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# MULTIPLE FRAME SURVEYS FOR AGRICULTURAL STATISTICS

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In our nation, the Agriculture Enumerative Survey (AES) is carried out every five years by the Agriculture Division of Statistics. Estimates for crops, animals, and other products are produced for all states by the AES, a multi-purpose survey based on an area sample. The survey has frequently had issues with the sample size allotted to smaller provinces being insufficient to generate accurate provincial estimates.

When it is impossible to secure a single sampling frame that covers the entire population or when two or more affordable sampling frames are available from various sources and cover the entire population, multiple frames (MF) are preferred. The usage of several frames is often necessary even if it is sometimes possible to employ a unique frame, but doing so may be quite expensive.

Even if using a unique frame is occasionally conceivable, doing so may be highly expensive. As a result, it may be more cost-effective to use numerous frames to cover the entire population. Utilizing MF surveys is mostly done so in order to save costs while keeping estimating efficiency that is nearly on par with single frame surveys.

In a multiple-frame survey, probability samples are drawn independently from the frames $A_1$, $A_2$,…,$_Q$; Q ≥ 2 respectively. The union of the Q frames is assumed to cover the finite population of interest U. Then the universe may be divided into $2_Q$ -1 mutually exclusive domain.Instead of using the standard single frame of units from the target population, a multiple frame (MF) survey combines two or more sampling frames. If independent probability samples are chosen from different frames, each frame may or may not be full, but the union is presumed to be complete and the information from the samples is used to estimate quantities of interest. Incomplete frames are less expensive to sample than

entire frames, provided they are available.

In order to do this, area and one or more list frames are typically used together for agricultural purposes.

Example: In Agricultural sector:

- Use of several lists frames(List of food crop farmers, list of cash crop farmers)
- Use of area and list frames

## Advantages of Multiple Frame surveys

- Highlight each frame's advantages while minimizing its shortcomings.
- When an area frame and a list frame are combined, numerous frames enable the quick and inexpensive generation of lists of agricultural holdings solely in the selected areas rather than across the entire nation. It is possible to measure and control variability.
- Enable the study of special or rare products.

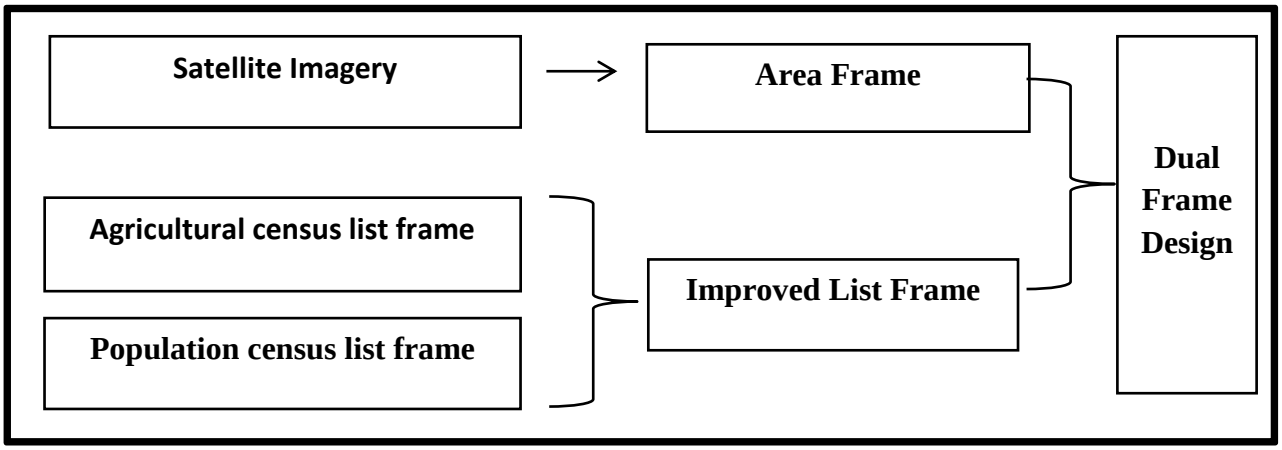


**Fig1:** Application of Multiple Frame Surveyin Agricultural sector

The concept of the multiple frame approach was initially developed theoretically by Hartley in 1962. Later, Cochran (1965), Lund (1968), Fuller and Burmeister (1972), Hartley (1974), Skinner (1991), Mecatti (2007), Rao and Wu (2010), and other authors contributed significantly to this study.

## Different Multiple Frame Estimators

- Hartley and the screening estimator (Hartley (1962, 1974))
- The Fuller-Burmeister estimator (Fuller and Burmeister (1972))

- The ranking ratio estimator (Skinner (1991))
- Pseudo-maximum likelihood (PML) estimator (Skinner and Rao (1996))
- Single frame multiplicity estimators (Mecatti (2007))
- Pseudo-Empirical Likelihood (PEL) estimator (Rao and Wu (2010))
- Generalized modified Horvitz-Thompson (GMHT) estimator (Singh and Mecatti (2011))

## Conclusion

In conclusion, it is felt that multiple frame testing has unquestionably been worthwhile after reviewing various research based on MFS. We will be able to greatly enhance our estimates in next surveys, just as other nations that have previously attained improved estimators, by applying the MFS approach to the Agricultural Surveys of India. The Multiple Frame minimizes the flaws of each frame while maximizing their positives. In the context of Multiple Frame, a number of estimates with varying levels of complexity are produced, although it is advised that the estimator be selected on the basis of simplicity. The easiest estimators to comprehend and use in real life are screening estimators(Hartley (1962, 1974)). Additionally, the sampling size to be defined should minimize the variance subject while allocating it to the region and list frame.

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