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Optimal spatial stratification in design-based sampling using digital soil maps

Jaap de Gruijter (2), Alex McBratney (1), and Budiman Minasny (1)
(1) Australia (budiman.minasny@sydney.edu.au), (2) Wageningen University, The Netherlands

Design-based method for sampling is most appropriate for estimating the total or average concentration in an area. The efficiency of a sampling scheme, in terms of precision and cost, is mostly governed by the distribution of the sampling units in the space-time universe. It is known that optimal stratification and allocation of sample sizes will lead to higher accuracy and lower cost of estimation. There are various stratification strategies that have been proposed: equal area, and stratification by ancillary variables, and stratification based on digital soil maps. Equal-area stratification works best if no information on an area is available. However in most situations ancillary variables will be available for the area. Here we can recognise the readily (and cheaply) available information: digital elevation models and aerial photography or satellite imagery or land use information. In addition, soil property map (of the target variable) along with its uncertainty generated from digital mapping approaches can be used. Here we propose an optimum method for stratification based on map of the target variable (soil pH) which takes into account geographical coordinates, model predictions and its uncertainty. An application of the technique for estimating the mean soil pH in a farm in New South Wales will be illustrated.