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Technical Session 2

Mohamed Barre
FAO RNE
Introduction

• As indicated in the Global Strategy’s foundational document, the implementation of the Second Pillar (integration of agriculture into the national statistical system) “begins with the development of a master sampling frame for agriculture that will be the foundation for all data collection based on sample surveys”

• Little guidance is currently available on building an MSF for agricultural surveys in different country contexts.
Introduction

- The GS aims at filling this gap with the development of guidelines and tools that are tailored to the specific situation of each country, taking into account both the structural characteristics of the agricultural sector and the level of development of the national statistical system.

- Two important guidelines on MSF:
  2. Master Sampling Frame for Fisheries and Aquaculture Statistics (on going)
What?
General consideration

- A master sampling frame is a sampling frame that provides the basis for all data collections through sample surveys and censuses in a certain sector.

- It is used to select samples either for multiple surveys, each with different content (as opposed to building an ad-hoc sampling frame for each survey), or for use in different rounds of a continuing or periodic survey.
MSF in Agricultural sector

- For the agricultural sector, MSF is a listing of sampling units that, when associated with reporting units, provides complete coverage of the populations of interest, as well as a linking of the agricultural holding to the household and land dimensions.

- In the context of the Global Strategy, the MSF is a tool that combines information on the socio-economic characteristics of the household and on the agricultural characteristics of the holding, including information on land area.

- The MSF should therefore allow the selection of samples for both household based surveys and holding based surveys.
MSF in Agricultural sector (cont’d)

Broadly speaking, In the context of the Global Strategy, the MSF will:

• ensure that information on the three basic statistical units - land parcel, household and holding- are interlinked, thus allowing to simultaneously provide consistent and integrated statistics on the environmental, social and economic dimensions of agriculture

• become survey basis (selection of probability based samples of holdings and households) for data collections for agricultural statistics for all providers in the national statistical system

• be made available to all institutions in the national statistical system for data collection
Why?

Integration, costs and coordination
Data integration: Issues

1) Data integration issues in current statistical systems:
   
   • In many countries, data are collected by sector using different sampling frames and surveys.

This division of data by sector does not allow for cross-sector analysis or the ability to measure the impact of actions in one sector on other sectors.
2) Surveys on crop production are often carried out separately from livestock production surveys, using different sampling frames.

- This does not allow the analysis of holdings characteristics that produce both crops and livestock or for comparing them to holdings that specialize in either crops or livestock.
3) Household surveys are conducted without coordination with production surveys, using different sampling frames and often with sample sizes too small for the data to inform on the rural or farm sectors.

- These data are also not usually combined with other data sources into a common database for access by data users.
4) There are usually several national organizations that have responsibility for data collection, analysis and reporting on agriculture, fishery and forestry data without coordination. The national statistical agency may collect the agricultural census while the ministry of agriculture may produce annual production data.

• Data are kept separate and often producing conflicting results, which confuses issues and data users.
Data integration & MSF

The main goal of the development of a master sampling frame is an integrated Agricultural Statistics Framework in order to:

- avoid duplication of efforts
- reduce statistics discrepancies
- connect various aspects of the sector
- allow the analysis of sampling units from different viewpoints
- have a better understanding of the sector.

The master sampling frame is one of the main tools for establishing a closer link between results from different statistical processes and statistical units.
Cost effectiveness

- The MSF may be cost effective when it covers several surveys. The costs of selecting the master sample units will be shared by all the surveys using the MS. The sample selection costs per survey will thus be reduced.

- Much greater cost savings are realized when the costs for preparing maps and subsampling frames of holdings units within master sample units are shared by the surveys.
Cost effectiveness (cont’d)

- Current technologies, in particular the availability of remote sensing, the ability of geographic information systems to overlay and integrate efficiently different layers of geographic information, have completely transformed the way of building master sampling frames for the agricultural sector and considerably reduced the cost and the time needed.
Planning and coordination facilitation

The MSF also facilitates the planning and coordination of regular surveys in a survey program:

- Gain in interviewers’ recruitment
- Reduced time for the interviewer to find the households.
- Reduced time for the organization and starting of surveys.
How?
MSF building approaches

Depending on country capacity and circumstances, the GS proposes five different approaches for establishing a MSF:

a) List frame based on the population census;
b) List frame based on the agricultural census;
c) List frame based on administrative data (e.g. business register of farms);
d) Area frame (based on remote sensing; aerial photos; etc.)
e) Mixed list and area frame (Multiple frame approach)
Population Census as Sample Frame Base

- Need to identify households with agricultural holdings in population census
- Need to add non-household holdings for a complete agricultural frame
- While it is possible to identify household holding agricultural production activities, measures of size are nearly impossible

More:

1. Guidelines for Linking Population and Housing Censuses with Agricultural Censuses with selected country practices (FAO, UNFPA 2012)
Agricultural Census as Sample Frame Base

- Assumes complete coverage of household holdings, commercial farms and subsistence farming households
- Must georeference land to farm headquarters or households, basically creating an area sample frame
- Register or frame updates are necessary between censuses
Administrative Data as Sample Frame Base

- Where reliable administrative data is available it can be used as the basis for an agricultural register
- Need to include small household and subsistence holdings data
- Georeference farms or households to census enumeration areas, basically creating area sample frame
Area Frame as Master Sample Frame

- Use georeferenced satellite imagery to categorize land by use
- Add census enumeration and administrative boundary layer
- Select areas for inclusion in samples
- Develop register of farms
Area Frame as Master Sample Frame (cont’d)

- Example of a sample of stripes in Sudan
Multiple frame approach

- Multiple frame sampling involves the joint use of two or more sample frames. For agricultural purposes, this usually involves the joint use of area and list frames.
- The list and area frames can be developed independently, and samples can be selected separately from each frame, in single or in multiple stages.
- Two main assumptions: Completeness (Every holding in the population belongs to at least one frame), Identifiability (For any sample unit from any frame, it is possible to determine whether the reporting unit belongs to any other frame).
- Specific statistical techniques are to be considered for estimations
Multiple frame approach (Example: dual frame)

- Two overlapping frames that form three domains in a general dual-frame design

\[ Y = Y_a + Y_b + Y_{ab} \]
Main steps to build an MSF

Handbook on Master Sampling Frames for Agricultural Statistics (Global strategy, 2015)
8 steps to identify the suitable frame

1. Conduct a thorough review of the statistical methods and operations, including censuses and surveys, used for agriculture in your country.
   - Where relevant, separate reviews should undertaken by/for the relevant National Statistical Office and by/for the statistical unit within the Ministry of Agriculture.
   - Both the methodology used and the data provided must be reviewed.
8 steps to identify the suitable frame (cont’d)

2. Review other censuses and surveys in your country with a focus on sample frames. Examples are the population census, national household surveys, and price collections for the Consumer Price Index.

3. Review administrative data and other possible sources for building and/or updating a list of farms or agricultural holders.

4. Obtain information on census or survey systems in countries of similar size, form of agriculture, and capabilities.
8 steps to identify the suitable frame (cont’d)

5. Compare findings from steps 1, 2, 3 and 4 above with the methods described in this Handbook to find out where similar methods are used and build off their experiences.

6. Follow the guidelines on obtaining background information on your country’s requirements for data on agriculture, as described in Chapter 2 of the Handbook. This information should then be contrasted with data currently available.
8 steps to identify the suitable frame (cont’d)

7. Identify overlaps in the statistical systems where resources can be combined to build an MSF.

8. Determine the requirements for geo-referencing agricultural and/or population census EAs. Identify how this can assist other parties in the national statistical system.

Following the 8 steps, there should be enough information to make a first recommendation on the choice of frame (list or area) or on a form of multiple frame sampling.
Final choice of MSF

- Seek a peer review of the frame selection process; revise as necessary.
- Begin implementation in a portion of the country.
- The final choice of MSF should take into consideration not only the costs of frame development and data collection, but also the costs required for maintenance and updating.
- The proposals should be realistic and reflect national capabilities, and include an indicative budget and timeframe for implementation.
- An effective MSF will facilitate the integration of agriculture into the national statistical system and will benefit the entire statistical system.
Limitations of MSF

- It always represents a compromise among different design requirements.
- Savings will be small if Master sample can not be extended to lower stages of sampling.
- Useful only if it is used more than once and for more than one survey.
- May not be suitable for Surveys aimed at local level or unevenly distributed and rare population sub-groups.
Countries experience

**BRAZIL**: Use of list frame and area frame to build a Master Sampling Frame.

**CHINA**: Use of area frame to build a master sampling frame.

**ETHIOPIA**: Use of list frame and area frame to build a Master Sampling Frame.

**EU MARS PROJECT**: Use of square segments to build an area frame for agricultural surveys.

**EUROSTAT LAND USE AND COVER SURVEY (LUCAS)**: Use of point frame to build an area frame for agricultural surveys.

**GUATEMALA**: Building an area sampling frame for agricultural surveys.

**LESOTHO**: Use of list frame to build a Master Sampling Frame.

**THE UNITED STATES**: Use of area frame for agricultural surveys.

More details on these experiences and lessons learned on *Handbook on Master Sampling Frames for Agricultural Statistics* (Global strategy, 2015)
Pilots tests

- Fields tests on going in Brazil, Nepal and Rwanda
References

Carfagna E. 2013. «Using Satellite Imagery and geo-referencing technology for building a master sampling frame» de 59th World Statistics Congress, Hong Kong


