

# **The use of k-NN estimation in the Finnish Multi-Source National Forest Inventory - development and current problems**

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**Abstract:** Development of the Finnish multi-source national forest inventory (MS-NFI) began in 1989, and the first operative results were calculated in 1990. The entire country has been covered three times so far. A need of obtaining forest resource information for smaller areas than would be possible with field data only without increasing the costs of the inventory significantly, was a driving force behind starting the development of the multi-source forest inventory method (MS-NFI) in connection with the Finnish national forest inventory (NFI). Furthermore, new natural resource satellite images provided new possibilities for increasing the efficiency of the inventories at relatively small additional costs. The method utilises satellite images and digital map data, in addition to NFI field data.

One basic requirement placed on the method was that it should be able to provide information applicable to forestry decision-making. Thus pixel level predictions and estimates for area units are required for all core inventory variables like area and volume estimates, possibly broken down into sub-classes, e.g., by tree species, timber assortments and stand-age classes. The k-NN fulfils this requirement and the basic version is easy to implement. The practical applications have shown, however, many improvement needs for the basic k-NN wherefore several modifications have been introduced, e.g., statistical corrections for map errors, the use of coarse scale forest variables as additional features and feature optimization.

The experienced, development steps, experiences in diverse forests with several tree species are discussed, as well as the current problems and improvement possibilities.

Keywords: forest inventory, multi-source inventory, k-NN