Second Regional Training Course on Sampling Methods for Producing Core Data Items for Agricultural and Rural Statistics

Module 4: Sampling Methods for Horticultural Surveys

Session 4.1: Horticulture Surveys

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IMPROVING AGRICULTURAL STATISTICS Global Strategy

BPS, Statistics Indonesia

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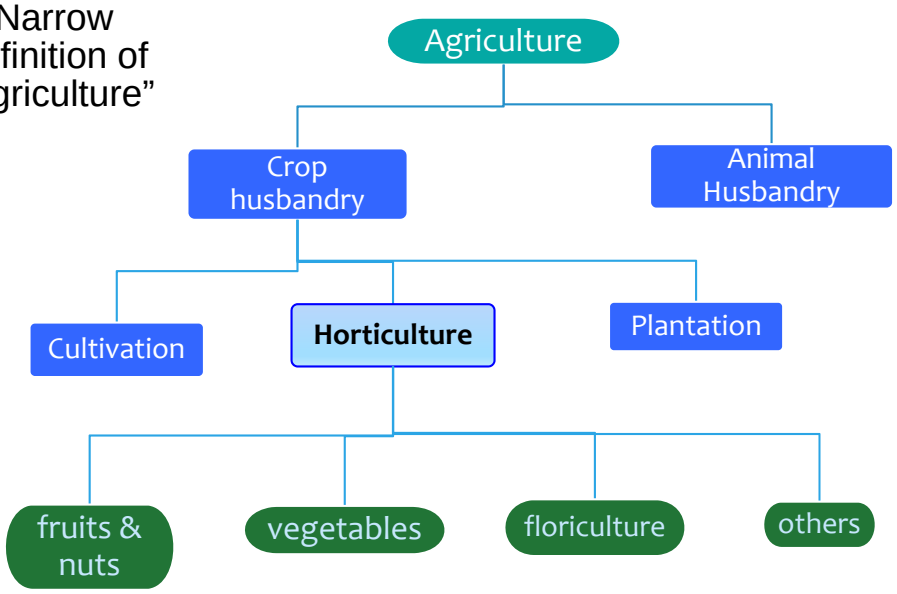
- Basic concepts
- Survey objectives - Variables (output, resource and input)
- Sample Selection and Statistical units
- Estimation of Basic Indicators

Basic Concepts

Basic Concepts

Horticulture in Agricultural Activities

Narrow definition of "Agriculture"



Horticulture

A broad definition of *horticulture* is production of

- fruits,
- vegetables,
- Flowers & ornamental plants and
- Others (medicinal plants, spices etc.)

When, among these, production of some fruits, palm oils, beverages etc. is carried out on a large-scale, in large farms or estates, it is usually called *plantation*.

For our purpose, the discussion in this module will cover both – *horticulture* & *plantation*.

Composition of Horticulture

- In most of the countries of Asia and the Pacific, fruits and vegetables account for a major part of total horticulture production.
- But, there is no official estimates on large number of fruits and vegetables - major data gap in most of the countries.

In this module, we will thus discuss Horticulture Production Surveys for only fruits and vegetables.

Horticulture Surveys

Ideally, horticulture surveys should have two main components:

1. Collection of data through physical observation for output measurement
2. Collection of data on Input and resources through a combination of interview and physical observation.

In many countries, the first is done as a part of general agricultural production survey and the second through Farm Management Studies.

Recommendation: Integration of the two – information on inputs and resources can be collected from a sub-sample of the holdings covered in production survey.

Method of Physical Observation

Timing of enumeration is crucial for production surveys.

* Field work must fit in with the harvesting of the crops.
* May involve more than visit.

Method of estimation may be either based on yield rate of two kinds:

- Quantity of production / area
- Quantity of production / number of trees

A Few Questions

You know the area of a large plot of land. One of the following is planted on it.

- Coconut trees (multiple harvesting in a year)
- Mango trees (single harvesting in a year)
- Egg plant (multiple pickings from single sowing)
- Banana (single harvesting for a sowing)

How will you measure *annual production* of main produce for each of them?

Vegetable production Survey

- Different vegetables are grown during different periods - the total period between sowing to harvesting often less than 80 days.
- Sometime, the harvesting and sowing of vegetables in different fields goes on simultaneously.
- For a given vegetable, its season is the one in which majority of the crop is harvested.
- For some vegetables, multiple pickings are done for a single sowing.

Output Measurement – Two Methods

Output measurement in Horticulture surveys are done in two different methods:

1. Output Measurement of Fruits
2. Output Measurement of Vegetables.

The method of output measurement of vegetables is very similar to CCS discussed earlier.

In this module, we will focus on measurement of fruits output.

Reference Period

Statistical exercises – census and surveys – are carried out for a reference period.

For agricultural surveys, the relevant reference periods are:

* **Agricultural year:** A period of 12 months which is normally different from the calendar year. I

  In South Asia: from 1st July to 30th June.

* **Agricultural Season:** Agricultural year is divided into a few non-overlapping seasons of three / four months duration each.

Crops Classification by Periodicity

* **Seasonal crops:** Crops that are traditionally harvested mainly during a specific season are defined as the seasonal crops of the respective season.

  Example: autumn paddy, pulses, winter wheat, tapioca, etc.

* **Annual crops:** Harvested throughout the year.

  For example, banana, sugarcane, plantain, pineapple and betel leaves are classified as annual crops for horticulture surveys.

* **Perennial crops:** Crops, which are standing for more than one year, are treated as perennial crops. These are permanent crops, which do not have to be replanted after each harvest.

A Question

How does periodicity of a crop matter in planning a survey for measuring its annual production?

- ❑ Defining statistical unit?
- ❑ Framing sample design?
- ❑ Adopting data collection method?

Relating to Pieces of land

* **Holding:** An economic unit under a single management for agricultural production.

  In most of the developing countries, agricultural activities are carried out by individual households operating small holdings.

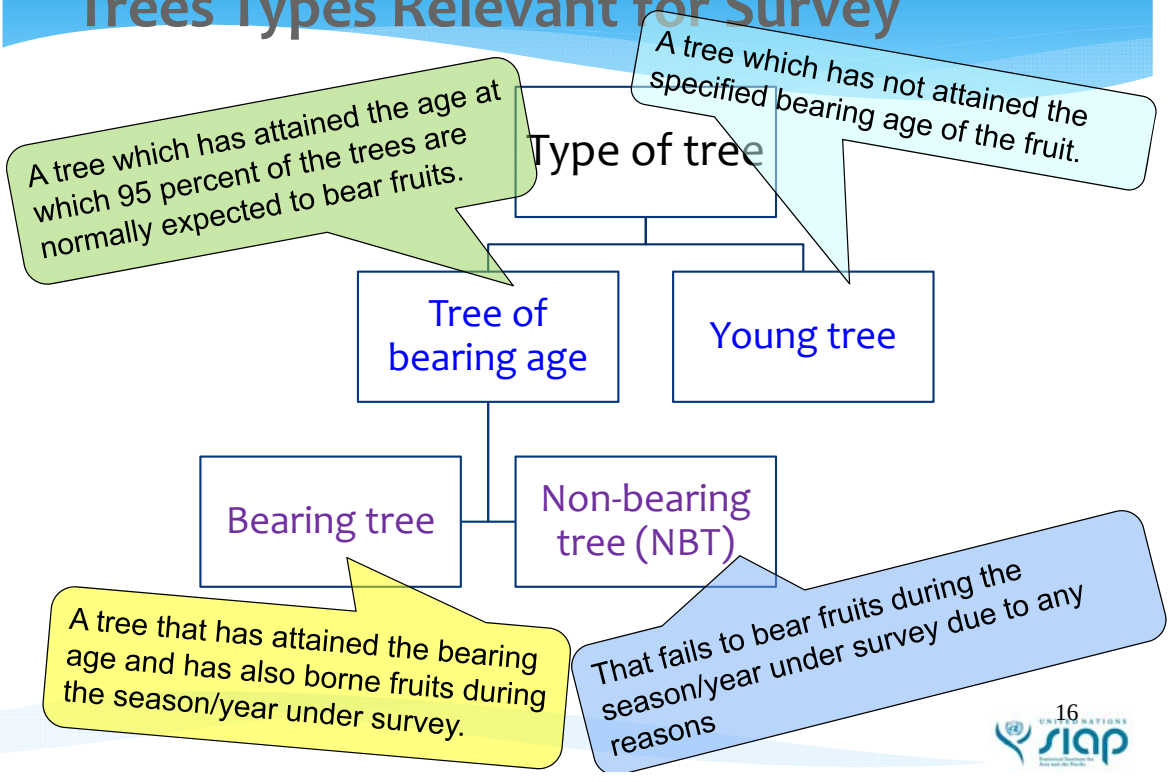
* **Plot:** A patch or piece of land, which has separate legal / administrative identity, such as

  survey sub-division number in tax register / land records.

* **Sub-plot:** A part of predetermined size located at random within the plot which is being harvested.

  A sub-plot is harvested by the enumerator(s).

Trees Types Relevant for Survey



Scattering of Trees

Horticulture crop trees are found either clustered in one place or scattered in different locations.

* **Orchard:** A compact piece of land with fruit trees, which is
  * at least 1/10th of an hectare area in size (when distance between trees is less than six meters) or
  * is having at least 12 trees planted on it (when between-trees distance is more than six meters).
* **Stray or scattered trees:** Trees not planted in orchards or plantations – in back-yard of houses, along the roads, river banks etc. are defined as stray or scattered trees.

  These are difficult to cover in horticulture surveys.

Yield and Extent of Fruits Cultivation

* **Average yield per bearing tree:** The average yield per bearing tree is the average yield obtained from trees of bearing age which have borne fruit during the season/year under survey in terms of weight as well as count of fruits.
* **Extent of cultivation of fruits**: Extent of cultivation of fruits includes:
  - total number of fruit trees categorized as bearing, non-bearing and young.
  - number of orchards categorized as bearing and young
  - area under orchards.

Important Definitions

Vegetable Cultivation (1)

Vegetable field: A vegetable field is a compact piece of land in which vegetables are grown either as pure or in mixed form or as intercrops. Usually a minimum size is prescribed.

- Pure vegetable field**:** the number of plants of the main vegetable crop is more than 90 percent.
- Mixed vegetable field**:** When two or more vegetable crops are sown with plants of none exceeding 90% of the total.

Important Definitions

Vegetable Cultivation (2)

* **Crop-cutting sub-plot:** For the purpose of estimating the production of vegetables, the random sub-plot having a prescribed shape and size.
* **Period of harvesting:** Period of harvesting of any vegetable crop will be regarded as total period between the first picking and the last picking when, either the crop is completely harvested or the vegetable field is ploughed for sowing the next crop.

Objectives and Main Variables

Objectives

Objectives of Horticulture Survey

Main objectives: to collect up-to-date data on horticultural production for use in

- compilation of national accounts
- policy making to promote horticulture growth
- monitoring of production trends
- measuring productivity and assess requirement of inputs

Objectives

Main variables

Horticulture production statistics consists of data relating to

- Output
- Input and
- Resources

Objectives

Output variables

Output Variables:

- Output – quantity and value
- Yield – yield per hectare or per tree
- Value of bye-products
- Harvest / planted area
- Number of trees – by type

Objectives

Input variables

Input Variables:

* Quantity & value of seeds
* Quantity & value of fertilizers used
* Quantity & value of pesticide used
* Irrigation charges
* Other costs

Objectives

Input variables

Resources Variables:

* Land used specifically for horticulture
* Of which, fallow land
* Agricultural machinery used
* Labour used and labour cost
* Value of constructions used for horticulture

Sample Selection and Statistical Unit

Sample Selection

Sampling Units for Fruits Survey

* Usually, a stratified multi-stage random sampling design is adopted.
* Typically, stratification is done at a sub-district level.
* **first stage unit (FSU):** Villages within a stratum are the of sampling
* **second stage unit (SSU):** Orchards and Holdings within each selected village
* **Ultimate unit of sampling (USU):** Cluster of trees in orchards and a (simple) random sample of stray trees in a holding.

Sampling for Fruits Survey

* Usually a stratified multistage random sampling design is adopted in fruit surveys.
* Districts are taken as starta.
* The sub-district administrative geographical units are then stratified into high-productive and low productive sub-strata.
* Next, villages (FSU) are selected from each sub-stratum.

Selection of SSUs

At this stage, two distinct frames are prepared for fruits survey.

* List of orchards / plantations in the selected FSU.
* List of holdings in the FSU.
* From each list, a sample is drawn independently.
* Sample of holdings is drawn to measure production of stray trees.

The estimates obtained for the two lists are then added to get estimates for the entire village.

Average yield rate is obtained as estimated production / number of bearing trees.

Selection of USU – trees

* A cluster sample of trees is usually drawn from selected orchards, and
* A random sample of stray trees is drawn from the trees in a selected holding.

Estimation of Basic Indicators

Basic Indicators

Basic Indicators obtained from a fruits survey:

- Quantity (and value) of fruits produced during the reference period
- Number of fruit trees – bearing, non-bearing and young trees
- Number of grower holdings – possessing orchards / plantations, and possessing only stray trees.
- Yield per bearing tree.

Estimating Basic Indicators

Survey produces direct design-based estimates of all the basic Indicators.

If reliable data on number of orchards and / or total number of fruit trees are available, the estimation procedure is adopted:

- Yield (***Y***) per bearing tree from the survey.
- Proportion (***R***) of bearing trees from the survey.
- Number (***N***) of trees from other source (like Palm Oil Board, Coconut planters' association etc.)
- Then an estimate of total production (***P***) is obtained as

$$P = N * R * Y$$

Thanks