Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS

SDG 12.3.1.a Direct data collection methods

Instruments and methods and their trade-offs

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ESS, Food and Agriculture Organization

TWO-PRONGED APPROACH FOR MONITORING FOOD LOSSES

Indirect methods:

- ❑ Do not produce food loss data but estimate losses by using other available data
- ❑ Supply Utilization Accounts / Food Balance Sheet approach or modelling approach (e.g. Food Loss Estimation Model)

- ➢ Can be used in the short run to have a benchmark estimate
- ➢ Less suited for impact and cross-domain analysis

Direct methods:

- ❑ Produce actual loss data but require more time and resources
- ❑ Data collection on different stages and sectors (agriculture, storage, processing, trade)

- ➢ Relevant for policy making and investment decisions
- ➢ Representative, good quality data that best suited to monitor progress

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SUSTAINABLE DEVELOPMENT GOALS

DIRECT METHODS

COMPONENTS OF A MEASUREMENT STRATEGY

Determining the general approach: **indirect/macro (no data collection) vs. direct/micro**

1. Determining the **data collection instrument** for each critical loss point
2. Determining the **assessment method** for each data collection instrument
3. Design the **questionnaire** to collect the food loss data

Agreeing on the scope and concepts

« LOSSES » : Any commodity that exists the food chain, from the farm up to, and excluding, the retail sector.

- **« MEASUREMENT »** : producing statistically valid estimates of losses at country-level, often from multiple data sources.
- « **DATA COLLECTION APPROACH**»: How the data is gathered, with which instrument, e.g. through surveys, field experiments, case-studies, etc.
- « **ASSESSMENT** APPROACH»: How losses are assessed, e.g. through physical measurements, respondent's opinion, etc.

Chose the data collection instrument for direct measurement

DATA COLLECTION INSTRUMENT

The objective is:

Implement a measurement that produces statistically valid results (representativeness and accuracy) that allow to identify and monitor food losses

Possible data collection instruments:

- Surveys
- Administrative data
- Field experiments/ controlled experiments
- Case studies
- Focal groups

DATA COLLECTION INSTRUMENT

1 Determining the **data collection instrument** for each critical loss point

- What **commodities** are targeted?
- What **segments** of the supply-chain are targeted?
- How **numerous** are the actors of the segment?
- How **heterogeneous** are the actors of the segment?
- How **variable** are losses expected to be across actors?
- What **data collection activities** are already in place?

DATA COLLECTION INSTRUMENT - **SURVEYS**

Surveys

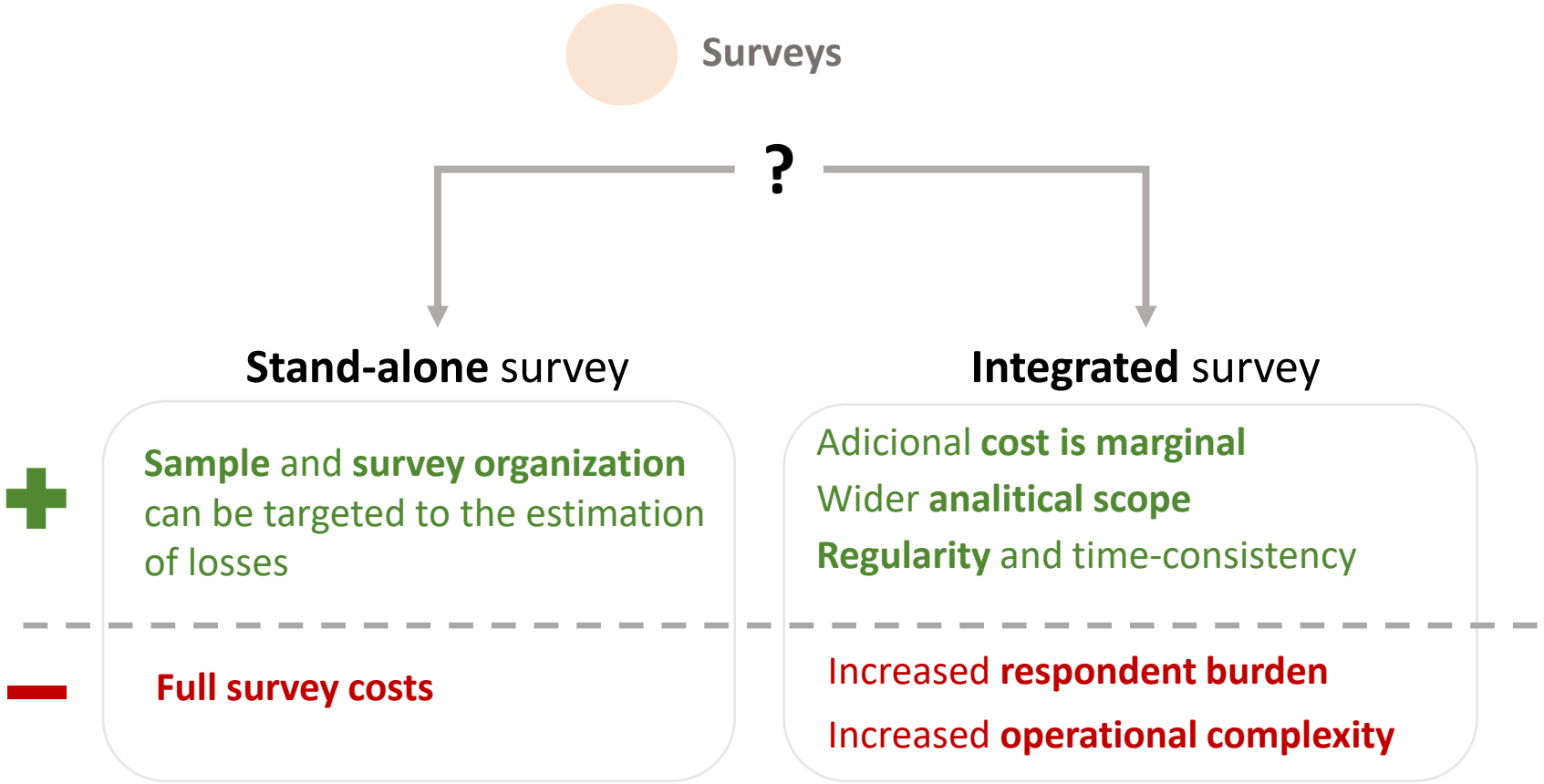
+

- Representativity
- Allows to measure precision
- Integration with other (agricultural) statistics
- Connecting losses with other dimentions
- Time-consistency

−

- Cost
- Requires experience in conducting (agricultural) surveys
- Level of detail generally not very high

DATA COLLECTION INSTRUMENT - **SURVEYS**



DATA COLLECTION INSTRUMENT – **ADMINISTRATIVE DATA**

Administrative data

+

- Cost-effective
- Regularity of data collection
- Certain level of representivity (certain part of the population)

–

- Does not allow the measurement of precision
- Integration with other agricultural statistics
- Probability high that only a certain part of the population is covered

DATA COLLECTION INSTRUMENT - **EXPERIMENTS**

Controlled experiments

+

- Relevance and accuracy
- Allows to measure precision
- High level of detail/granularity
- Limited cost

–

- Representativity
- Theoretical losses ≠ effective losses
- Regularity and time-consistency
- Integration with other agricultural statistics

DATA COLLECTION INSTRUMENT – **CASE-STUDIES**

Case-studies

+

- Quick results
- Allows to reach a relatively high level of granularity/detail
- Limited cost

–

- Representativity
- Does not allow the measurement of precision
- Regularity and time-consistency
- Integration with other agricultural statistics

DATA COLLECTION INSTRUMENT – **FOCUS GROUPS**

Focus groups

+

- Quick results
- Assessment of qualitative aspects which are not well adapted to a standard survey
- Limited cost

–

- Accuracy
- Representativity
- Does not allow the measurement of precision
- Regularity and time-consistency
- Integration with other agricultural statistics

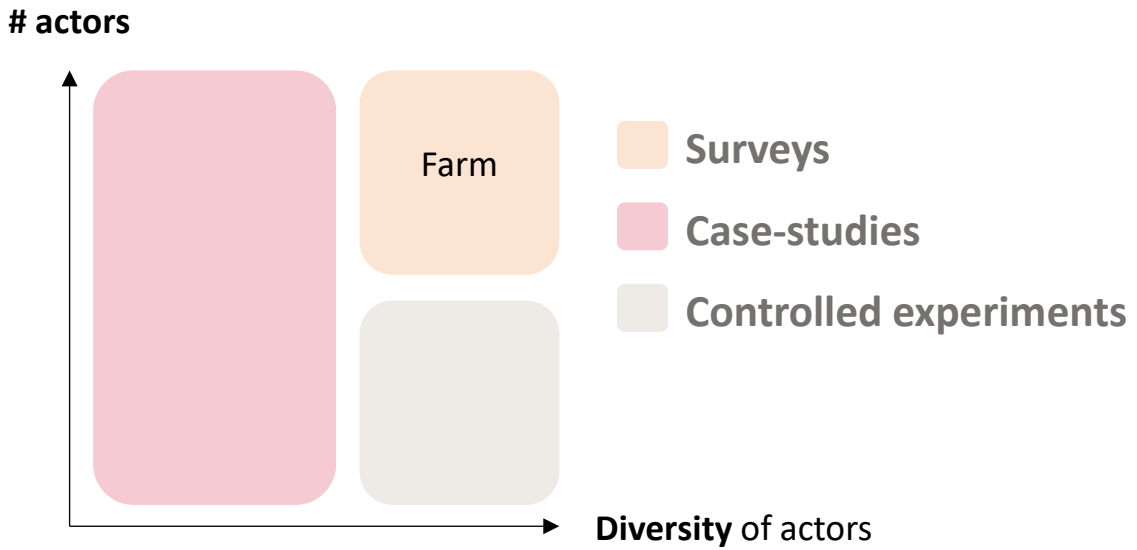
DATA COLLECTION INSTRUMENT – **SUMMARY**

As a general rule...

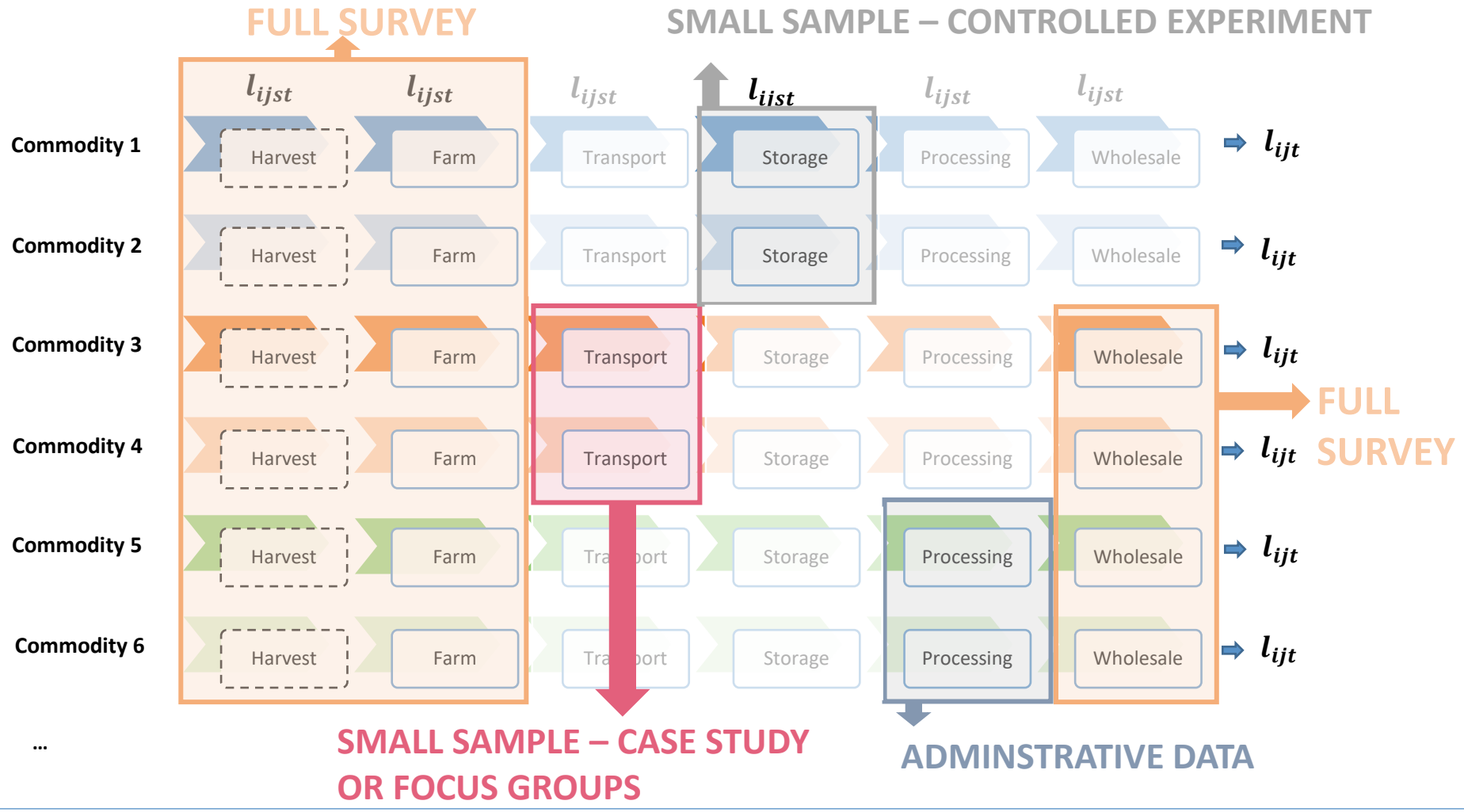
OBJETIVE	INSTRUMENT
Estimating losses at **national scale**	**Surveys** **Administrative data**
In-depth evaluations: causes, production systems, etc.	**Controlled experiments** **Case-studies**
Qualitative dimensions: social aspects, etc.	**Focus-groups** **Case-studies**

DATA COLLECTION INSTRUMENT – **SUMMARY**

In practice, **are surveys always required** to produce nationally-representative loss estimates?



DATA COLLECTION INSTRUMENT – **EXAMPLE**



Find a balance between:

- the **type of instrument** that fits the **stage characteristics**
- The **quality** of the data and **cost** of data collection
- **Surveys are first-best** option, but s**econd-best** instruments can be used to achieve an acceptable quality and **reduce costs**

Choose the loss assessment method for direct measurement

ASSESSMENT METHOD

Once the instrument is defined, the **assessment method** must be determined:

- Physical measurements
- Declarations
- Expert opinion
- Visual scales, other
- Combination of methods

The decision depends on several factors

- The level of **accuracy/precision/detail** targeted
- **Sample size** or # of actors to be covered
- **Budget**
- Experience in **record-keeping**
- **Time** available for the study
- Availability of **experimented personel**/enumerators
- Posibility to collaborate with research institutions

ASSESSMENT METHOD - **DECLARATIONS**

Questionnaires to farmers

Questionnaires to transporters/distributers

Questionnaires to processing plants and storage facilities

Questionnaires to wholesale traders

Mainly used in : **Surveys** and **Case-studies**

ASSESSMENT METHOD – **PHYSICAL MEASUREMENTS**

Harvest losses

Post-harvest losses

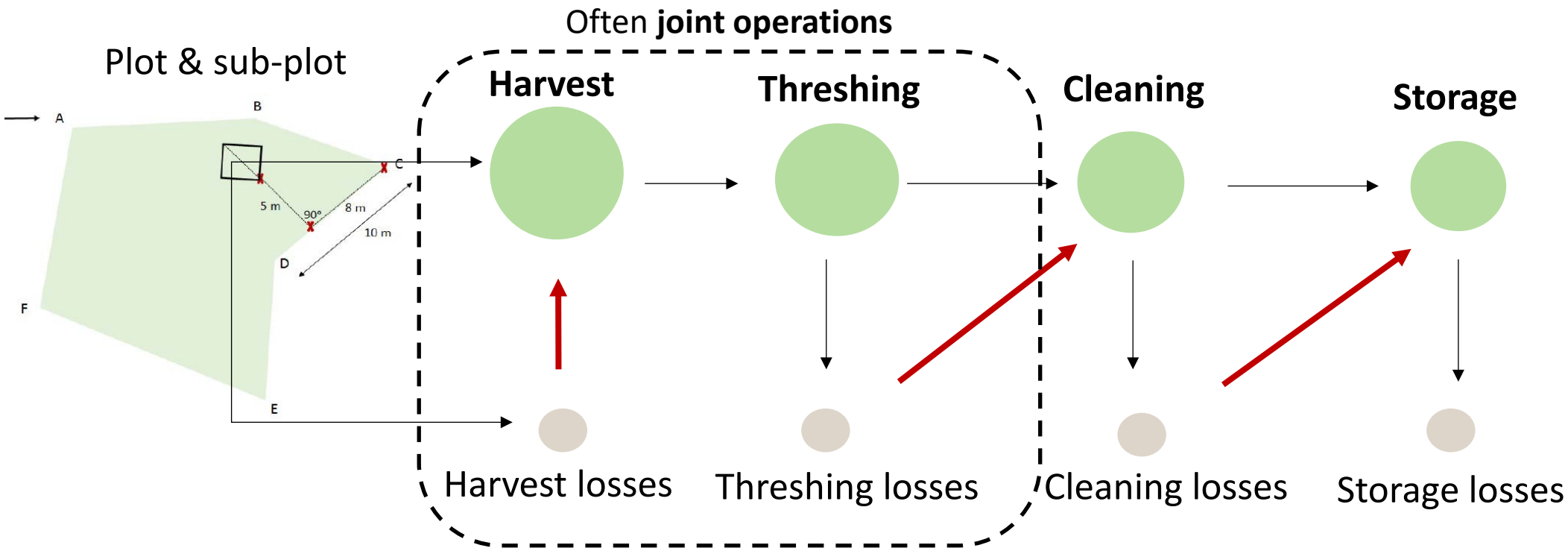
Storage losses

Mainly used in: Controlled experiments

Under certain conditions: Surveys

LOSSES IN **PRIMARY PRODUCTION** – PHYSICAL MEASUREMENTS

A complex **experimental setting**



ASSESSMENT METHOD – **PHYSICAL MEASUREMENT VS. DECLARATIONS**

Is there a **systematic bias**?

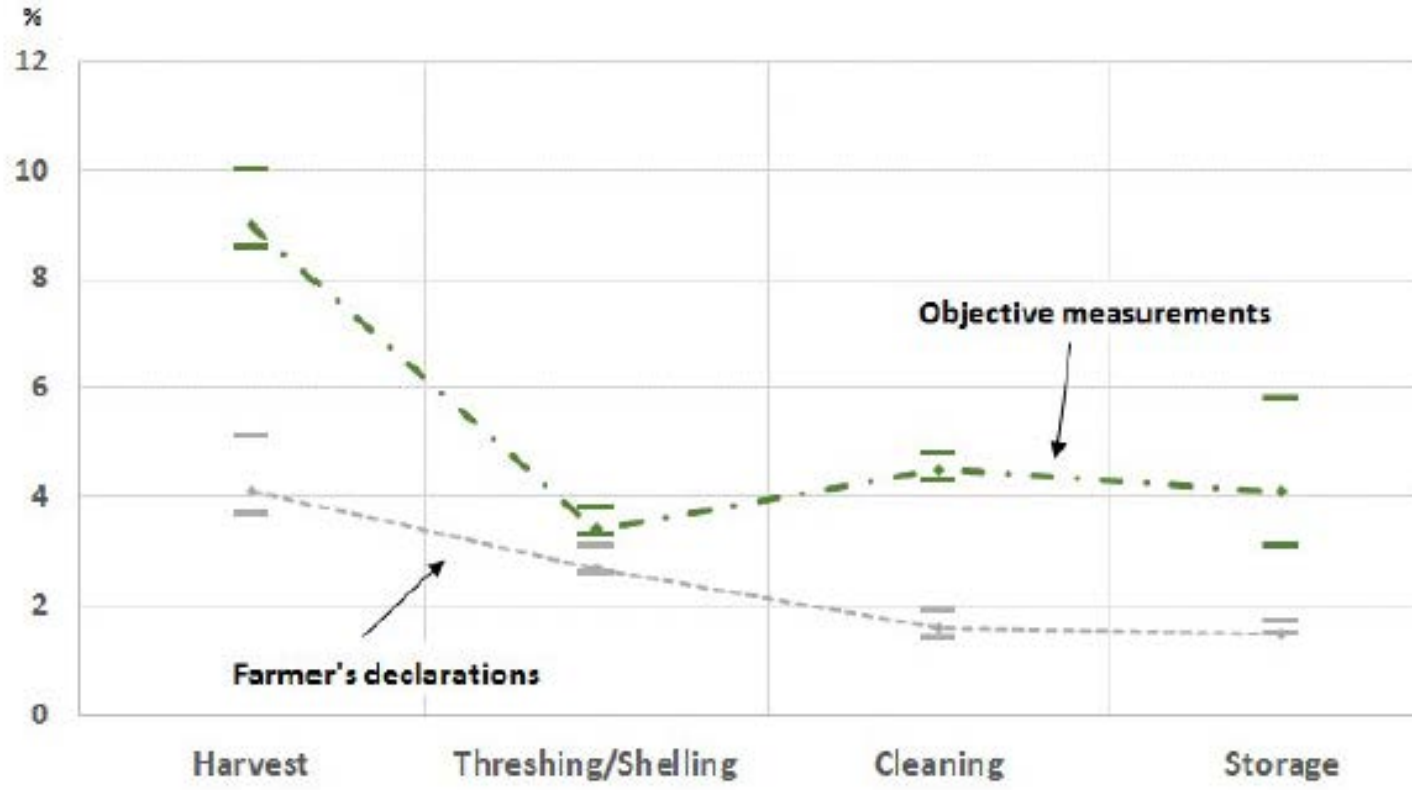


Figure: % maize losses for different on-farm operations in Ghana

Source: field-test, Global Strategy, 2017

ASSESSMENT METHOD – **VISUAL SCALES**

Matches **crop visual condition** with a % loss

13.3% loss

22.6% loss

- Established trough **laboratory experiments**
- **1 visual scale per crop**
- Adapted to situations where crop is **stored for some time**
- **Approximation** of the reality
- **Does not require the presence of the respondent**

Mainly used in: **Controlled experiments** and **Surveys**

ASSESSMENT METHOD – **ON-FARM**

On-farm losses – What type of assessment method?

?

Physical measurements

- If the agricultural survey has a **crop-cutting component**
- If **skilled enumerators** are used
- If a collaboration with a **grain analysis centre/laboratory** is possible

Declarations of farmers

- Should be included in **all assessments**
- **Easy to integrate** in an existing survey

Visual scales

- Can only be used for a few crops
- Adapted to assess **losses during storage**

ASSESSMENT METHOD – **OFF-FARM**

Off-farm losses – What type of assessment method?

?

Declarations

- Should be included in **all assessments**
- **Easy to integrate** in an existing survey
- Quality depends on the **complexity** of the processes and reutilizations (processing) and the volatility (trade)
- **Records can help** to better declare losses

Physical measurements

- Only relevant where **declarations** are **not precise** enough
- Requires enumerators with the **capacity** to conduct the measures
- Possibility to **get access** to the facilities (industry)

Others

- **Use records** (complementing questions)
- **Visual scales** (grain storage)
- **Laboratory analysis** (grain storage)
- **Mass-balance** (commerce)

Some inputs on the sampling strategy on-farm and off-farm

SAMPLING STRATEGY – **GENERAL**

On-farm:

- **Primary production** is a category of its own in the statistical system
- Generally, there are **sampling frames available** at the farm level
- The sample design for the loss data collection on the farm can be based on these (**farm surveys, census, agricultural records**)

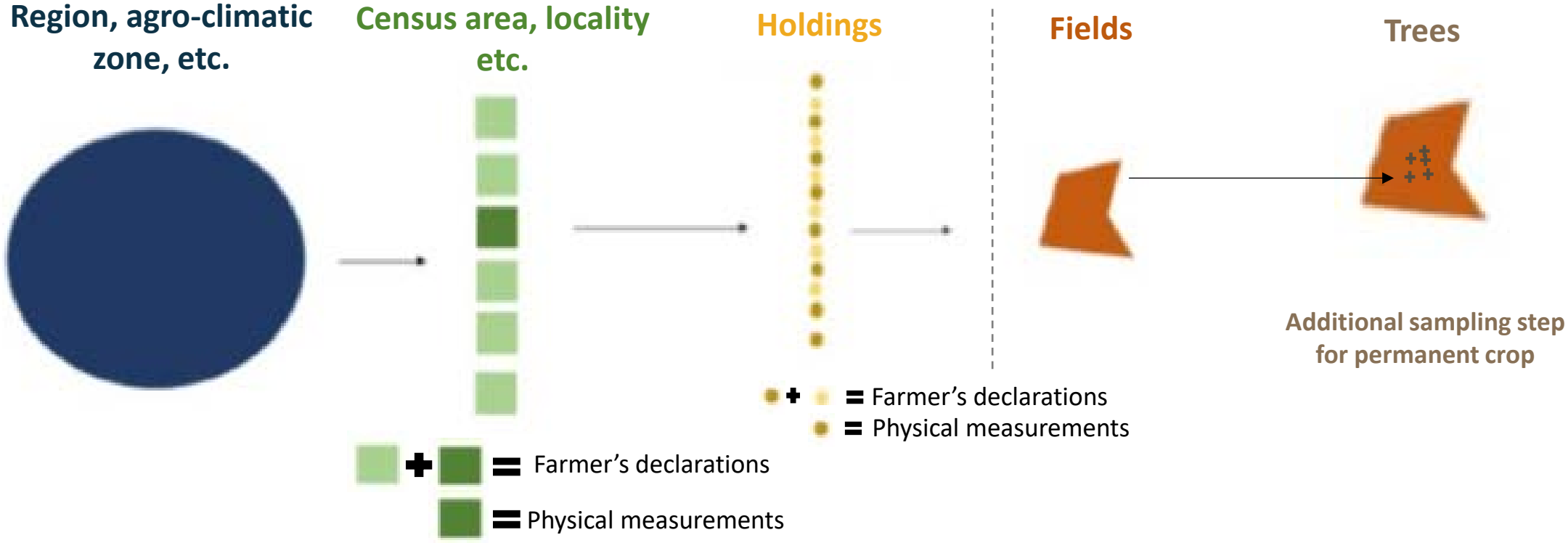
Off-farm

- The food supply stages often **do not have** a proper **sampling frame**
- They are part of the sampling frame and listings of the **manufacture, commerce and service sectors**.
- It is highly probable that a part of the actors along the supply chains **is not registered in any listings** (intermediaries, rural collectors, micro-businesses)

SAMPLING STRATEGY – **ON FARM**

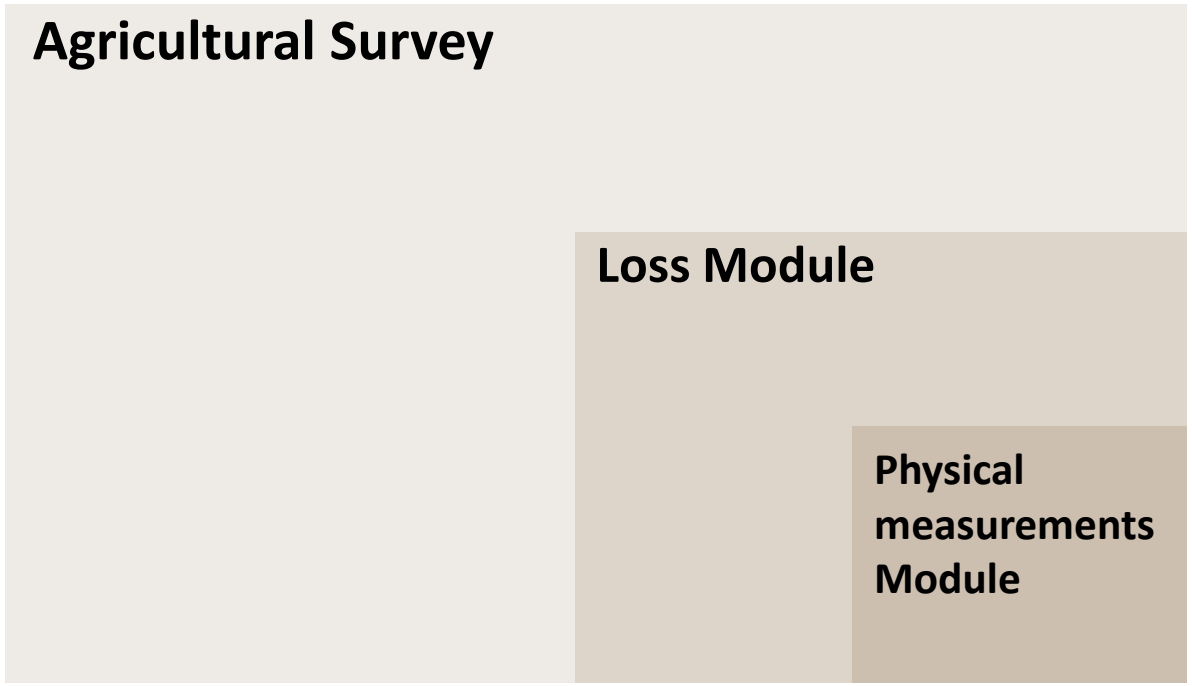
On-farm losses - Sampling strategy

For **harvest losses**



SAMPLING STRATEGY – **ON FARM**

On-farm losses - A possible survey strategy



- Full sample
- Area, production, socio-eco, etc.
- Annual survey

- **Sub-sample** of the Agricultural Survey
- Losses based on **farmer's estimate**
- Each **3-4 years**

- **Sub-sample** of the Loss Modules
- Losses based on **physical measurements** and/or **visual scales**
- Each **3-4 years**

SAMPLING STRATEGY – **OFF FARM**

Challenges of having a sampling frame for the off-farm links:

Make use of economic censuses / business records and listings:

- Possible bias towards large / formalized businesses
- Possible bias towards urban areas,
- Difficulty of segmenting into commodities and stages

Collect the listings of off-farm actors in selected areas

- Additional cost of generating frame / listings
- Limited to measurement areas and possibly not feasible on a national scale
- But it helps to complete listings

Request the listings of each stage and commodity from organizations/ committees /unions:

- Requires a certain level of chain organization, willingness to share information
- Better coverage of the organized sector, possibly excluding the unorganized sector

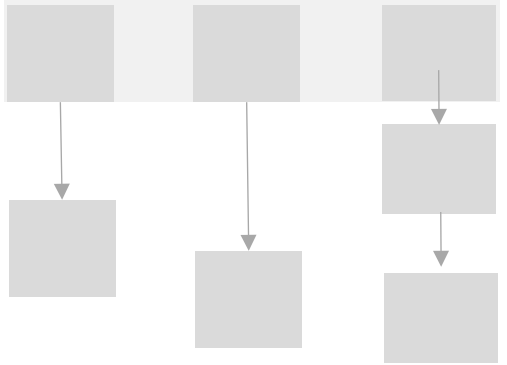
Snowball or Indirect sampling (follow the product down the chain):

- Ask interviewees to identify other entities that are not listed
- Use agricultural sampling frame and follow the product (does not require macro sampling for each link) → depends on the willingness to share data

SAMPLING STRATEGY – **OFF FARM**

Sample design when facing a incomplete or total lack of frames:

Sampling design of economic surveys	Sampling design by threshhold	Sampling design by stage + listing survey	Sampling desing by following the product
Sample of the economic survey Food sector	Build listings (experts, organizations, etc.) and cut when 80% of sector value is reached Expert confirmation	Region 1: Collect listings Region 2: Collect listings	Sub-sample taken from the farm survey
eg Colombia	*eg Costa Rica*	*eg Pilots guidelines*	*eg Mexico*



Some inputs on the questionnaire design (declarations)

QUESTIONNAIRE DESIGN

Minimum information necessary to measure losses:

Volume produced/ handled

Quantity or percentage **of food losses**

Context information to analyze and understand losses:

- Causes of losses
- Activities/operations in which they are observed (eg selection process, or storage)
- Destination of total volume produced/handled (utilizations)
- Destination of losses (waste management)
- Market destinations (different quality criteria)
- General characteristics (size, technology, equipment, etc.)

QUESTIONNAIRE DESIGN

The level of detail of the questionnaire depends on the objectives, resources and the sector:

Single general FL question	• Ask for total losses in all activities/operations
FL questions by **general segments**	• **Farm**: Ask about losses in harvest and post-harvest losses • **Industry:** Loss of input, loss of final product
FL questions **by activity/ operation (food loss module)**	• Inquire about losses at reception/sorting, storage, transportation, processing, etc. separately • Requires the volume handled in each activity

QUESTIONNAIRE DESIGN

Formulation of the food loss question:

Terminology

- The term **losses may not be ideal** - discarded product/ product not used may be more common terms to refer to unused/withdrawn product disposed of.

Conceptualization of food losses in the question

- **Ask directly about losses**: of what you harvested/handled, how much product did you lose/disposed of?
- **Ask for losses as one of the destinations of the harvested production/handled volume**: Out of what you harvested, how much did you sold, use for own consumption, send to animal feed, lose?
- **Ask about the discarded product and its destinations (some of which are losses, others not)**: How much product was discarded → How much of it did go to the following destinations: another industry, animal feed or some waste management

QUESTIONNAIRE DESIGN

Farm questionnaire

Separate losses at **pre-harvest,** during **harvest** and at **post-harvest**

- Producers tend to **include pre-harvest losses** (a clear formulation is needed = use 3 separate questions)
- Estimating losses during **harvest can be difficult** (not observable)

Farmers do not **account for quantity losses**

- Greater focus on **economic losses**
- Or they do not consider losses at all: composting, reincorporated into the field, seen as normal

Harvest procedures

- **On harvested plots**, excluding not harvested plots
- Is observed as produce left on the field
- **How many harvests** do you carry out per year/**how many cuts** or recollections you do per harvest

Post-Harvest procedures

- Mostly, the activities are carried out **close to harvest time**
- **Except storage**: If the survey is carried out during harvest period, the losses in storage are asked about the previous harvest

QUESTIONNAIRE DESIGN

Off-farm questionnaire

Storage facilites

- Product **inputs and outputs** (e.g. average volume/month, or total quantity stored during the reference period)
- **Days** the product is **stored on average**
- "**Natural" weight loss** due to moisture loss not food loss

Rural collectors/ middleman/ wholesalers

- **Origin and destination** of the product are relevant
- **Diversified** destinations (reuse)
- **Temporary operation**
- **Fluctuations** (markets, prices) and losses

Processing industry

- **Focus on primary processing** (cleaning/drying, milling, freezing, cooking, extraction, cuts)
- Differentiate **input losses, final product losses**
- **Reutilization strategies** (flows and processes)

Transport companies/ logistic companies

- **Produce not handed over to destination** during transport or refusals on delivery
- **Damages during transport** are measured at the destination link

QUESTIONNAIRE DESIGN – EXAMPLE OF LOSSES IN FARM SURVEY

Pre-harvest losses		Losses during harvesting	UTILIZATION/DESTINATION OF PRODUCTION (% losses (**P32**) + % own consumption (**P33**) + % sells (**P34**) = 100%					POST HARVEST LOSSES		
			Post-harvest losses	Own consumption			Sells			
What was the unharvested area?	What was the reason for not harvesting this arae?	On the harvested area, ¿how many kg where not harvested and left on the field?	From total production, what percentage got LOST	From total production, what was the percentage used for OWN CONSUMPTION	From total production, what was the percentage used for SEEDS	From total production, what was the percentage used for ANIMAL FEED	From total production, what was the percentage SOLD	What activities do you realice in post-harvest?	In which of these did losses occure?	What was the main cause of the loss
		kg	%	%	%	%	%			

QUESTIONNAIRE DESIGN – EXAMPLE OF FOOD LOSS MODULE OR STAND-ALONE SURVEY

Post-Harvest losses

Post-Harvest losses occur during post-harvest and are not reused

*01. Which of the following **post-harvest operations** did you applied?*

- ❑ *Collection, grading, cleaning*
- ❑ *Storage*
- ❑ *Transportation (to off-farm)*

Collection, grading, cleaning

*02. What was the **total quantity handled** in collection, grading, and cleaning?*

These operations can be conducted directly at the edge of the plot/orchard or on a specific site on-farm. It is likely that the handled quantity in grading is the quantity harvested.

_____ *Tons*

*03. What was the **total quantity of produce removed and disposed** in collection, grading and cleaning without giving the produce any other utilization?*

Please only include produce with no other use (as secondary markets, animal feeding or food industry).

_____ *Tons*

Storage

*07. What was the **total quantity of produce stored** on-farm during the reference period?*

_____ *Tons*

*08. What is the **total quantity of produce discarded during** on-farm storage without any other utilization?*

Please only include produce with no other utilization (food industry, animal feeding, etc).

_____ *Tons*

*09. What **type of storage** is used?*

- ❑ *Open air*
- ❑ *Closed*
- ❑ *Cold storage*
- ❑ *Other (specify)*

Transportation

*10. What was the **total quantity of produce transported** from the farm to off-farm? Please consider own transportation only.*

_____ *Tons*

*11. What was the **total quantity of produce transported but that was not handed over** to the buyer or destination?*

Please only include produce that was not used in any other utilization. Please do not include other damages and losses caused during transportation, these will be registered in the next stage.

_____ *Tons*

QUESTIONNAIRE DESIGN – EXAMPLE OF INDIRECT QUESTION IN INDUSTRY SURVEY

Inputs and final products

Technical conversion factor

PARTS REMOVED

REUTILIZATION

LOSSES

							USE OF DISCARDED PRODUCE in % (should be 100%)				
CPC	Describe the inputs and final products for which you experience losses		Quantity of input recieved/ Quantity of final product produced	State of the input or final product 1) primary product 2) milled 3) frozen	How many kg of final product do you produce with 100 kg of input	Quantity of input or final product removed and discarded	Send to other industrial processing	Send to animal feeding	Send to Co-digestion Anaerobic digester	Composting	Final disposal
XXXX	Input 1										
	Input 2										
	Input 2										
	Input 2										
	Final product 1										
	Final product 2										

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Thank you very much!

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