Master Sampling Frames for Agricultural Statistics

Providing a coherent and cost-effective foundation for data collection based on sample surveys
What is a Master Sampling Frame (MSF) for agriculture?

A Master Sampling Frame (MSF) is a survey frame that forms the basis for the selection of probability-based samples and that can be used for several surveys or several rounds of the same survey. In the context of agricultural surveys, an MSF covers the population of interest (commercial and non-commercial farms) in its entirety, and enables the linkage of the farms’ characteristics with those of the households and the land.

In other words, an MSF is a powerful, practical and cost-effective instrument that:
- can be used in the sampling designs of several agricultural surveys and different rounds of the same survey;
- supports the study of the economic, social and environmental dimensions of agriculture;
- facilitates the implementation of an integrated survey framework;
- and thus contributes to the improvement of the agricultural statistical system and the availability of quality statistics-related agriculture.

What is new?

Having identified a significant gap in the technical guidance on MSFs for agricultural surveys, the Global Strategy has prepared several key documents to address this issue in a way that recognizes the diversity of countries’ situations and resources:

- a Handbook providing technical and operational guidance on various aspects of the development and use of MSFs for agricultural surveys
- a collection of countries’ experiences in building and using different types of MSF
- a methodological note on the development and use of recommended MSFs in the context of AGRIS, an integrated survey framework developed by the Global Strategy
What problems can an MSF solve?

Without an MSF, the design, data collection and data analysis of agricultural surveys tend to be conducted separately. Agricultural production surveys are often conducted by type of agricultural commodities, using different concepts, sampling frames, sampling methods, collection procedures, survey processing approaches and dissemination methods.

This unique sampling frame allows countries to:

- Better coordinate and plan statistical operations among several stakeholders;
- Develop an integrated survey framework that provides a linkage between all data collections;
- Optimize the use of statistical infrastructure and financial resources as well as data production processes;
- Improve the data coherence and statistical comparisons of the agricultural statistics;
- Conduct cross-sectoral and socio-economic analyses on the rural and farm sectors.
WHY AN MSF FOR AGRICULTURAL STATISTICS?

To attain better coherence and data integration within the NSS

- Ensure the availability of more relevant statistical products for policy-making
- Allow for connection of various aspects of the sector and analysis of sampling units from different angle, resulting in a better understanding of the sector
- Facilitate the application of international standards and classifications
- Provide a stable reference system for agricultural surveys over time
To better plan and coordinate across the NSS

- Contribute to the implementation process of the Strategic Plans for Agricultural and Rural Statistics (SPARS) and facilitate long-term budgeting for the production of agricultural statistics
- Set common goals for all producers of agricultural statistics
- Ensure the use of a unique framework for various surveys, to cover all populations targeted by an integrated survey program
- Provide a solid foundation for the implementation of an Agricultural Integrated Survey (AGRIS)
- Avoid duplication of efforts, ensure better coherence and reduce discrepancies in data from various surveys

To optimize the use of financial resources

- Share the cost of building an MSF from budgets allocated for different surveys
- Ensure savings in the resources allocated to interviewers’ recruitment and training, when used for integrated surveys
- Reduce the time required for the interviewer to identify respondents and for the organization and launching of surveys
- Reduce the costs associated with the use of modern technologies and various sources (remote sensing, Geographic Information Systems, administrative sources, etc.)
WHAT TYPES OF SAMPLING FRAMES CAN BE USED AS AN MSF?

List frames are crucial for building and using MSFs, because different sampling stages usually rely on lists of sampling units.

There are various strategies for building an MSF for countries using list frames; for example, a combination of list frames can be used to cover the holdings in both the household and the non-household sectors.

The main strategies to construct an MSF include the use of list frames obtained from:
- Population censuses
- Agricultural censuses
- Business registers of farms
- Listings of agricultural holdings in selected geographical areas

Example: Lesotho
The current MSF was constructed from the 2006 Census of Population and Housing and is the basis for sample selection for all surveys conducted by the Bureau of Statistics.

The country has integrated non-agricultural and agricultural surveys that share the same MSF.
Providing a coherent and cost-effective foundation for data collection based on sample surveys

Area frames

An alternative to the use of list sampling frames is to use the territory as a basis to define an area sampling frame.

An area frame can be considered as a list of area units or a set of land elements, which may be points or pieces of land.

These frames are created by using digital maps, aerial photographs or satellite images.

They enable the direct observation of some variables such as crop area and yield.

Example: Guatemala
After conducting the Fourth National Farming Census in 2003, the National Institute of Statistics of Guatemala designed a System of Continuous Farming Statistics based on the construction of an area sampling frame. The area frame was built using satellite images and aerial photographs. This frame was used during the 2005, 2006, 2007 and 2008 surveys. In 2013, Guatemala designed a new survey for obtaining an accurate national estimates for priority crops, using an updated area frame.

Multiple frame sampling

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.

Multiple frame sampling was introduced as a method that makes full use of the strengths of individual frames, while affording sampling flexibility to each frame.

Example: Rwanda
The current MSF was constructed from the 2006 Census of Population and Housing and is the basis for sample selection for all surveys conducted by the Bureau of Statistics. The country has integrated non-agricultural and agricultural surveys that share the same MSF. Agricultural surveys implemented since 2013 in Rwanda are based on Multiple Frame Agricultural Surveys. The multiple frame sampling used combines a sample of segments, selected from an area frame, with a short complementary list of special farms. The segments have identifiable physical boundaries (roads, rivers, paths, etc.). The special farms were defined according to certain characteristics, such as the plot size of growing crops or the size of the herd.
List frames

**PROS**
- Easy to use
- Enable in-depth analysis of alternative sampling designs
- Usually less expensive to build and use for sampling design
- Allow for the use of ancillary information to improve sampling designs and estimators

**CONS**
- Problems arise when they are not complete and/or are obsolete, or contain erroneous units
- High maintenance costs, because they usually require regular updating

**WHAT ARE THE PROS AND CONS OF EACH TYPE OF MSF?**
Area frames

- Provide a complete coverage of the area of interest
- Remain stable over a long period of time
- Direct observation possible
- Allow for the monitoring of land condition and inventory of natural resources

Multiple frame sampling

- Build on strengths of AFs and LFs and minimize their weakness
- Can enhance survey coverage and precision of estimates
- Enable the study of special or rare products

- Can be difficult to identify overlaps in the sample
- List and area frames should be updated independently
- Estimation formulas can be complex

- Initial cost of building this type of frame may be high
- May not be adaptable to some variables, such as livestock, large farms or rare items
- Practical challenges in the field
WHAT ARE THE INITIAL STEPS IN BUILDING AN MSF?
HAS THE COUNTRY RECENTLY CONDUCTED CENSUS OPERATIONS, OR DOES IT HAVE GOOD ADMINISTRATIVE RECORDS?

NO

Start new frame

Imagery (aerial photographs, aerial orthophotographs, satellite images, etc).

Maps/GIS

Pieces of land

Point sampling

Segments (physical boundaries, regular grids)

AREA FRAME

YES

Which data sources are available?

Agricultural census

Cadastral information (maps)

Registers (list)

Lists of large holdings, commercial farms

List of agricultural holdings

List of agricultural holdings in selected areas or villages

List of agricultural households

Agricultural module?

Selection of enumeration areas or villages and listing

Multiple frame

List frame