NASS List Sampling Frames and Sampling Methodologies

NASS LIST SAMPLING FRAMES

NASS's list frame is a roster of known farmers and ranchers and includes a profile of each operation indicating the size of the operation and the commodities they produce. NASS continually works to keep the list frame as complete as possible by obtaining records for new or omitted operations from other USDA lists, producer association lists, and many other sources. A special effort is made to ensure that larger producers are included on the list. Nevertheless, a list frame can never provide complete coverage of all farms, since farming arrangements are constantly changing. Moreover, there will always be some farms on the list that are out of business. Despite these limitations, the list frame is an efficient method to select samples and data can be collected using less expensive methods such as mail, telephone, or internet.

SAMPLING METHODOLOGIES

NASS evaluates survey goals and available information (List Frame Data, Survey Data, Pilot Study, Administrative Data, etc.) when selecting a sample design for a particular survey. Two of many sample designs used by NASS are stratified simple random and Multivariate Probability Proportional to Size (MPPS).

The sample size formula for a stratified simple random sampling design is:

$$n_{jh} = \frac{1}{\left(\frac{\left(\left(CV_{jh}\right)T_{jh}\right)^{\square}}{100\left(N_{jh}\,s_{jh}^{\square}\right)}\right)^2 + \frac{1^{\square}_{\square}}{N_{jh}}}$$

Where:
n_{jh} is the sample size for target commodity h in strata j,
N_{jh} is the population for target commodity h in strata j,
Sj_h is the standard deviation for target commodity h in strata j,
CV_{jh} is the coefficient of variation for target commodity h in strata j, and
T_{jh} is the total for target commodity h in strata j.

The MPPS uses multiple auxiliary variables in the sample allocation to achieve the sampling efficiency of a Probability Proportional to Size (PPS) design in the estimation of multiple variables. The target sample size for each commodity was derived using a simple random sample size formula.

The probability of selection for an MPPS design is:

❑

$$\pi_{ij}=min\left\{1,max\left(n_{j1}\times\frac{x_{ij1}^{0.75}}{\sum_{i=1}^{N_h}x_{ij1}^{0.75}},\ldots,n_{jH}\times\frac{x_{ijH}^{0.75}}{\sum_{i=1}^{N_h}x_{ijH}^{0.75}}\right)\right\}$$

Where:
π_{ij} is the maximum probability of selection for farm operator i in state j.
i is the farm operator.
h is the target commodity (h=1,…,H).
j is the state.
N_h is the number of farm operators in the sampling frame for target commodity h, and
x_{ijh} is the value of target commodity h for the ith farm operator in state j.

A sample is chosen by sorting the sampling frame on a measure of size variable, generating a uniform random number (RN), calculating the cumulative probability for unit i as $Cumulative_i = Cumulative_{i+1} + \pi_i$, and selecting unit i if $Cumulative_{i+1}<RN+k< = Cumulative_i$ for any k= 0,1,2, …n where n is the total number of units selected for the sample[1].

---

[1] Hicks, Susan, Amrhein, John and Kott, Phil (1996), Methods to Meet Target Sample Sizes Under a Multivariate PPS Sampling Strategy, Proceedings of the Section on Survey Research Methods, American Statistical Association, pp. 234-238.