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Monitoring changes in carbon pools matched to land use and land-use change based on field sampling measurements

Hans Petersson¹, Johannes Breidenbach², David Ellison¹, Mattias Lundblad¹, and Alex Appiah Mensah¹

¹The Swedish University of Agricultural Sciences

²The Norwegian Institute of Bioeconomy Research

Changes in carbon pools, land use and land-use change can be monitored based on field inventoried sampling units without using maps or remote sensing products. One way is to use a sampling framework. The framework can be based on a map, but the map does not necessarily need to be used for improving the estimates. The map can consist of a Member state's total land and freshwater area. The sampling units can be distributed using a systematic grid with randomized location in the framework. A permanent design (the same sample units are re-inventoried in a periodic cycle) has been proven efficient when estimating change. Stratification into assumed homogenous strata is another way to further improve the accuracy of estimates. The distribution of sampling units can be spatially explicit (geo-referenced) in the sense that their locations are identified using GPS. This, combined with the permanent design, makes it possible to estimate both gross and net land use transfers in order to provide a land use matrix. The area-based sampling combined with the Horvitz and Thompson-estimator, makes a sampling unit representative of a certain area and all sample units together comprise the total land and freshwater area. This design makes it possible to match changes in carbon pools to land use and land-use change and to trace them back in time.

We present a monitoring design based on the Swedish NFI and adapted to reporting under the UNFCCC/KP frameworks or the EU-regulation. Pros and cons are discussed and we compare with alternative designs (combining ground truth with remote sensing). Finally, we assess the accuracy of estimates of selected variables (sample and model errors).