fruits and vegetables as well as roots and tubers. Losses will be collected from the harvest up to the point where the produce leaves the farm<sup>2</sup>. Pre-harvest losses will not be explicitly assessed, including the losses of mature produce left unharvested in the field. Losses for livestock and fishery products will not be covered by the HPhL-AG tool, at least in its initial version.

The HPhL-AG tool provides essential information for the computation of SDG 12.3.1 Global Food Loss Index, whose custodian agency is FAO. As the Target 12.3 has two components, Losses and Waste, the HPhL-AG tool focuses on the Food Loss Index.

The HPhL-AG rotating module is an optional specialized survey instrument that can be added and integrated, depending on the country needs and demand, to the other 50x2030 survey instruments. The *50x2030 Initiative to Close the Agricultural Data Gap* aims at empowering and supporting fifty low and lower-middle income countries to build strong national data systems that produce and use high-quality and timely agricultural data through survey programs. To close the agricultural data gap, the 50x2030 Initiative supports a flexible survey system, which builds on the experience of the FAO’s Agricultural

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<sup>1</sup> In the rest of the document, for conciseness, the term post-harvest losses will refer to harvest and post-harvest losses, unless stated otherwise.

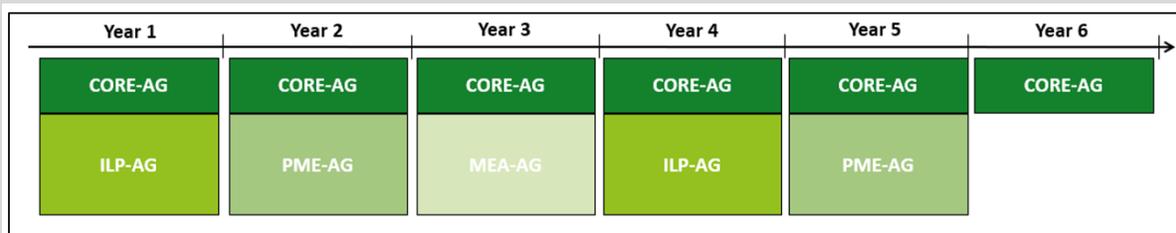
<sup>2</sup> For a comprehensive explanation of the main concepts related to food losses, see GSARS (2018a).

Integrated Surveys (AGRIS) and the World Bank’s Living Standards Measurement Study - Integrated Surveys on Agriculture (LSMS-ISA) programs. See Box 1 for a description of the 50\*2030 Survey System.

### BOX 1. The 50x2030 Survey System

**The 50x2030 Survey System** is a modular survey system with an annual core survey tool focused on crop, livestock, aquaculture, fishery, and forestry production (‘CORE-AG’), and a set of specialized tools covering such topics as farm income, labor and productivity (‘ILP-AG’); non-farm income and households living standards (‘ILS-HH’); production practices and environmental aspects of farming (‘PME-AG’) and machinery, equipment and assets (‘MEA-AG’). These specialized tools are administered at lower frequencies and are integrated seamlessly with the CORE-AG tool. Therefore, agricultural production is captured in the same way annually, with different extensions added every year.

*Schema of the 50x2030 Survey System*



Two optional expansions of the ILP-AG tool are the tool on the measurement of agricultural inputs (a more disaggregated, in-depth set of sections for agricultural inputs, i.e. crop and livestock labor; fertilizers, chemicals), and the crop-cutting tool to complement farmer-reported harvest estimates. These two extensions are designed to improve data quality and its analytical value. The HPHL-AG tool is intended in the same way.

While the CORE-AG instrument includes just two questions about the quantity and causes of losses occurred in the post-harvest period (see CORE-AG – PH, modules 1B and 2B, questions 11 and 12), the HPHL-AG aims at collecting detailed information on losses and is proposed as an optional questionnaire to obtain a more accurate assessment of the harvest and post-harvest losses.

The main objective of the HPHL-AG questionnaire is to assess the quantity of on-farm losses occurring at different stages and for different activities. In particular, information about losses occurred during harvesting, post-harvest processes, transport and storage at farm level are collected. The type of post-harvest activities depends on the crop. For grains, they typically include: threshing/shelling, cleaning/winnowing and drying. For roots, tubers, fruits and vegetables, other post-harvest processes apply and are reflected in the questionnaires, such as peeling, washing, slicing, etc. For all products, losses during storage and on-farm transport will be assessed. The HPHL-AG questionnaire also captures the causes of losses, and it allows to relate the losses to the agricultural practices used by the farmers for each operation. For example, the questionnaire asks about the type of storage facility used, as this may affect the amount lost during this stage.

### BOX 2. SDG 12.3

SDG 12.3 sets the target to: "By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses." The questionnaire on harvest and post-harvest losses to be included in the 50x2030 survey instruments will address part of the data needs required for the SDG Sub-Indicator 12.3.1.a - Food Loss Index, of which FAO is the custodian agency. The Food Loss Index (FLI) focuses on food losses that occur from production up to (and not including) the retail level. It measures the changes in percentage losses for a basket of 10 main commodities by country in comparison with a base period. The Sub-Indicator 12.3.1.b - Food Waste Index is complementary to the FLI, as it covers the remaining segments of the food chain, i.e. the losses occurring at the retail and final consumption stages. The UN Environment Program is the custodian agency for the Food Waste Index.

The data on the quantities lost gathered through the harvest and post-harvest losses questionnaires provides part of the information required to compute the FLI index, as the latter also covers off-farm stages, such as processing, transportation and wholesale markets, which are not covered in the HPHL-AG questionnaire. Complementary data sources, not necessarily survey-based, and possibly imputation models will be required to compute or estimate the missing information for the off-farm segments. The data required to compute the weights of the index – the value of production of the individual commodities – are collected in the CORE-AG – PH module. The measurement approach (physical measures and/or declarative) does not affect the nature of the data collected (quantities lost and handled at each stage), but its quality and reliability.

Collecting reliable data about on-farm losses is challenging, as farmers are asked to report losses that occurred sometimes many months in the past. This complexity is compounded when the assessments cover several commodities, a requirement to compute the 12.3.1 index. The latter requires loss estimates for 2 commodities within each of the 5 main commodity groups. For the HPHL-AG tool, this means that at least 6 commodities need to be covered, 2 for each of the 3 groups (i.e., cereals and pulses, vegetables and fruits, roots and tubers). The extent to which the set of questionnaires of the 50x2030 initiative addresses the data requirements of the FLI index is presented in **Error! Reference source not found.**

TABLE 1. DATA REQUIREMENTS OF THE FOOD LOSS INDEX AND THEIR CONNECTION TO THE 50x2030 QUESTIONNAIRES

Data item	50x2030 Questionnaire	Comments
Quantities produced by commodities	CORE-AG – PH Questionnaire (sections 1A and 2A)	
Selling prices by commodities	CORE-AG – PH Questionnaire (sections 1B and 2B)	Indirectly obtained by dividing receipts from sales and sold quantities.
Post-harvest losses	CORE-AG – PH Questionnaire (sections 1B and 2B)	This variable could be used if the country does not wish to implement the HPHL questionnaire.
Quantities lost during harvest and post-harvest operations (for each operation), excluding storage	HPHL Questionnaire (sections 1A, 1B, 2A and 2B)	Different modules according to the commodity (grains and the other crops) and the assessment approach (declarations and physical measurements). The FLI excludes harvest losses.

Quantities lost during storage	HPHL Questionnaire (sections 3A, 3B, 4A and 4B)	Different questionnaires according to the commodity (grains and the other crops) and the assessment approach (declarations and physical measurements).
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Recognizing that the full HPHL is quite long and complex to be administered, and that different countries have different priorities in terms of what they need to measure, monitor, and analyze and may face different implementation constraints, In Table 1 bis the questions required for the computation of the 12.3.1 index only are reported as deemed as essential questions. The practical example of cereals is given, assuming an assessment approach based on farmer declarations only.

As for roots, tubers, fruits and vegetables, the inclusion of crop-specific post-harvest processes (such as peeling, washing, slicing) related questions should be reflected in the selection of the required variables. Harvest and post-harvest losses questions are included in the HPHL questionnaire, while the required information on harvested quantities and selling prices by commodities are elicited in the CORE-AG PH questionnaire.

**TABLE 2 BIS. MAPPING OF THE PH QUESTIONNAIRES WITH THE DATA REQUIREMENTS OF THE FOOD LOSS INDEX – THE EXAMPLE OF CEREALS**

Data item	Specific item	Questionnaire module	Questions/ Variables
Quantities produced by commodities	Quantity harvested during the reference agricultural year	CORE-AG – PH Questionnaire (section 1A)	Question 9
Selling prices by commodities	Selling or farm-gate prices by commodities	CORE-AG – PH Questionnaire (section 1B)	Questions 3, 4b and 4c
Harvest losses	Quantities lost during harvest	HPHL Questionnaire 2Ai HPHL Declarative	Question 3
	Quantities lost during threshing	HPHL Questionnaire 2Ai HPHL Declarative	Question 10
Quantities lost during post-harvest operations (for each operation), excluding storage	Quantities lost during cleaning	HPHL Questionnaire 2Ai HPHL Declarative	Question 20
	Quantities lost during drying	HPHL Questionnaire 2Ai HPHL Declarative	Question 25
	Quantities lost during on-farm transport	HPHL Questionnaire 2Ai HPHL Declarative	Question 29
Quantities lost during storage	Quantities lost since the last harvest	HPHL Questionnaire 2Ai HPHL Declarative	Question 6

In order to get more reliable data about on-farm harvest and post-harvest losses, the full HPHL-AG tool combines declarative and physically measured data for the operations occurring at the farm level in traditional farming systems. Field tests show that the difference between physical and declarative

measurements is higher for harvesting and storage losses than for other operations<sup>3</sup>. In addition, physical measurement for threshing, cleaning and drying operations is particularly complex and lengthy in terms of fieldwork, and may be prone to measurement errors. For these reasons, the HPHL-AG tool collects losses through physical measurement only for harvesting and storage, while the declarative assessment is asked for all the on-farm operations. Physical measurement of post-harvest losses builds on the methodology put forth by the Global Strategy to Improve Agricultural and Rural Statistics (2018a). As there is little evidence and experience about the practices for the physical measurement of losses for roots and tubers, the HPHL-AG tool includes a physical measurement component only for grains and fruits and vegetables.

As the physical assessment of harvest losses is based on the crop-cutting subplot selection, it is recommended to be fielded together with the crop-cutting questionnaire, when adopted<sup>4</sup> (see Box 1). For the 50x2030 Initiative, crop-cutting is proposed as an optional method to obtain a more accurate measure of the production of a country's main crops. Similarly, the adoption of the physical measurement sections of the HPHL-AG tool is recommended when a more accurate measure of losses is required for statistical or research purposes.

Physical measurements of losses on the farm are prone to high non-sampling errors, due to their complexity and length. To minimize these errors, these assessments should be conducted by experienced field staff, carefully trained and supervised. The adoption of the physical measurement sections may not be feasible at scale given the high costs of enumerators training, fieldwork and supervision<sup>5</sup>. Rather, these sections may be administered to a subsample of households and/or plots and results then extrapolated to the entire population, to allow for high-quality post-harvest loss data at scale with minimal implementation burden.

As aggregate HPHL parameters (for example, national averages), such as loss percentages by commodity and operation, are relatively stable from year to year, it is not recommended to carry out the HPHL-AG module every year. A frequency of every three or four years could be sufficient. However, to establish a good baseline, a first series of measurements over 3 consecutive years is recommended. If fieldwork implementation of the HPHL module is not feasible for 3 consecutive years because of technical and financial constraints, at least two consecutive measurements should be considered to establish a reliable baseline.

Finally, regarding international demand, SDG 12.3.1 on Global Food Loss Index is expected at country level and subnational domain estimations are therefore not particularly required. For this reason, to limit operational costs and respondents' burden, data on harvest and post-harvest losses can be collected on a subsample of farms<sup>6</sup>. If there is an interest at country level to produce more disaggregated results, for example by farm types or regions, the sampling strategy and survey design will need to be adjusted accordingly.

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<sup>3</sup> See GSARS (2017, 2018b, 2018c, 2018d) and FAO, ICAR and INEGI (2019) for loss assessment results and comparisons between declarative and physical methods.

<sup>4</sup> The approach for measuring losses for fruit trees is slightly different but follows the same experimental logic: it consists of selecting a small sample of trees within a parcel. This approach is also used to assess yields.

<sup>5</sup> Procedures and protocols are explained and discussed in GSARS (2018a).

<sup>6</sup> See 50x30 Initiative (2020b) for a discussion on sampling and subsampling approaches.

## HPHL-AG integration into the 50\*2030 modular survey system

The full HPHL-AG tool, comprising both physical and declarative measurement tools, is implemented over multiple visits, as losses may occur over different stages of the on-farm crop processes. Table 2 gives the overview of the content and level of analysis of the modules included in the full HPHL-AG tool.

TABLE 2. OVERVIEW OF HPHL-AG QUESTIONNAIRE MODULES

Questionnaire Topics and sections	Level of Data Collection
0 Interview Cover	Holding
1A HPHL Physical Measurement – Grains	Parcel-Plot-Crop
1B HPHL Physical Measurement - Fruits&Veg	Parcel-Plot-Crop
2Ai HPHL Declarative 1 – Grains and Roots&Tubers	Parcel-Plot-Crop
2Aii HPHL Declarative 2 – Grains and Roots&Tubers	Crop
2Bi HPHL Declarative 1 – Fruits&Veg	Parcel-Plot-Crop
2Bii HPHL Declarative 2 – Fruits&Veg	Crop
3A HPHL Physical Measurement, Storage – Grains	Crop
3B HPHL Physical Measurement, Storage - Fruits&Veg	Crop
4A HPHL Declarative Storage – Grains and Roots&Tubers	Crop
4B HPHL Declarative Storage - Fruits&Veg	Crop
5 HPHL Prevention	Crop

Figure 1A shows an overview of the full HPHL-AG (both physical and declarative measurements) tool implementation over the 50\*2030 modular survey system. The case of one season and two visits (post-planting and post-harvest) per year is taken as reference. In addition to the post-planting and post-harvest visits, a visit for crop-cutting harvest measurement (CC visit 2) is foreseen to occur when the crop is mature (in addition to a visit for crop-cutting subplot selection – CC visit 1 – to be fielded together with the post-planting visit (Core AG PP)), but the harvest of the plot has not started yet (i.e. before the post-harvest visit).<sup>7</sup>

Modules **HPHL 1A** and **HPHL 1B** on physical measurement of losses for harvesting are fielded together with the crop cutting harvest questionnaire (CC visit 2), as the crop-cutting subplot selection is necessary to implement the HPHL 1 module. Modules **HPHL 2Ai**, **2Aii**, **2Bi** and **2Bii** (declarative losses assessment for harvesting, threshing, cleaning and drying) are fielded together with the post-harvest Core AG questionnaire.

Assessing storage losses through physical measurement (modules **HPHL 3A** and **3B** for grains and fruits and vegetables, respectively) requires two visits spreading over a period of 3 to 9 months. The first visit should be fielded soon after the harvested crops are stored, i.e. together with the post-harvest Core AG questionnaire. The second visit should take place at the same time as the post-planting Core AG

<sup>7</sup> This scenario explains the principles guiding the adaptation process, so that it can easily be applied to other scenarios not explicitly discussed here.

questionnaire for Season 1 – Year 2, ideally after 3 to 9 months after the previous visit (for fruits and vegetables, the second visit could take place earlier, as storage durations are lower).

Together with the second visit for the physical measurement of storage losses, modules **HPHL 4A, 4B** and **HPHL 5** can be fielded, the first one dealing with the declarative assessment of losses at storage level, the second one dealing with the actions adopted by the farmer in order to prevent post-harvest losses. The questions on withdrawals from stocks, which provide useful information to validate the stock estimates through physical measurements or declarations, can be easily integrated within in the Core-AG Questionnaire sections 1B and 2B, which focus on the destination of production.

**FIGURE 1A. TWO VISITS PER AGRICULTURAL SEASON - PHYSICAL AND DECLARATIVE MEASUREMENTS**

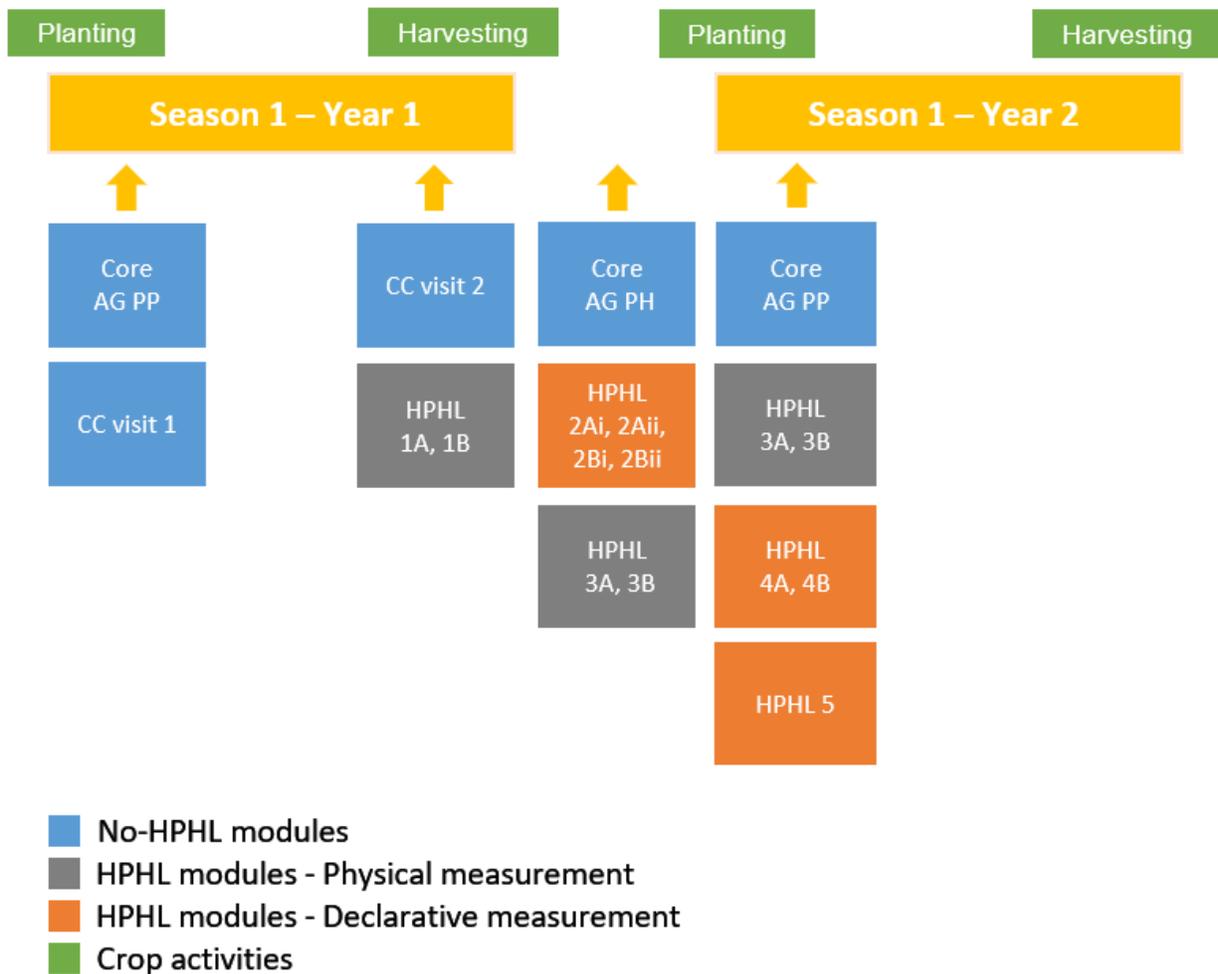


FIGURE 2B. TWO VISITS PER AGRICULTURAL SEASON - DECLARATIVE MEASUREMENTS

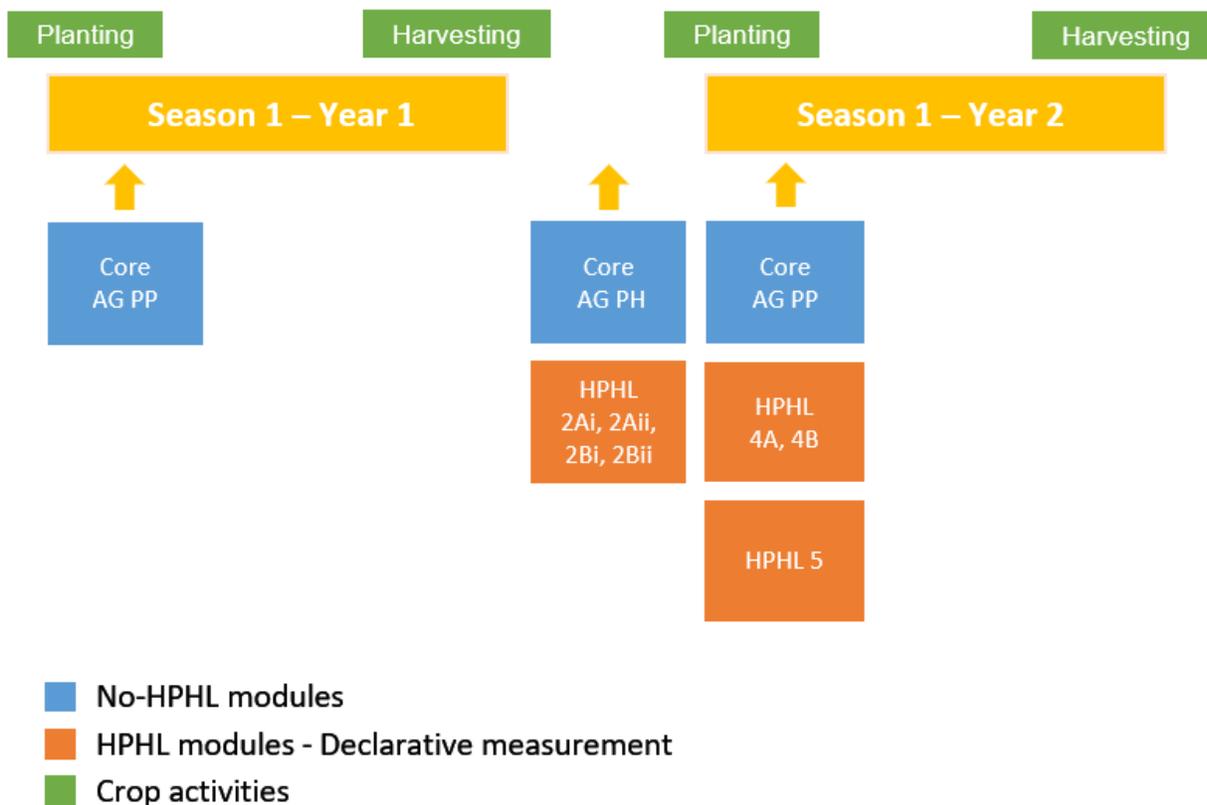


Figure 1B shows the case when only the declarative modules are fielded to capture harvest and post-harvest losses. In the case of a two visits scenario per year/agricultural season (Post-Planting and Post-Harvest), modules **HPHL 2Ai, 2Aii, 2Bi** and **2Bii** (declarative losses assessment for harvesting, threshing, cleaning and drying) are fielded together with the post-harvest Core AG questionnaire, while modules **HPHL 4A, 4B** and **HPHL 5**, measuring farmers’ assessment of losses at the storage level, as well as actions adopted by the farmer in order to prevent post-harvest losses, are fielded together with the post-planting Core AG questionnaire for Season 1 – Year 2. The declarative measurement modules (**HPHL 2Ai, 2Aii, 2Bi, 2Bii, 4a, 4B** and **5**) allow to capture the same information as the physical measurement modules (**HPHL 1A, 1B, 3A and 3B**) but evidence has shown that farmers’ declarations can suffer from biases which can compromise the accuracy of HPHL estimates. Thus, depending on country need and interest, it is recommended to field the HPHL physical measurement modules, especially if a crop-cutting module for harvest measurement is conducted, so that the implementation burden of the physical assessments can be minimized.

In Appendix the implementation of the HPHL-AG tool in different scenarios is explained.

## Questionnaire modules description

### Section 0 HPHL Interview Cover

The information solicited (or pre-filled) in Section **0 Interview Cover** is country specific. This section aims to ensure that the enumerator approaches the household explaining the purpose of the survey and how it will be conducted.

### Section 1A HPHL Physical Measurement – Grains

This optional module allows the physical measurement of harvesting losses for grains. This module is to be added up to the crop-cutting questionnaire, as it will be implemented for the selected crop-cutting subplots.

The physical measurements must reflect as closely as possible the actual practices of the farmer, as the module intends to measure the losses effectively occurring on the field and not theoretical losses.

A succinct description of the measurement techniques for measuring harvesting losses for grains is provided below<sup>8</sup>: 1) on the selected crop-cutting plot(s)<sup>9</sup>, before the harvest, the enumerator will pick-up from the ground the ears or cobs fallen on the ground that the farmer would typically not include in its harvest (e.g. damaged or rotten produce). These can be considered as pre-harvest losses and should therefore be excluded from the assessment; 2) the crop-cutting plot will be harvested, and the harvested quantity will be weighed. This quantity corresponds to the yield of the crop-cutting plot; 3) the enumerators will pick-up the produce remaining on the ground or standing plants and weight it: this corresponds to the quantities lost during the harvesting of the sub-plot.

### Section 1B HPHL Physical Measurement - Vegetables and Fruits (included permanent crops)

For fruits and vegetables, the physical measurements follow the same logic than for grains. Sub-plots for crop-cutting experiments may be smaller for vegetables and certain fruits that tend to be grown on smaller parcels<sup>10</sup> (e.g. lettuce, broccoli, strawberries, etc.). The measurement of yields and harvest losses for fruit trees are usually based on a random selection of trees in parcels rather than on a sub-plot.

### Section 2Ai HPHL Declarative 1 – Grains and Roots&Tubers

In this section farmers are asked to report losses occurred during harvest, as well as the main causes of losses for grains and roots and tubers. As the plot characteristics may affect losses during harvest (e.g. topography, drainage, etc.), this module is at parcel/plot/crop level. Parcels, plots and crops pre-filled in this module are taken from the module **3 Crop Roster** in the CORE-AG PP questionnaire.

### Section 2Aii HPHL Declarative 2 – Grains and Roots&Tubers

This section collects farmers' subjective assessment of losses for the following operations occurred at the farm level: threshing/shelling, cleaning/winnowing and drying and transport. The methods adopted for each of the mentioned activities, as well as the causes of losses, are also asked. This information allows to relate the level of losses with the techniques adopted by the farmers to process the crops.

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<sup>8</sup> Details on the measurement techniques can be found in GSARS (2018a).

<sup>9</sup> Procedures and protocols are explained and discussed in FAO (2018). Possible reasons of inaccurate crop cutting measures are discussed in Gourlay et al. (2019).

<sup>10</sup> The term *parcel* is used to define a piece of land of one tenure type entirely surrounded by other land, water, roads, forests of a different tenure type that may or may not be used or owned by the same household. Different terms like field or garden can be used for the same concept, depending on the context where the survey is fielded.

#### Section 2Bi HPHL Declarative 1 – Fruits and Vegetables

This module collects the same information as section **2Ai HPHL Declarative 1 – Grains and Roots&Tubers**, though is specific for fruits and vegetables losses.

#### Section 2Bii HPHL Declarative 2 – Fruits and Vegetables

This module collects the same information as section **2Aii HPHL Declarative 2 – Grains and Roots&Tubers**, though is specific for fruits and vegetables losses.

#### Section 3A HPHL Physical Measurement Storage – Grains

This optional module allows the physical measurement of storage losses for the grain crops stored by the farmers. This module should be fielded twice: the first time soon after the harvested crops are stored, the second one ideally 3 to 9 months after the previous visit. The comparison between the two visits provides an estimate of the losses attributable to storage.

The main steps of the measurement of grains losses during storage are the following. They should be repeated for each of the two visits: 1) the amount of produce stored at the time of the visit, as declared by the farmer, is recorded; 2) a sample of produce is taken, generally in two steps: first by randomly selecting a sample of packaging units (bags, boxes, drums, etc.) and second by selecting a sample of grains within these units. If the grain is stored in loose form, the selection is done in one-step; 3) the moisture content in the sample of grains is recorded, damaged and undamaged grains are separated and weighed. Ideally, the analysis of the grain should be done by a specialized laboratory that would also have the skills to identify the main causes of grain damage in each sample (type of insect, fungi, rodent, etc.). The difference in the percentage losses between the two visits provides an estimate of the relative losses during storage. Multiplying this percentage by the quantity of produce stored provides an estimate of the quantities lost during storage.

#### Section 3B HPHL Physical Measurement Storage – Fruits and vegetables

This optional module allows the physical measurement of storage losses for the fruits and vegetables stored by the farmers. The operational strategy and measurement procedures are analogous to those presented for grains in the **Section 3A**.

#### Section 4A PHL Declarative – Storage

This module collects farmers' subjective assessment of losses occurred during storage. The storage type used, as well as the causes of losses, are also asked.

#### Section 4B PHL Declarative – Storage

This module collects farmers' subjective assessment of losses occurred during storage for fruits and vegetables. The storage type used, as well as the causes of losses, are also asked.

#### Section 5 PHL Prevention

This module asks the farmers to report, for each cultivated crop (i.e. grains, roots and tubers and fruits and vegetables), the main actions implemented to prevent harvest and post-harvest losses as well as the main limitation faced in the implementation of these practices.

## References

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## Appendix 1 - HPHL questionnaire integration into the 50\*2030 modular survey system under different scenarios

In Figure 1 the integration of the full HPHL questionnaire (including both physical and declarative modules) into the 50\*2030 modular survey system has been discussed. In this section the integration of the HPHL questionnaire under some of the different scenarios described in Section 5 of 50x30 Initiative (2020a) is discussed.

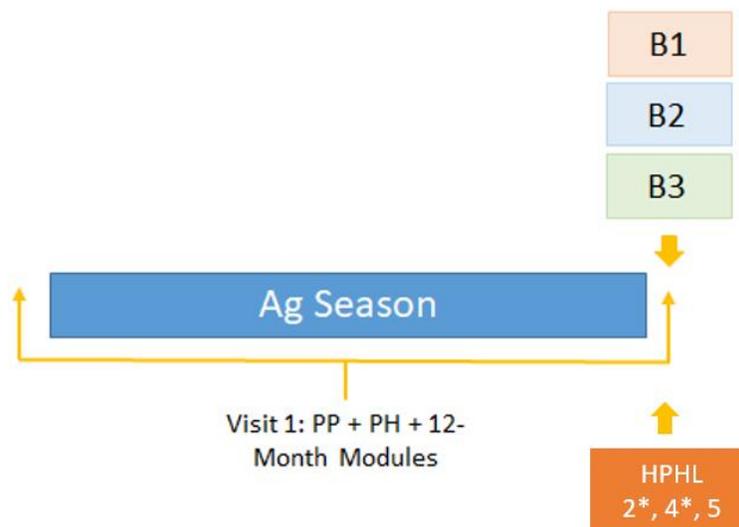
We consider the case in which only the declarative sections of the full HPHL questionnaire are fielded, i.e. modules 2A and 2B (2\*), 4A and 4B (4\*) and 5. The major disadvantage of fielding all these modules at the same time is that these modules refer to activities occurring at different times, implying recall periods with different lengths. In order to get reliable information about losses that occurred during harvesting, threshing, cleaning and drying, modules 2A and 2B should be fielded right after harvesting, while for storage losses, modules 4A and 4B should be fielded about 6 - 8 months after harvesting. If modules 4A and 4B are fielded earlier, there is the risk that farmers report data from the previous season or average figures. If they are fielded later, recall issues may undermine the reliability of farmers' declaration. At the same time, fielding modules 2\* and 4\* in different visits might not be feasible due to fieldwork constraints.

In the Figures A1 and A2, block B1 refers to the seasonal post-planting sections, block B2 to the seasonal post-harvest sections and block B3 to the 12-months section (see Section 5 of 50x30 Initiative (2020a)). Modules HPHL 2\*, 4\* and 5 should be fielded together with block B2 of the CORE-AG module (and block B3 if implemented).

### One-season, one-visit scenario

In the case of a one-season one-visit scenario (Fig A1), the HPHL modules should be fielded together with the other modules, asking about losses for the last (completed) agricultural season.

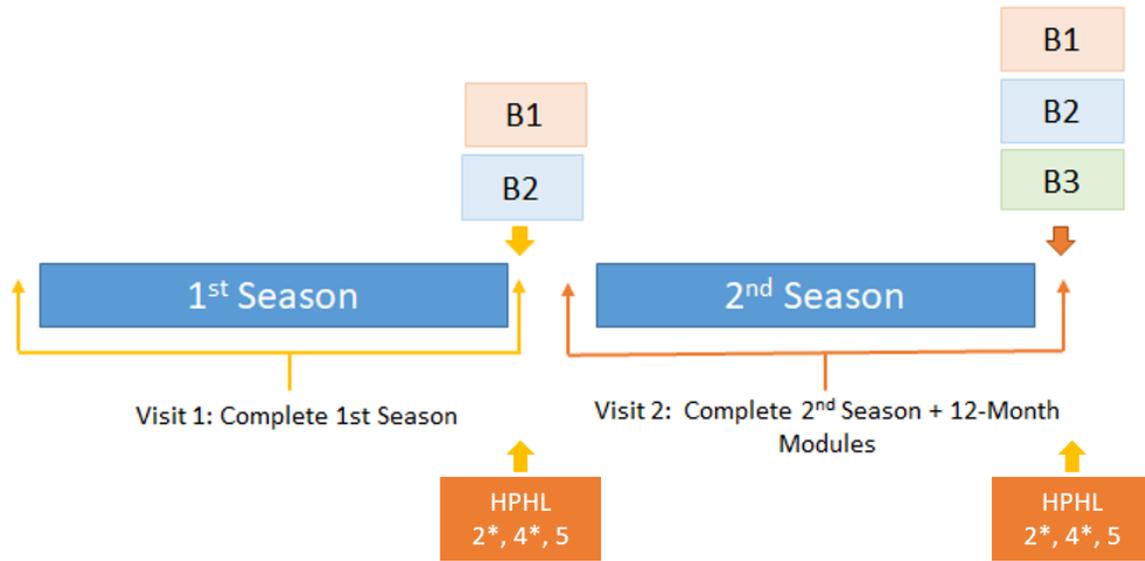
**FIGURE A3. ONE AGRICULTURAL SEASON PER YEAR, ONE VISIT - DECLARATIVE MEASUREMENTS**



Two-seasons, two-visits scenario with two seasons of equal importance

In the Fig A2 scenario, HPHL modules should be administered for each season together with block B2 (and block B3), after the harvest period of each (completed) agricultural season.

**FIGURE A2. TWO AGRICULTURAL SEASONS PER YEAR, ONE VISIT PER AGRICULTURAL SEASON - DECLARATIVE MEASUREMENTS**



## Appendix 2 - Concepts and Definitions

In this section the main concepts used in the field of food loss measurement are defined. All definitions are taken from GSARS, 2018a.

**Food:** Commodities that people normally eat. It includes the wholesome edible material that would normally be consumed by humans. Portions of the crop that are generally considered inedible, such as stalks, hulls and leaves, are not considered food. Crops mainly intended for animal feed are not considered food.

**Grain:** This term is used in these Guidelines in a broad sense and includes cereals and pulses. It also includes cereals on the head, ear or cob, as well as after threshing or shelling, and pulses both shelled and in pod.

**Harvest:** The deliberate act of separating the food material from the site of immediate growth or production, for instance the reaping of cereals, the picking of fruits, the lifting of fish from water, etc.

**Post-harvest:** The period beginning after separation from the site of immediate growth or production and ending when the food reaches its final use. For most PHL studies, as well as for these Guidelines, the end of the chain is reached when the grain or grain product is at a stage when it can be considered ready for final consumption.

**Food loss:** The measurable decrease in the quantity or quality of food produce. It is the result of any reduction in the availability of food or in the edibility, wholesomeness, or quality of food that reduces its value to humans. Food loss is considered as the unintended result of an agricultural process or technical limitation in storage, infrastructure, packaging or marketing. Food losses are often classified as direct or indirect.

**Food waste:** Term referring to food that is fit for human consumption but that is discarded either before or after it spoils. Hence, food waste is the result of negligence or a conscious decision to throw food away.

**Pre-harvest losses:** Losses that occur before the beginning of the harvesting process and that may be due to attacks by insects, mites, rodents, birds, weeds, or diseases afflicting and damaging crops.

**Harvest losses:** These occur during the harvesting process and may be due to shattering, mechanical damage and shedding of the grain from the ears to the ground.

**Post-harvest losses (PHL):** Any losses occurring after the separation of the product from the site of immediate growth (harvest) to the moment it reaches the consumer.

**Post-production losses:** The combination of harvest losses and PHL.