MEASURING FOOD LOSSES

Session 4: Sampling design
Objectives of the presentation

• Provide guidance on the sampling approach to better assess post-harvest loss (PHL)

• Present the different issues related to the sampling strategy
Outline

Introduction

1) Sampling approach at farm-gate level

2) Sampling approach off-farm
Important considerations when designing a survey:

- **Representativity**
- **Extrapolation of the results at national or regional levels and for other domains**

All the units, at any stage of selection, should be chosen using a random procedure.

At farm-gate level:

- **Selection of the holding**
- **Selection of the fields and plots**
- **Identification of the crops, operations and channels**
- **Selection procedures to take grain at the storage**
1 Sampling approach at the farm-gate level
1.1. Sampling approach at farm-gate level: Selection of the holding

Goals: a representative sample of holdings growing the respective crops

Example:

Selection of primary sampling units (PSUs)

- A list of PSUs to be prepared
- A sample of PSUs is prepared with equal probability selection or proportional to size (number of farmers, crop areas etc.)

Selection of second sampling units (SSUs)

- A list of all SSUs in the selected PSUs to be prepared
- A sample of SSUs (such as villages) to be selected randomly from the list

Selection of tertiary sampling units (TSUs):

- Enumeration of each SSU selected
- List of farming households where crops are being grown or identified crops are grown
- Could also stratify farming households into categories
1.2. Sampling approach at the farm-gate level: selection of fields and plots

- A list of all fields of the selected farmers for each crop grown

- One field for a particular crop selected to be selected randomly

- Two plots (for example 5 x 5 m, depending on the crop) to be placed for physical measurement

- A sample of PSUs is prepared with equal probability selection or proportional to size (number of farmers, crop areas etc.)
1.2. Sampling approach at the farm-gate level: selection of fields and plots

**Random placement of a sub-plot in a field**

1) Location of the field, identification and numbering of all its points or vertices

2) Measurement of the length of each side, ideally using an adapted global positioning system or computation of the perimeter, area and half-perimeter of the field

3) Selection of a random number between 1 and the number of sides of the fields. This first random number determines the vertex (point) and side from which the enumerator enters inside the field

4) Selection of a second random number between 1 and the half-perimeter of the field to determine how far, perpendicularly from the side, the enumerator will go into the field. The point reached in the field to be marked with a peg. This is the first point of the sub-plot

5) The sub-plot can then be selected
1.2. Sampling approach at farm-gate level: selection of fields and plots
1.3. Sampling approach at the farm-gate level: identification of the crops, operations and channels

• The first choice to make often concerns the set of commodities to be covered

• Different units can be sampled depending on the activity, operations and points of the supply chain targeted for the assessment

• The choice of activities, operations or points of the supply chain to cover in a sample survey is a function of the objective of the assessment
1.3. Sampling approach at farm-gate level: identification of the crops, operations and channels

<table>
<thead>
<tr>
<th>Activity or channel</th>
<th>Coverage of the activity</th>
<th>Unit Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvesting</td>
<td>Cutting of standing crop</td>
<td>Plots, fields, parcels</td>
</tr>
<tr>
<td>Collection</td>
<td>Stacking, bundling and transportation up to the threshing floor</td>
<td>Stacks, heaps, bundles, etc.</td>
</tr>
<tr>
<td>Threshing</td>
<td>Separation of grain from crop manually or using thresher and collection of straw and grain</td>
<td>Bundles, heaps, stacks, etc.</td>
</tr>
<tr>
<td>Winnowing or cleaning</td>
<td>Collection of threshed material, winnowing to remove chaff, dust, etc.</td>
<td>Bags, specific containers, etc.</td>
</tr>
<tr>
<td>Drying</td>
<td>Collection of material after cleaning, spreading for drying, heaping after drying</td>
<td>Bags, boxes, specific containers, etc.</td>
</tr>
<tr>
<td>Packaging</td>
<td>Collection after winnowing/cleaning/drying/sorting/grading/threshing, filling in bags/baskets/other packaging material</td>
<td>Bags, baskets, packaging material</td>
</tr>
<tr>
<td>Transportation</td>
<td>Loading of packed material in threshing yard, transportation to store of farmer, unloading for storage, transportation from threshing yard to market yard, unloading at market yard</td>
<td>Trucks, bags, boxes, etc.</td>
</tr>
<tr>
<td>Storage at farm level</td>
<td>During storage, cleaning/grading, before sending to market for sale or own consumption</td>
<td>Bags, baskets, boxes, granaries, etc.</td>
</tr>
<tr>
<td>Storage at warehouse</td>
<td>Unloading, during storage, loading for further sale/disposal</td>
<td>Bags, drums, boxes, etc.</td>
</tr>
<tr>
<td>Storage at wholesale level</td>
<td>Unloading, during storage, loading for further sale or disposal</td>
<td>Bags, drums, boxes, etc.</td>
</tr>
<tr>
<td>Storage at retail level</td>
<td>Unloading and loading, during storage, sorting or grading for sale</td>
<td>Bags, drums, boxes, etc.</td>
</tr>
<tr>
<td>Storage at millers or processors level</td>
<td>Unloading material for storage during storage</td>
<td>Bags, drums, boxes, etc.</td>
</tr>
</tbody>
</table>
1.4. Sampling approach at the farm-gate level: selection of grains at storage

• The same sample of farmers (as drawn for data collection at the farm level) is taken for data collection on storage losses

• The grains and cobs should be selected at different places at the storage facility

• If the storage has more than one unit (for examples bags), one, two or three bags (depending on the number of bags) are selected randomly

• For example, if the type of storage is a bag, the selection should be from the top, the middle and the bottom of the bag
Sampling approach off-farm
2.1. Sampling approach off-farm: wholesalers

• The list of wholesale market yards at the PSUs headquarters (capital) is prepared

• One market is selected randomly

• All the wholesalers in the market are enumerated

• A sample of wholesalers for each crop or commodity is randomly selected

• The strategy to select the bags, grains, etc. is the same as the one applied at storage
2.2. Sampling approach off-farm: retailers

- A list of main retail markets at the PSUs headquarter, including fruits and vegetables are prepared.

- One or more (depending on resources available and desired precision level) markets are randomly selected and enumerated.

- A number of retailers are randomly selected in each selected market.

- The strategy to select the bags, grains etc. is the same as the one applied at storage.
2.3. Sampling approach off-farm: milling and processing units

- A list of processing units related to the crops or commodities at the PSUs headquarters, including fruits and vegetables, are prepared.

- Selection is then done.

- In case some of them are not available in the PSUs, units in neighbouring PSUs are taken.
Conclusion

• This presentation covered the main sampling approaches for different types of units

• The definition of the units being observed is very important and should be the first topic to be discussed

• The sample size depends on financial and human resources
Conclusion

Required sample size to achieve a given degree of precision

<table>
<thead>
<tr>
<th>Desired precision</th>
<th>Range of expected weight losses (%) (difference in % between highest and lowest)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>±1%</td>
<td>5 625</td>
</tr>
<tr>
<td>±2%</td>
<td>1 406</td>
</tr>
<tr>
<td>±5%</td>
<td>225</td>
</tr>
<tr>
<td>±10%</td>
<td>57</td>
</tr>
</tbody>
</table>

*Source: Harris and Lindblad, 1978*
References

Thank You