

# How is the logging residue harvesting reflected in the soil solution N and C concentrations 6 years after the clear-cut?

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## Introduction

Logging residue harvesting for bioenergy in connection to clear-cut is a widely used practice in Finland. In logging residue harvesting where also needles are harvested, significant amounts of nutrients (e.g. N) are removed from the forest ecosystem. Soil solution retained into the forest soil is important for the nutrient (e.g. N) uptake of the trees. The aim of this study was to determine how harvesting or leaving of logging residues is reflected in the soil solution N and C concentrations 6 years after the clear-cut.

## Material and methods

The study site is located in Paltamo, northern Finland, where a Norway spruce stand growing on sandy soil was clear-cut in 2007. Samples were collected in October 2013 from the sample plots of treatments: 1) no logging residues, and 2) 40 kg m<sup>-2</sup> fresh spruce branches. Solution retained in the soil matrix was extracted from the soil samples by the centrifugation method, and the concentrations of the dissolved organic nitrogen (DON), ammonium nitrogen (NH<sub>4</sub>-N), nitrate nitrogen (NO<sub>3</sub>-N) and dissolved organic carbon (DOC) were determined. Soil solution was extracted from the soil samples of the O, E, B, BC and C horizons of the podzolic soil (Fig. 1).

## Results and conclusions

The DOC, DON, NH<sub>4</sub>-N and NO<sub>3</sub>-N concentrations were clearly higher on the experimental sample plot where logging residues were left on the site compared to the situation where they were harvested (Fig. 2).

The clearest differences in the DON and DOC concentrations between the two treatments were found in the O and E horizons. The NH<sub>4</sub>-N and NO<sub>3</sub>-N concentrations were higher in all soil horizons in the treatment containing logging residues (Fig. 2). Because in humus layer the NH<sub>4</sub>-N and NO<sub>3</sub>-N concentrations were orders of magnitude lower than DON concentration, almost all of the nitrogen was in organic form.

In conclusion, logging residues are important from the point of view of nutrient concentrations in soil solution even several years after the clear-cut.



Fig.1. Soil samples were taken by soil horizons of the podzolic soil. There were 4 replicate samples for each soil horizon.

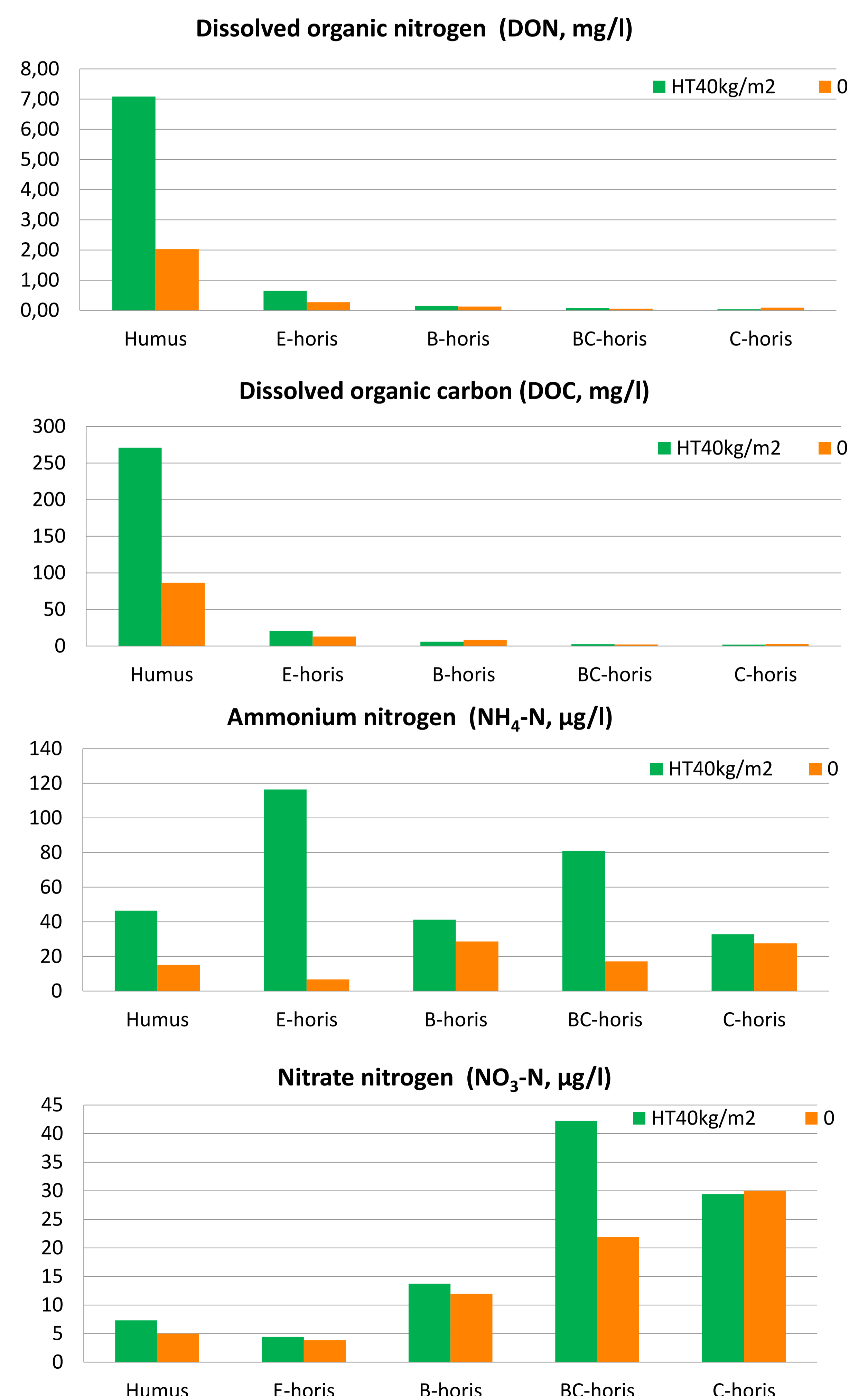


Fig.2. The DON, DOC, NH<sub>4</sub>-N and NO<sub>3</sub>-N concentrations of the soil solution 6 years after the clear-cut (2013) in the O, E, B, BC and C horizons of the podzolic soil. Logging residue (HT) treatments were 40 or 0 kg/m<sup>2</sup> fresh spruce branches. The clear-cut was done in 2007.