



Global Strategy
IMPROVING AG-STATISTICS
ASIA PACIFIC REGION



Framework to develop Master Sample Frame for Agriculture

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What is a Sampling Frame

- Sample surveys are conducted to make estimates or inferences for a study population based on the observations made on a limited number of units in the population.
- Sampling Frame is a listing of the population units from which a sample is to be selected at any stage of sampling.
- It depends on the population to be studied such as households, agricultural holdings, enumeration areas



What is a Sample Frame?

- Survey planning commences with
 - Defining the population to which survey results are to be applied
 - Representing it in physical form from which samples can be drawn
 - A sampling frame is such a representation
- In the survey process, we make two kind of errors
 - Errors in measurement
 - Errors in estimation
- Two important elements in estimation are
 - Sampling frame
 - Design effect

What is a Sample Frame?

- An explicit list of all units in the population
- Most important requirement is that it covers all units in the population
- It also depend on structure of the samples and the process to select them
 - Multi-stage sampling is frequently used in practice
 - List of Villages/EAs as PSU, List of all farms as SSUs, selection of actual plot on the field as USUs
- Durability of frame declines as we move down the hierarchy of the units
- PSUs are generally more stable
- SSUs/USUs need to be updated more frequently



Master Sample

- The frame for first stage of sampling has to cover the entire population of PSUs
- At each next stage, the lists of units are needed only within the previous stage units.
- For economy or convenience, one or more stages can be combined or shared among a number of surveys.
- The sample resulting from the shared stages is called a Master Sample
- The objective is to provide a common sample of units down to a certain stage from which sampling can be carried out to serve individual surveys.



Master Sample Frame

- It is basically a list of area units that covers the whole country
- For each unit, we may have information on Rural/Urban classification, link to higher level administrative unit (district/province), Population and the boundary of the unit.
- Most common MSF is one with EAs as the basic frame units with supplementary information for efficient sample selection
- From this MSF, samples for different surveys can be selected entirely independently
- But there are substantial gains, if a large sample can be selected and then sub samples for different but related surveys.
- A common Master Sample in many countries consists of PSUs where the PSUs are EAs and SSUs are household or housing units



Master Sample selection

- It can be done in many ways depending on nature of surveys
 - Sub-sampling of PSUs. Thus each survey would have a different sample of EAs.
 - Sub-sampling of SSUs. Thus each survey may have same sample EAs but different sample SSUs
 - There can also be overlap between sub-samples if desired
 - Requires sample can also be selected as independent sub-samples or replicates for each survey



Master Sample Benefits

- Cost savings are much higher when costs for preparing maps and sub-sampling frames are shared by the surveys.
- Operational convenience
- to recruit and station the interviewers locally
- Possible to select overlapping samples in two surveys to permit integration of data at micro level.

Design Effect

- A measure of the effect on variance of an estimate, of various complexities in the design
- Computed as a ratio of its variance under actual design to what would have been the variance under a SRS of same size.

Advantages and limitations of MSF

- Advantages
 - Cost savings are much higher when costs for preparing maps and sub-sampling frames are shared by the surveys.
 - Reduced costs in maintaining separate frames for different surveys
 - Reduced cost on sample design and selection
 - Possible to select overlapping samples in two surveys to permit integration of data at micro level.
 - Drawing of multiple samples for various surveys from same frame
 - Operational convenience
 - to recruit and station the interviewers locally
- Limitations
 - 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 population sub-groups
 - When sampling units are used, risks of biases/ non response



Designing of MSF

- Stages in design of MSF
 1. Assessing availability of data and other material
 2. Decision on Coverage of MSF
 3. Decision on basic frame units
 4. Information about the frame units to be included in the frame
 5. Documentation and Maintenance of MSF



Designing of MSF

1. Assessing availability of data and other material
 - PHC, list of EAs with population and household counts
 - Sketch map of EAs, maps of larger areas to identify it
 - Rural/urban, coverage of institutional population
 - Quality of data (maps sketchy/detailed/digitized/no maps but list of localities in the EA)
 - Quality deteriorates with time due to population growth, migration, splitting/merging of units

Prepare an up to date list of administrative division and sub-divisions



Designing of MSF

2. Decision on Coverage of MSF

- Whether to exclude remote areas/sparsely populated areas
- Coverage of nomadic groups/hill tribes
- Coverage of institutional population

3. Decision on basic frame units

- Frame Units/Basic Frame units
 - EAs, Villages, Administrative sub-divisions, EA-s
 - Thailand (blocks within EA in municipal areas as FUs), Lao (villages as FU)
- Advantages of EA as frame unit
 - Demarcated with equal sized population areas
 - Mapped with description of boundary
 - Computerized in many countries
- Optimal size of EA



Designing of MSF

4. Supplementary information to be included with frame units
 - Information that allows to group BFUs into larger units
 - Information about higher level units to which it belongs
 - Information on size of units
 - Important if large variation across units
 - Need not be exact
 - Enables sample selection with PPS sampling
 - Allocation of sample to strata
 - To form strata itself
 - As auxiliary variable
 - To form sampling units of hogher size
 - Other supplementary Information such as population density, ethnic groups, main economic activity, average income level etc.

Maintaining the MSF

5. Documentation and Maintenance of MSF

- Documentation starts with creation of a database containing all the frame units
- Each unit should be uniquely identified with the use of numerical identifiers in a hierarchical fashion
- A number of unit characteristics such as population, no. of households, U/Rural etc.
- Should be easy to access and use. Excel format may be sufficient for most purposes

Maintaining the MSF

- Two kinds of changes affect durability of MSF
- Changes in frame unit boundaries
 - Creation of new districts/administrative divisions
 - Splitting of existing divisions
 - Only boundaries are altered
 - System be developed to obtain such information
- Changes in frame unit characteristics
 - Change in identification (names)
 - Change in measure of size/classification
 - Changes problematic only when large and sudden changes



MSF for Agriculture

- Many countries depend on Administrative Reporting Systems
 - Not based on objective assessments
 - have quality issues
 - Only economic data is collected and aggregated at different levels without link to socio economic data
 - Aggregation does not allow further analysis at lower level
- Data collected by sector not amenable to cross sectoral analysis
- Duplicated data collections by different Government Organizations

MSF is expected to introduce objectivity in agriculture assessment using sampling approach.

MSF will also enable operational efficiencies in data collection



Samples Frames for Agricultural Statistics

- Population Census Enumeration areas
 - Cartographic maps used to divide the country into Eas
 - PHC provides population and household numbers by EA
 - Sample of EA at first stage
 - List all households in the sampled EAs and screen them for desired survey purpose (crops/livestock, fisheries)
 - Can be made more efficient if question on agriculture is included in PHC
- Household Registers from population census
 - Develop a register of hhs listed in PHC and use for surveys
 - Drawkack is list becomes outdated soon unless we have regular means of updation
- Agricultural Census Enumeration Areas
 - Cartographic material from PHC is used for ag. Census
 - EAs become the frame, with additional information collected during agricultural census for screening of Eas
 - Sample Eas are screened for farms/agrl. Holdings for production surveys



Samples Frames for Agricultural Statistics

- Register of Farms from agricultural census
 - List of hhs prepared during ag. Census are used to develop Farm register
 - List becomes obsolete soon
- Registers of Farms from administrative sources
 - Mainly in countries where farms have to pay taxes
 - List of farms is maintained but it has coverage issues
 - Small scale farms/subsistence farms may be excluded
- Area Sample Frames
- Divide the country into administrative areas such as provinces, districts, blocks.
- Satellite imagery used to divide the admn areas into land use categories
- Each land use stratum is divided into square grids.
- Sample of segments/points is selected and associated with hhs
- Construction of area frame is usually costly and time consuming
- But is stable over long time, provides complete coverage
- Can be used for geo referencing survey data with land use category
- Disadvantage is that sampling based on land use not on size or type of holding



Multiple Frames

- A combination of list frames and area frames
- Appropriate where large variation in size and type of agricultural holdings with a subset of large commercial farms
- Area frame ensures that all subsistence/small farms are covered
- List frame of large farms ensures coverage of small number of these enterprises.

Thank You

