



Training Activities

Global Strategy to improve Agricultural and Rural Statistics

Master Sampling Frames for Agricultural Statistics

Frame Development, Sample Design And Estimation

Training material – User guide

1. Background

The Global Strategy to improve Agricultural and Rural Statistics (GS) aims to significantly increase the availability and quality of agricultural and rural statistics by developing the relevant institutional, human and financial capacities. It provides a framework for national and international statistical systems to produce and apply the basic data and information needed to guide policy on rural development and sustainable agricultural production.

The GS is centred upon three pillars: (1) the establishment of a minimum set of core data; (2) the integration of agriculture into National Statistical Systems (NSSs); and (3) the sustainability of the statistical system through governance and statistical capacity building.

As indicated in the GS foundational document, the implementation of the Second Pillar “begins with the development of a master sampling frame (MSF) for agriculture that will be the foundation for all data collection based on sample surveys or censuses”. Indeed, the use of an MSF has several advantages. For example, it enables the selection of all probability-based samples of farms and households, thus guaranteeing more coherence and efficiency in the production of basic statistics in the long term. It also allows for farm characteristics to be connected with those of the households, as well as with the dimensions of both land cover and land use.

As a result, the GS has conducted research on improved methodologies for the creation and use of an MSF, which led to the preparation of a set of consolidated guidelines on MSFs. The [Handbook on Master Sampling Frames for Agricultural Statistics](#), developed by a group of high-level experts and finalized in late 2015,¹ has therefore been an important contribution of the GS to countries that are in the early stages of building an MSF or improving an existing MSF.

¹ A total of three research topics were developed under this handbook: (i) Identifying the most appropriate sampling frame for specific landscape types; (ii) Improving methods for linking area frames with list frames; and (iii) Improving the use of Global Position Systems (GPS), Global Information Systems (GIS) and Remote Sensing (RS) for setting up a master sampling frame.

Due to the technical content of this handbook, the GS has decided to develop further training material to facilitate the transfer of knowledge to the staff involved in the construction, use and maintenance of MSFs and to assist trainers and technical assistance providers in carrying out their capacity-building activities at regional and country level.

This user guide has been prepared to guide the users through this training material.

2. Objectives of the training

General objectives

The generic training material was designed with the objective of producing the following results:

- Promote the creation and use of an MSF to strengthen, modernize and transform the production of agricultural and rural statistics and better integrate them within NSSs;
- Improve the capacity of statisticians and technicians working in the area of agriculture statistics to construct, use and maintain an MSF; and
- Improve the capacity of countries to adopt cost-effective and reliable methods for producing a minimum set of agricultural and rural statistics.

Learning outcomes

The main objective of the training material is to provide a strong foundation in all aspects related to the promotion, construction, maintenance and use of an MSF. Therefore, by the end of the training, recipients are expected to have acquired the necessary skills and knowledge to:

- Understand the concepts and main characteristics of an MSF, the benefits of an MSF in facilitating the production of agricultural and rural statistics, and the implications of building and maintaining an MSF;
- Understand and list the basic concepts associated with area, list and multiple frames, and the advantages and disadvantages of adopting them as an MSF;
- List the steps required to create area, list or multiple frames as an MSF using data from population censuses, agricultural censuses, business registers, administrative sources, digital maps, aerial photographs or satellite images;
- Use new technologies such as GPS, GIS or remote sensing to build and maintain an MSF for agricultural statistics; and
- Apply sound methodologies and statistical theory to improve the efficiency and quality of survey designs and estimations, using various types of MSFs.

3. Course content

The course is designed for national statistical offices and statistical units within ministries of agriculture. The relevant training activities consist of a judicious mix of lectures and individual and group assessment discussions and exercises. The training design also features knowledge-sharing on country practices and methods.

The training topics cover the following:

- Introduction to MSFs (basic definitions, rationale, type of MSF and advantages and disadvantages of each MSF type, steps to identify which MSF type is relevant to the country's specificities);
- Use of technology to build an MSF;
- How to build an MSF using list frames, area frames or multiple frames;
- Sampling designs and estimation methods for the various types of MSF;
- Hands-on exercises to construct an area frame using GIS and remote sensing technologies; and

- Countries' experiences in building and using an MSF.

4. Course design and delivery

Delivery mode

The training on MSF is divided into three training modules: one advocacy and introductory training module and two technical training modules, which cover in more detail respectively (1) the aspects related to the construction and maintenance of an MSF using various types of list, area and multiple sampling frames, and (2) the statistical methods related to the use of the different types of MSF for sampling and estimation. The advocacy and introductory module and the first technical trainings can be offered as stand-alone training modules to the respective target audiences. However, it is recommended to attend the first technical training before undertaking the second one.

For the advocacy and introductory training module, a face-to-face delivery mode is recommended to allow for in-depth discussions between the trainer and the senior managers and statisticians targeted by this training. No prior readings or training are required.

However, given the level of the technical nature of the two technical trainings, it is important to ensure the possibility of continuous interaction between the trainees and the trainers for these two modules. For this reason, most of these trainings should be delivered face-to-face with the trainers physically present. The face-to-face trainings can be followed or preceded by online lectures, readings or e-learning activities to ensure the participants' proficiency on certain basic topics related to MSFs, the use of technology in setting up a sampling frame, as well as sampling and estimation techniques.

Length of the training

This will depend on the specific objectives determined with the recipient organizations and the background of the trainees. As the objective of the first training module is to provide an initial overview of the concepts and main characteristics of an MSF, the benefits of an MSF in facilitating the production of agricultural and rural statistics, and the implications of building and maintaining such a frame, it was designed to be short (ranging from one and a half day to two days).

As for the other two training modules, it is recommended to hold four to five days of training, including a mix of hands-on exercises (individual or small-group) and lectures every day.

Recommended number of trainers and participants

For the first training module, there is no limit on the number of participants, as the content is more informative than technical. It is however important that the trainer be an excellent communicator and sufficiently experienced to be able to efficiently explain the concepts and requirements of an MSF and make an effective promotion of its benefits to senior managers.

As for the other two modules, because of the technical content and hands-on nature of the training, it is advisable to keep the number of participants between 15 and 25. Past trainings on MSFs have also shown that a group of approximately 20 persons is appropriate. Indeed, this group size is small enough to ensure interaction among trainees and with the trainers, as well as organize hands-on exercises and applications. In addition, it is sufficiently large to include most of the stakeholders and to allow for mutually beneficial exchanges.

For the technical trainings, it is also recommended to plan for one or two trainers: one trainer with significant knowledge of and experience with the use of technology required to design survey frames (in particular area frames), and one trainer with strong experience in sampling and estimation techniques within the context of agricultural surveys.

5. Course material

The proposed material for the course is composed of the following:

- A set of five PowerPoint presentations for Module 1:
 - Session 1: The Master Sampling Frame for agricultural statistics: basic principles
 - Session 2: What is the Agricultural Integrated Survey (AGRIS) and how does an MSF fit in an AGRIS or an integrated survey program?
 - Session 3: Using different frames to build and use an MSF
 - Session 4: Requirements to building an MSF
 - Session 5: Country experiences
- A set of five PowerPoint presentations for Module 2:
 - Session 1: Defining the MSF for agricultural statistics: basic principles
 - Session 2: Use of technology for sample frame development
 - Session 3: Using list frames to build and maintain an MSF
 - Session 4: Using area sampling frames to build and maintain an MSF
 - Session 5: Using a multiple sampling frame as an MSF
- A set of four PowerPoint presentations for Module 3:
 - Session 1: Sampling design considerations when developing an MSF
 - Session 2: Sampling design and estimation when the MSF is a list frame
 - Session 3: Sampling design and estimations when the MSF is an area frame
 - Session 4: Survey design and estimation when the MSF is a multiple frame
- A series of exercises to practice on the use of GIS and remote sensing to:
 - Design segments and points within a given region and execute some processing tasks in QGIS;
 - Design a land use/cover survey form using Open Foris Collect; and
 - Classify the segments and points according to their land/use cover using Collect Earth and Google Earth Pro.

Additional presentations on country experiences could be prepared according to participants' training needs and country realities. Otherwise, the presentation of Session 1 or Module 1 can be used as case studies in the delivery of Modules 2 and 3.

The supporting material to be reviewed by the participants in addition to the training material is included in the reference section below.

Finally, at the end of the training, the participants should be given an evaluation form, on which they will be able to provide their feedback on the course and identify the areas where further training could be provided.

6. Target audience

For this training material, there are three target audiences:

1. For the advocacy and introductory training module (Module 1), the target audience consists of the managers of agricultural statistics divisions in NSSs (or ministries of agriculture), senior staff working in this area (agricultural engineers, economists, veterinaries zoologists, among others) and academia involved in the sector.

2. For the training on MSF construction and maintenance (Module 2), the target audience consists of statisticians, sampling experts, cartographers, topographers, cadastral engineers and GIS specialists who are involved or are soon to be involved in the production of agricultural statistics.
3. For the training on the use of MSFs (Module 3), the target audience consists of statisticians and sampling experts involved or soon to be involved in the production of agricultural statistics. It is expected that they undertake training on MSF construction and maintenance before completing this module.

This training material can also be used to train targeted trainers or technical assistance providers from statistical training centres, regional economic communities and regional and subregional organizations specialized in statistical capacity building.

For Modules 2 and 3, participants are expected to have basic knowledge of statistics and statistical terminology, and basic computer skills. It would be preferable that they also have basic notions of map reading, spatial analysis, GPS skills, and other technological tools (smartphones or tablets).

7. References

Global Strategy to improve Agricultural and Rural Statistics (GS). 2014. *Technical report on identifying the most appropriate sampling frame for specific landscape types*. GS Technical Report: Rome. Available at <http://gsars.org/en/technical-report-on-identifying-the-most-appropriate-sampling-frame-for-specific-landscape-types/>.

_____. 2015. *Handbook on Master Sampling Frames for Agricultural Statistics, Frame Development, Sample Design and Estimation*. GS Handbook: Rome. Available at <http://gsars.org/wp-content/uploads/2016/02/MSF-010216-web.pdf>.

_____. 2015. *Technical report on linking area and list frames in agricultural surveys*. GS Technical Report: Rome. Available at <http://gsars.org/en/technical-report-on-linking-area-and-list-frames-in-agricultural-surveys/>.

_____. 2016. *Guidelines for the integrated survey framework*. GS Guidelines: Rome. Available at <http://gsars.org/en/guidelines-for-the-integrated-survey-framework/>.

_____. 2017. *The Agricultural Integrated Survey (AGRIS): Producing cost-efficient data on farms for policymaking*. GS Brochure: Rome. Available at <http://gsars.org/en/8-page-brochure-on-the-agricultural-integrated-survey-agris/>.

_____. (forthcoming). *Master Sampling Frames for Agriculture- Supplement on selected Country Experiences*. GS Handbook Supplement: Rome.

_____. (forthcoming). *Master Sampling Frames for agricultural surveys*. GS Brochure: Rome.

_____. (forthcoming). *AGRIS Methodological Note*. GS Methodological Note: Rome.

_____. (forthcoming). *AGRIS Generic Questionnaires*. GS Questionnaires: Rome.

Appendix 1

Example of an agenda for a two-day advocacy and introductory training on the MSF
(Module 1)

Day 1	
8:30 – 9:30	Participants’ registration Opening remarks
9:30 – 10:15	Session 1 – Defining the Master Sampling Frame (MSF) for agricultural statistics – basic principles
10:15 – 10:45	Coffee break
10-45 – 12:30	Session 1 – Defining the Master Sampling Frame (MSF) for agricultural statistics – basic principles (cont’d) Q&A and Discussion period on Session 1
12:30 – 14:00	Lunch Break
14:00 – 15:30	Session 2 – What is the Agricultural Integrated Survey (AGRIS) and how does an MSF fit into an AGRIS or integrated survey program?
15:30 – 15:50	Coffee Break
15:50 – 17:00	Session 2 – What is the Agricultural Integrated Survey (AGRIS) and how does an MSF fit into an AGRIS or integrated survey program? (cont’d) Q&A and Discussion period on Session 2 Session 3 – Using different frames to build and use MSFs
Day 2	
8:30 – 10:15	Session 3 – Using different frames to build and use MSFs (cont’d) Q&A and Discussion period on Session 3
10:15 – 10:45	Coffee break
10-45 – 12:30	Session 4 – Requirements for building an MSF Q&A and Discussion period on Session 4
12:30 – 14:00	Lunch break
14:00 – 15:30	Session 5 – Countries’ experiences Q&A and Discussion period on Session 5
15:30 – 15:50	Coffee break
15:50 – 17:00	Final Q&A period Concluding remarks Training evaluation

Appendix 2

Example of an agenda for a five-day training on the construction and maintenance of an MSF
(Module 2)

Day 1	
8:30 – 9:30	Participants’ registration Opening remarks
9:30 – 10:15	Session 1 – Defining the Master Sampling Frame (MSF) for agricultural statistics – basic principles
10:15 – 10:45	Coffee break
10:45 – 12:30	Session 1 – Defining the Master Sampling Frame (MSF) for agricultural statistics – basic principles (cont’d) <i>Discussion period</i>
12:30 – 14:00	Lunch break
14:00 – 15:30	Session 1 – Defining the Master Sampling Frame (MSF) for agricultural statistics – basic principles (cont’d)
15:30 - 15:50	Coffee break
15:50 - 17:00	Session 1 – Defining the Master Sampling Frame (MSF) for agricultural statistics – basic principles (cont’d) Q&A and Discussion period on Session 1

Day 2	
8:30 – 10:15	Session 2 – Use of technology for sample frame development
10:15 – 10:45	Coffee break
10:45 – 12:30	Session 2 – Use of technology for sample frame development (cont’d)
12:30 – 14:00	Lunch break
14:00 – 15:30	<i>Exercises</i> <ul style="list-style-type: none"> • <i>Satellite images exploration (e.g. Landsat8, MODIS) with Google Earth Engine & Earth Explorer</i> • <i>How to download public satellite images</i> • <i>Satellite image processing in QGIS</i> • <i>Clipping, index computation and mapping (vegetation index and water index)</i>
15:30 – 15:50	Coffee break
15:50 – 17:00	<i>Exercises</i> <ul style="list-style-type: none"> • <i>Customization of editing form</i> • <i>Vector layer creation in QGIS (polygons, points, lines)</i> • <i>Grids and points creation in QGIS</i> Q&A and Discussion period on Session 2

Day 3	
8:30 – 10:15	Session 3 – Using list frames to build and maintain an MSF
10:15 – 10:45	Coffee break
10:45 – 12:30	Session 3 – Using list frames to build and maintain an MSF (cont'd) <i>Discussion on available data sources to update list framed, in particular for the organized sector</i> Q&A period
12:30 – 14:00	Lunch break
14:00 – 15:30	Session 3 – Using list frames to build and maintain an MSF (cont'd)
15:30 – 15:50	Coffee Break
15:50 – 17:00	Session 3 – Using list frames to build and maintain an MSF (cont'd) Q&A and Discussion period on Session 3

Day 4	
8:30 – 10:15	Session 4 – Using area sampling frames to build and maintain an MSF
10:15 – 10:45	Coffee break
10:45 – 12:30	Session 4 – Using Area Sampling Frames to build and maintain a master sampling frame (cont'd) Q&A period
12:30 – 14:00	Lunch break
14:00 – 15:30	Exercise to practice on the use of GIS technology and satellite images to create an area frame <ul style="list-style-type: none"> • <i>Design segments and points within a given region and execute some processing tasks in QGIS</i> • <i>Design a land use/cover survey form using Open Foris Collect</i>
15:30 – 15:50	Coffee break
15:50 – 17:00	Exercise to practice on the use of GIS technology and satellite images to create an area frame (cont'd) <ul style="list-style-type: none"> • <i>Classify the segments and points according to their land/use cover using Collect Earth and Google Earth Pro</i> Q&A and Discussion period on Session 4

Day 5	
8:30 – 10:15	Session 5 – Using a multiple sampling frame as an MSF
10:15 – 10:45	Coffee break
10:45 – 12:30	Session 5 – Using a multiple sampling frame as an MSF (cont'd) Q&A period
12:30 – 14:00	Lunch break
14:00 – 15:30	Session 5 – Using a multiple sampling frame as an MSF (cont'd) Discussion and Q&A period on Section 4
15:30 – 15:50	Coffee break
15:50 – 17:00	Final Q&A period Concluding remarks Training evaluation

Appendix 3

Example of an agenda for a four-day training on the use of an MSF
(Module 3)

Day 1	
8:30 – 9:30	Participants' registration Opening remarks
9:30 – 10:15	Session 1 – Sampling design considerations when developing an MSF
10:15 – 10:45	Coffee break
10:45 – 12:30	Session 1 – Sampling design considerations when developing an MSF (cont'd) <i>Country example – The Gambia</i> Discussion period
12:30 – 14:00	Lunch break
14:00 – 15:30	Session 1 – Sampling design considerations when developing an MSF (cont'd)
15:30 – 15:50	Coffee break
15:50 – 17:00	Session 1 – Sampling design considerations when developing an MSF (cont'd) Q&A and Discussion period on Session 1

Day 2	
8:30 – 10:15	Session 2– Sampling design and estimation when the MSF is a list frame
10:15 – 10:45	Coffee break
10:45 – 12:30	Session 2 – Sampling design and estimation when the MSF is a list frame (cont'd) <i>Country examples – Nepal and Ethiopia</i> Discussion period
12:30 – 14:00	Lunch break
14:00 – 15:30	Session 2 – Sampling design and estimation when the MSF is a list frame (cont'd)
15:30 – 15:50	Coffee break
15:50 – 17:00	Session 2 – Sampling design and estimation when the MSF is a list frame (cont'd) <i>Discussion on country experiences</i> Q&A and Discussion period on Session 2

Day 3	
8:30 – 10:15	Session 3 – Sampling design and estimation when the MSF is an area frame
10:15 – 10:45	Coffee break
10:45 – 12:30	Session 3 – Sampling design and estimation when the MSF is an area frame (cont'd) Q&A period
12:30 – 14:00	Lunch Break
14:00 – 15:30	Session 3 – Sampling design and estimation when the MSF is an area frame (cont'd)
15:30 – 15:50	Coffee break
15:50 – 17:00	Session 3 – Sampling design and estimation when the MSF is an area frame (cont'd) Q&A and Discussion period on Session 3

Day 4	
8:30 – 10:15	Session 4 – Sampling design and estimation when the MSF is a multiple sampling frame
10:15 – 10:45	Coffee break
10:45 – 12:30	Session 4 – Sampling design and estimation when the MSF is a multiple sampling frame (cont'd)
12:30 – 14:00	Lunch break
14:00 – 15:30	Session 4 – Sampling design and estimation when the MSF is a multiple sampling frame (cont'd) Q&A and Discussion period on Session 4
15:30 – 15:50	Coffee Break
15:50 – 17:00	Final Q&A period Concluding remarks Training evaluation