

Fine-Resolution Mapping of soil total nitrogen and soil C:N ratios distribution characteristics across China in 1980s

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Precise estimates of the spatial distribution of soil total nitrogen (STN) is essential for nitrogen sequestration potential, soil nutrient management and global warming researching. However, the accurate detailed maps of STN in a national scale are not available. In this study, a total of 4022 soil profiles from China's Second National Soil Inventory and 18 environmental covariates were employed to characterize the spatial pattern of STN in topsoil (0-20 cm). We have predicted a new map at 90-m resolution with three machine learning approaches, namely Cubist, Random Forest (RF) and Extreme Gradient Boosting (XGBoost). Dividing the whole country into 1086 tiles, each 100 km × 100 km, and parallel computing was used, which can increase the calculation efficiency. Model parameters were settled by 10-fold cross-validation, and accuracy assessments by independent profiles showed that the XGBoost had the best prediction performance with acceptable coefficient of determination (0.34). The predictions showed that the highest STN distributed in the Heilongjiang province, northeast Inner Mongolia province and eastern Tibetan Plateau. Compared with Liang's work in SOM, trends in soil N closely follow trends in C. The C:N ratios showed evident variation among different provinces, soil orders and land use classes. Through nationwide prediction of STN and profound comprehension of C:N ratios characteristics, this study has a certain reference value on future soil nitrogen inventorying and soil nutrition balance assessing.