

APPLICATION OF THE RANKED SET SAMPLING TO AGRICULTURAL DATA

Rasa Beržvinskaitė
Statistics Lithuania, Lithuania, rasa.berzvinskaite@stat.gov.lt

Ranked set sampling (RSS) is a sampling technique, which uses the sampler's judgment or auxiliary information about the relative sizes of the sampling units. It allows to collect observations that are more likely to represent the full range of values from the population than the simple random sample (SRS) of the same size. The method was first proposed by McIntyre (1952) as a way to estimate mean pasture and forage yields. It was later improved and modified by numerous researchers. A literature review of the RSS method as well as some of its modifications and applications are provided by AL-Omar & Bouza (2014). Application of the method in finite population studies are introduced by Kowalczyk (2004) and Ozturk (2014).

A survey of agricultural crop area, harvest and yield is carried out at Statistics Lithuania every year. A stratified simple random sampling design is currently used to estimate the population total of variables of interest. Some improvements in the survey could be made in order to gain more accurate estimates. The aim of this work is to apply RSS and SRS methods to agricultural data of the mentioned survey and to compare the results obtained from estimating the population total. Data from the survey are used as a finite population for simulation study. Two different RSS designs, i.e. *level-1* and *level-2*, and five different sets of the method parameters (set size and number of cycles) are used for simulation. There are 25000 iterations performed for each set. The results are compared with respect to the different types of errors: root mean square error, relative root mean square error, absolute bias and average absolute bias. According to the simulation results, it is possible to choose the set of parameters such that the RSS estimator is more accurate than the SRS estimator when the correlation between the study variable and ranking variable is strong enough.

References

- Al-Omari, A. I. & Bouza, C. N. (2014). Review of ranked set sampling: Modifications and applications. *Revista Investigacion Operacional* **35**, 215 – 240.
- Kowalczyk, B. (2004). Ranked set sampling and its applications in finite population studies. *Statistics in Transition* **6**, 1031 – 1046
- McIntyre, G. A. (1952). A method for unbiased selective sampling using ranking sets. *Australian Journal of Agricultural Research* **3**, 385 – 390
- Ozturk, O. (2014). Estimation of population mean and total in a finite population setting using multiple auxiliary variables. *Journal of Agricultural, Biological and Environmental Statistics* **19**, 161 – 184