

Geochemical changes in a podzolic forest soil caused by mechanical site preparation

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Mechanical site preparation after clear-cut of the forest stand is a normal practice in regeneration of forests. Ploughing (deep tilling) causes disturbances to the profile structure of the podzolic soil, because as a result of ploughing illuvial B as well as leached eluvial E horizons together with organic humus layer are turned upside down (so called 'tilt') onto the original soil profile located aside to the furrow. About 7 million ha of the total forest land area has been deeply tilled in Finland, and therefore it is important to increase our knowledge about the geochemical changes taking place in the exposed soil horizons in these areas. The aim of this study was to determine the changes in the total element concentrations of the podzolic soil horizons exposed to soil forming processes due to deep tilling. The changes in the total concentrations reflect the weathering processes in the soil leading to the depletion or enrichment of elements. The effects of deep tilling were studied in a boreal forest soil located in southern Finland.

Samples of the podzolic soil horizons were collected from undisturbed soil, tilt, undisturbed soil below the tilt and furrow 17 years after clear-cut of the forest stand and deep tilling of the forest soil. The total concentrations of elements were determined by x-ray fluorescence (XRF). In the topmost horizons of the furrow where the upper soil horizons (O, E, partly B) had been removed, clear weathering depletion had taken place after the exposure of the remaining B horizon to soil forming processes due to deep tilling (e.g. increase in Zr and decrease in CaO, MgO, FeO concentrations). In tilt horizons, the weathering depletion was not clear and it was found only related to the most sensitive elements (e.g. FeO). The original horizons in the tilt were mixed due to deep tilling, and this seemed to be the main factor determining the concentrations in the tilt.