

Geophysical Research Abstracts  
Vol. 17, EGU2015-13237, 2015  
EGU General Assembly 2015  
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## Effects of biomass utilization on the carbon balance of Finnish forests

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The boreal forests cover three fourths of the land area of Finland. About 80 per cent of the total forest area is managed for commercial forestry. The forests produce timber for wood processing and pulp and paper industries and provide also bioenergy. The harvests of timber vary depending on demand of products of forest industry; the harvest level has been on average about 70 per cent of growth in recent years. The utilization of forest biomass is therefore the most important factor affecting the carbon balance of Finnish forests.

We made projections of carbon balance of Finnish forests during 2012-2050 based on scenarios of timber and bioenergy demands. To assess the changes in carbon stock of forests, we combined three models: a large-scale forestry model, the soil carbon model Yasso07 for mineral soils, and a method based on emission factors for peatland soils. We considered two harvest scenarios based on the recent projections of plausible levels (min, max) of timber demand. For the bioenergy demand, we compared cases in which the wood energy use was low or high.

In the past decades, the Finnish forests have been a steadily growing and substantial carbon sink. Its size has been more than 40% of the national GHG emissions during 1990-2012. The planned use of wood from the forests to forest and energy industry does not threaten the increasing trend of the forest sink; with the lowest use of forest biomass the sink may even match the national GHG emissions until 2050.

The stock change of trees is the most important component of carbon balance of forests; it accounts for approximately 80 % of the total stock change. Trees and mineral soils act as carbon sinks and the drained peatland soils as a carbon source. By comparing the scenarios of wood energy use we conclude that the amount of carbon emissions avoided by replacing fossil fuels with stemwood is outweighed by the loss in carbon sequestration.