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CHAPTER 20: Data collection methods and use of technology

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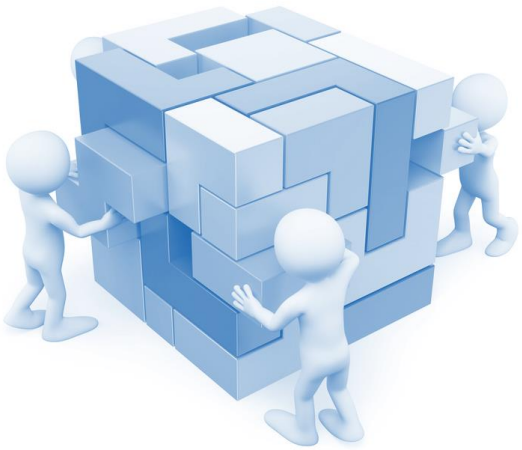

Methods of collecting data during an agricultural census

There are **several ways** of collecting data during a census and the choice between data collection methods is **influenced by several factors**, including**:**

- costs
- coverage of the target population
- literacy and education of respondents
- flexibility of asking questions
- respondents' willingness to participate and response accuracy
- availability of holding level accounting or book keeping.

TWO ways:

- Face-to-face data collection
- Remote data collection methods.

⟶ Usually these methods are used in combination.

Face-to-face data collection

Face-to-face, through paper or electronic questionnaires, is the most widely used for agricultural censuses, particularly in developing countries. Face-to-face has the following advantages:

- Enumerators can be well trained in the concepts, instructions and procedures;
- In areas of relatively low literacy, the meaning and purpose of the census questions can be rephrased. Face-to-face interviews elicit prompt replies, and cases of reluctance to cooperate can generally be settled during the course of the enumeration itself;
- Within an EA, the information is likely to have fairly uniform quality and consistency;
- More complex questions can be included in the census than would otherwise be possible.

Face-to-face data collection (cont'd)

- Data can be obtained through *interview* with the respondent or by *objective measurement* or both.

Interview

- Challenges in developing countries:
  - respondents have no quantitative concepts, and even if they do, many of the agricultural operations are such that the respondents fail to recall accurate information and consequently errors are introduced into the census data.
  - difficult items such as agricultural labour: reliable information usually cannot be obtained with a single interview.
  - data on production of agricultural commodities may not be readily obtained in one visit (harvest is spread over the year).
  - data on the number of trees, or on age and species of livestock numbers, etc. are difficult to obtain through simple oral inquiries.

Face-to-face data collection (cont'd)

Interview (cont'd)

- Different ways of procuring the data from respondents will have to be developed depending on their socio-economic status.
- Pre-test surveys should provide guidelines on the methodology to be adopted to collect data on specific items.
- To get the right answer to a question often a number of indirect questions will have to be used .
- May be necessary to give background explanations in the dialect of the respondent in order to communicate proper meaning of the original questions.
- It may be also recommended to note the data and other information obtained through conversation with the respondent and summarize in the form of explicit answers on the main questionnaire:
  - Space may be dedicated, such as the back of the sheets, to record the data and other information.
  - Provision should be made also in electronic questionnaires for recording such information.

Face-to-face data collection (cont'd)

Objective measurement: may be necessary for some items such as area and yield measurements, and usually on a sampling basis.

- Area measurement can be done in different ways: (i) by actual measurements in the field or (ii) by using aerial photography or remote sensing imagery.
- FAO recommends the use of GPS in place of compass traversing method *.
- Whatever method is applied, actual field measurements remains time-consuming because each field has to be visited by the enumerators.
- For this reason measurements are done only on a sampling basis and never by complete enumeration.

**The compass and rope method, or traversing, is considered the 'gold standard' of land area measurement.*

Remote data collection methods

Methods which do not require enumerators meeting in person for interviewing respondents.

Different methods

*Drop-off/Mail-back (**DO-MB**) or Pick-up by enumerators (**DO-PKE**)*

- The census office mails paper-based questionnaires to local or field enumerators.
- Field enumerators deliver the questionnaires to the respondents' residence with instructions on how to complete the questionnaire and how to mail it back in an enclosed postage-paid envelope or to be picked-up physically by the enumerators.

*Mail-out/Mail-back (**MO-MB**)*

- The census office mails paper-based questionnaires directly to respondents with instructions on how to complete the questionnaire and how to mail it back in an enclosed postage-paid envelope.
- Completed questionnaires are mailed back to the census office.

Remote data collection methods (cont'd)

*Paper-Assisted Telephone Interviewing (**PATI**)*

- The census office has interviewers contacting respondents by phone and writing data on paper-based questionnaires.
- A notice letter and paper-based questionnaire could be mailed prior to the collection period with instructions on how to complete it to prepare respondents for the phone interview.
- This activity could be centralized in the census office or in communal-local offices.

*Computer-Assisted Telephone Interviewing (**CATI**)*

- Similar to PATI except that interviewers enter the data into electronic questionnaires.

Remote data collection methods (cont'd)

*Computer-Assisted Self-Interviewing (**CASI**) or Computer-Assisted Web Interviewing (**CAWI**) with online electronic questionnaire*

- The census office sends census notice to respondents with instructions on: **a)** how to access the web questionnaires with a secure access code; **b)** a call center for help; and **c)** instructions on how to complete it.
- The secure access code is required to authenticate respondents, allowing them to access the application, and notifying the field collection operation once a questionnaire is transmitted by respondents.
- The CASI/CAWI questionnaire usually includes navigational help information, drop-down menus and online edits. Edits can be simplified in order to reduce respondent frustration with errors and its associated response burden.
- Skip patterns are built in CASI/CAWI questionnaires so only questions related to the type of holding operations are presented to respondents.

Comparison of data collection methods

	REMOTE DATA COLLECTION						FACE-TO-FACE	
	DO-MB	DO-PKE	MO-MB	PATI	CATI	CASI/CAWI	PAPI	CAPI
	Relative scale from Low/less (1) to High/more (5)							
Personal contact	3	4	1	2	2	1	5	5
Identification of new and active holdings	5	5	2	2	2	2	5	5
Timeliness – data collection (a)	2	2	1	3	4	5	2	2
Timeliness – data processing	1	1	2	3	5	5	3	5
Data quality and coherence	1	2	1	2	5	5	3	5
Failed-edit follow-up calls	3	3	5	2	1	1	2	1
Follow-up non-response	2	2	5	4	4	5	2	2
Response burden	4	4	5	3	2	1	3	2

Cost comparison of remote data collection methods

	REMOTE DATA COLLECTION						FACE-TO-FACE	
	DO-MB	DO-PKE	MO-MB	PATI	CATI	CASI/CAWI	PAPI	CAPI
Collection cost:	Relative scale from Lower cost (1) to Higher cost (5)							
• field enumerators (a)	2	3	1	1	1	1	4	5
• interviewers (b)	2	1	2	5	4	1	1	1
• printing	5	5	5	5	1	1	5	1
• mail (c)	5	2	5	1	1	1	2	1
• data capture (d)	5	5	5	4	1	1	4	1
• failed-edit follow-up	5	4	5	3	1	1	2	1
• follow-up non-response	2	2	2	4	4	4	2	2

Use of technology for census data collection

Use of Remote sensing and aerial photos

Support to field work of censuses/surveys

- Satellite images or aerial photos can help enumerators to optimize their displacements and facilitate localization of holdings and fields.
- Aerial photos or very high-resolution imagery will help the enumerators to access the land and/or locate the holder.
- Used as paper prints or on a mobile device, imagery will also minimize the obvious declaration and measurement errors.

Crop area estimation

- Two main methods are used to derive crop area statistics from RS (Delince J, 2015):

  (i) Pixel counting, and

  (ii) Calibration methods.

Example of Ag Census of Morocco

Orto-photos (spatial resolution of 30 cm) to identify boundaries of holdings and their plots.
Scale 1/5,000

Use of technology for census data collection (cont'd)

Use of Handheld GPS:

- Provides support to field activities:
  - Geo-referencing plots
  - Measuring the area of a plot or landscape patch
  - Holding location
- It is also used in building frames.

Handheld mobile digital devices (smartphones, tablets, etc) :

- CAPI applications are being developed to leverage these devices for data collection.
- Most mobile devices contain built-in GPS and are more portable than computers. The devices can be used for CAPI data collection method.
- When equipped with GPS, they also can be used for geo-referencing holdings, optimizing logistics and supporting enumerators, and for collecting and compiling *paradata* for effective monitoring of census progress. Examples of this include:
  - Listing exercise is undertaken and enumerators must return to conduct the interview;
  - Questionable responses that require follow-up;
  - Agricultural censuses using modular approach or integrated census survey modality requiring more than one visit.

**Paradata: information captured about the interview (e.g. date and time of start, completion, approval, etc.)*

Use of technology for census data collection (cont'd)

Mobile devices with GPS

Using GPS and paradata for monitoring census progress:

- Geo-referencing the location of the interviews gives census managers a tool to minimise fabricated data.
- Plotting geo-references on a map allows census managers to visualize the progress.
- The daily tabulation of this information allows census managers to closely monitor the progress of activities and even detect fraudulent interviews.

Mobile devices for CAPI

- CAPI can reduce overall cost, improve data quality, and decrease the time between data collection and analysis.
- Limitations: size and cost, access to data networks and Wi-Fi, access to power in some areas, safety and security.

Special problems

- **Kitchen gardens and horticulture crops:** single plot grows several vegetables, all sown in separate rows.
- **Crops cultivated simultaneously**: two or more different temporary or permanent crops grown simultaneously in the same field or plot.
- **Continuous harvesting**: Root crops such as carrots, beetroots, radishes, turnips, sweet potatoes, green corn cobs, etc., can be harvested continuously from the same field throughout the season.
- **Partial harvesting**: This refers to so-called "reserve crops" among which is cassava, an important food crop in some developing countries.
- **Scattered fruit trees**: The number of fruit trees which are planted along field borders or scattered in fields and in other parts of a holding should be counted separately for each species, classified into those of bearing and non-bearing age.
- **Enumeration of outside parcels:** parcels of a holding may be outside the selected primary sampling unit under a separate operator. If too far away, they can be enumerated by the nearest enumerator and the relevant questionnaire passed to the enumerator in charge of the holding.

Special problems (cont'd)

Urban and peri-urban agriculture

- Major difficulty: non-availability of suitable frame and potential high cost for identifying the holdings and building a frame.
- When important, various actions may be considered to capture the related information: agriculture-section in PHC, use admin sources and use of area frame.

Common land and livestock lease: the land not belonging directly to any agricultural holding but land on which common rights apply; the area used by each holding is not individualized.

Special problems (cont'd)

- **Shifting cultivation:** it is a system of cultivation where holders clear certain parts in the reservoir of natural vegetation (forest/grass-woodland) for a certain time and abandon them when the soil fertility is depleted.
- **Enumeration of nomadic and semi-nomadic livestock**: two types of data collection methods can be used **(i)** ground surveys and **(ii)** aerial/satellite surveys.

  Ground surveys implemented through two main ways:

  - ✓ Enumeration points
  - ✓ Specific ethnics groups or clans.

  Aerial surveys can be implemented in various ways:

  - ✓ Low level aerial surveys, (100-300 meters) above the ground, suited for coverage of extensive, remote areas, inaccessible by other means.
  - ✓ Drones and micro-drones may represent another way to gather aerial count data.

  For more, refer to the Global Strategy guidelines on enumeration of nomadic and seminomadic livestock.

Countries using e-questionnaires in agri-censuses since 2006

CAPI	Argentina (2008), Brazil (2006), Colombia (2013/2014), Cote d'Ivoire (2014/2015), Equatorial Guinea (2015), Cabo Verde (2014/2015), France (2010), French Guyana (2010), Iran (2014), Jordan (2007), Malta (2010), Martinique (2010), Mexico (2007), Morocco (2016), Mozambique (2009/2010), Namibia (2013/2014), Oman (2012), Saudi Arabia (2015), Thailand (2013), Venezuela (2008)
CAWI	Australia (2010/2011), Italy (2010), Rep. of Korea (2015)
CATI	UK (2010)
CAPI, CAWI, CATI combined	Austria (2010), Brazil (2017), Canada (2011), Estonia (2010), Finland (2010), Iceland (2010), Latvia (2010), Lithuania (2010), the Netherlands (2010), Mexico (2017, pilot census), Poland (2010), Slovenia (2010), Spain (2009/2010), Sweden (2010), USA (2012)

Country examples

USA

- In the 2012 agricultural census, **mail-out and mail-back** was the primary data collection method**.** It was supplemented with CAWI and non-response follow-ups by CATI and face-to-face interviewing.

Canada

- About **11%** of the agricultural holders opted for CAWI in the 2011 census of agriculture. This percentage went up to **55%** in the 2016 census of agriculture and is expected to reach **70%** in 2021. Similar trends are seen in other countries.

Country examples (cont'd)

Mauritius: 2014 agricultural census: mail-out / mail-back (MO-MB)

- For the non-household sector, a letter was sent to around **200** agricultural businesses in July 2014, requesting them to return the completed questionnaire to Statistics Maurice (SM) by mid-August 2014.
- A reminder was sent to all non-respondents at the end of August 2014.
- SM agents visited non-respondents to improve the response rate.
- In the end, only **113** farms in the non-household sector responded. The remaining farms had either ceased operations or could not be located.

THANK YOU