SILAVA

10th International Scientific Conference
RURAL DEVELOPMENT 2021
Challenges for Sustainable Bioeconomy and Climate Change

Impact of litter turnover on carbon cycling in forests with drained and naturally wet nutrient-rich organic soils in Latvia

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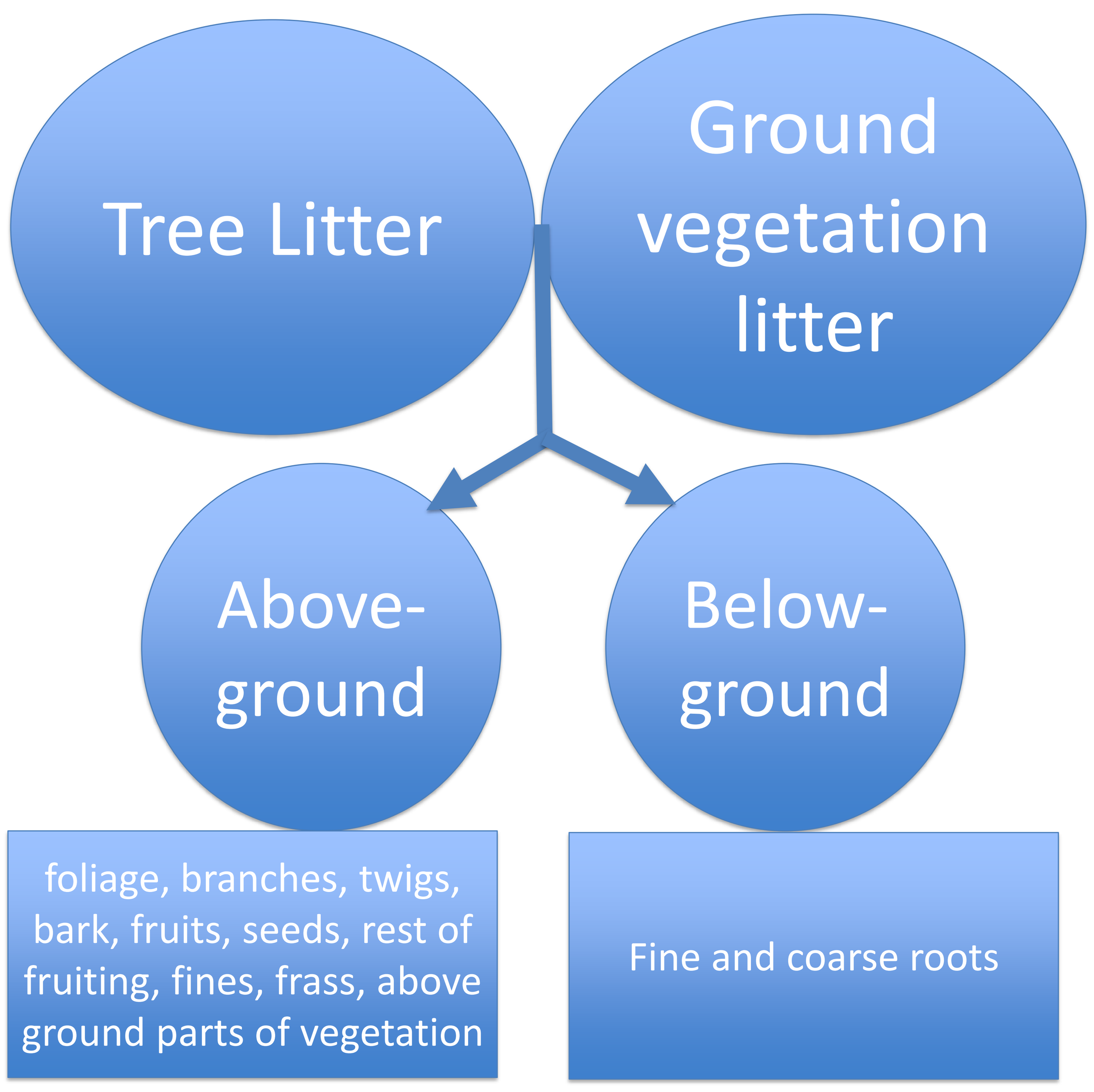
Introduction

Worldwide a large amount of carbon (C) is stored in organic soils. These soils can be both sinks and sources of greenhouse gases (GHG). Drainage of soils lowers the emissions of methane (CH_4), but simultaneously it increases those of carbon dioxide (CO_2) and nitrous oxide (N_2O). Drained organic soils in forest land in Latvia comprise about 384.76 kha , whereas naturally wet organic soils comprise about 334.6 Kha.

Litter production is a crucial parameter in estimating forest soil carbon stock and its changes responding to climate change or management. The process of litter decomposition drives carbon and other nutrient cycles in forest soils.



The aim of the study was to determine the impact of above- and below-ground as well as ground vegetation litter turnover on carbon cycling in forests with drained and naturally wet nutrient-rich organic soils, depending on dominant tree species and stand age to improve National GHG inventory.

Methodology

Tree above-ground litter were collected in 67 research sites representing a typical forests with drained and naturally wet organic soils in hemiboreal region. The forest site types are *Callunosa turf. mel.* (relatively low soil fertility), *Myrtillosa turf. mel*. (relatively high soil fertility), *Vacciniosa turf. mel*. (moderate soil fertility), *Oxalidosa turf. mel*. (relatively high soil fertility), *Filipendulosa* (relatively high soil fertility) and *Dryopterioso–caricosa* (moderately high soil fertility) . The research sites were dominated by *Scots pine* (*Pinus sylvestris* L.), *Norway spruce* (*Picea abies* (L.) H.Karst.), *Silver birch* (*Betula pendula* Roth) and *Black alder* (*Alnus glutinosa*).

A model to estimate fine root biomass was chosen, where stem biomass is required as input data, and the value was multiplied by the C content in biomass.

Ground vegetation biomass was calculated for spruce, pine and broadleaf stands and for different plant forms – mosses, lichens, dwarf-shrubs, herbs and grasses – separately . The input variable is stand age (years).

Results

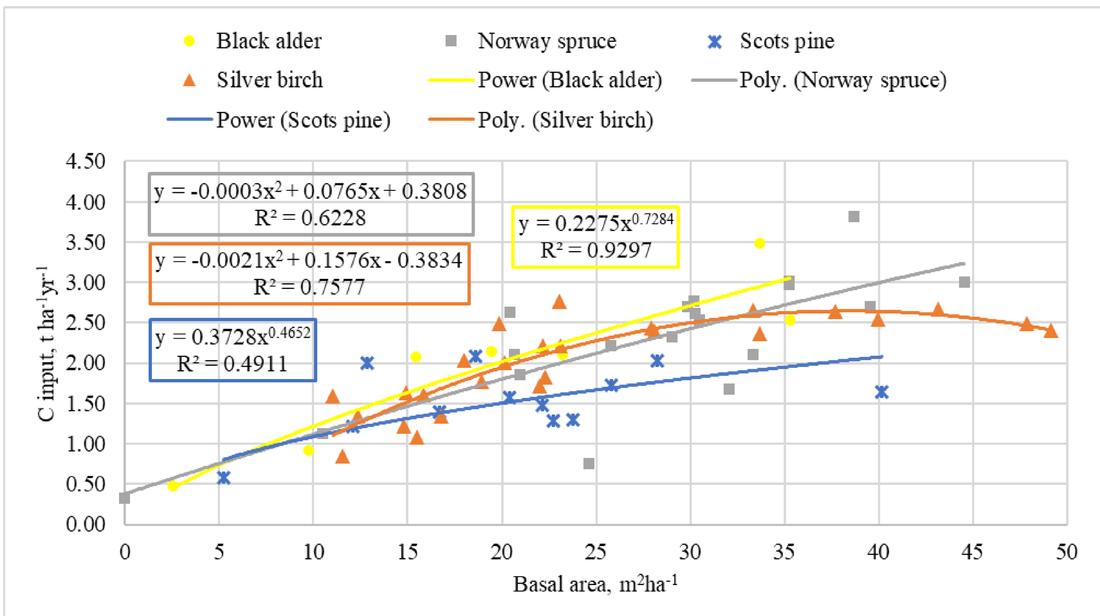


Figure 1. Annual C input with tree above-ground litter in forest stands with different dominant tree species depending on stand basal area

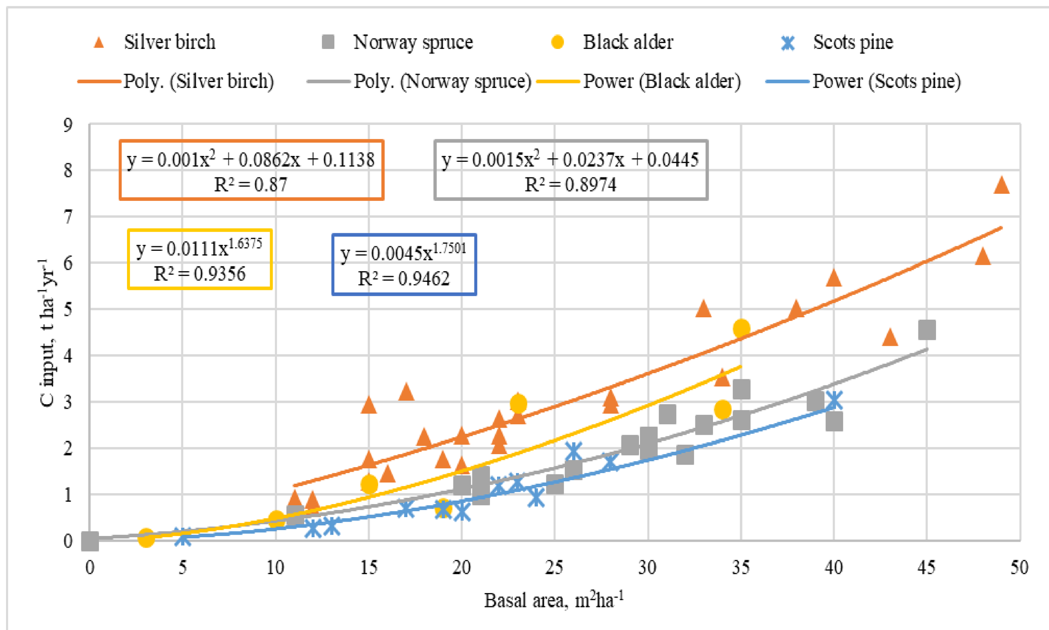


Figure 2. Annual C input with fine-root litter in forest stands with different dominant tree species depending on stand basal area

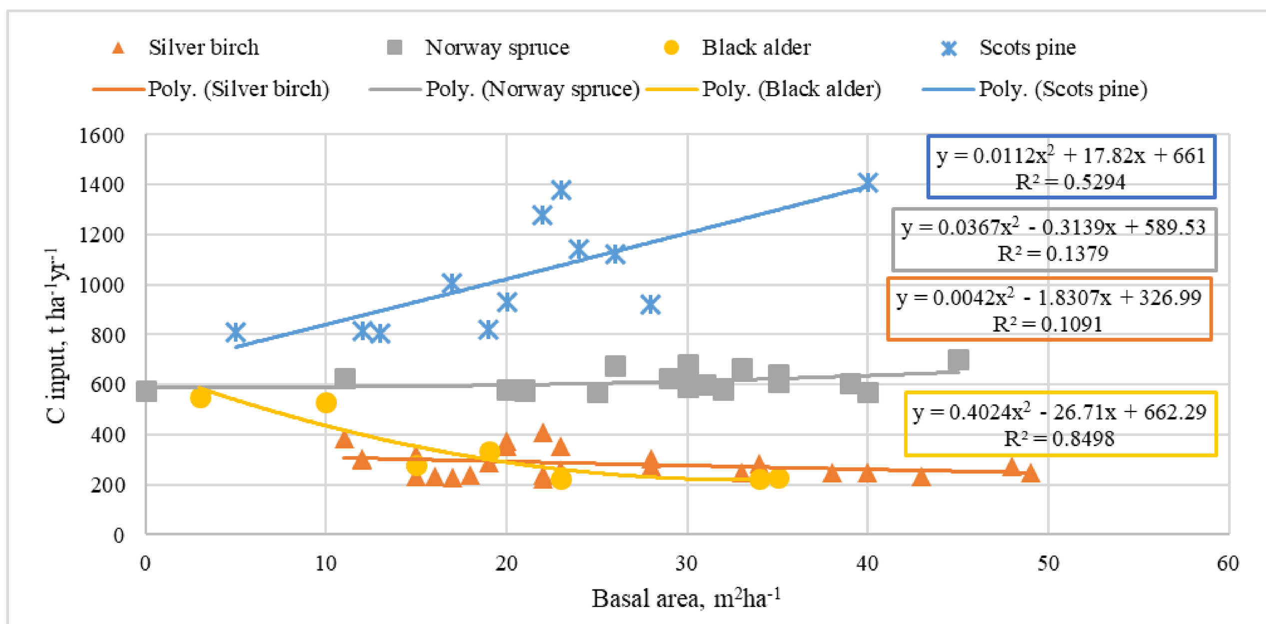


Figure 3. Annual C input with ground vegetation litter in forest stands with different dominant tree species depending on stand basal area

Main conclusions

There is a trend for C input with tree above- and below-ground to increase along with increasing stand basal area.

In conifer stands the C input with ground vegetation increases with stand basal area, whereas for broadleaves there is a slighly decreasing trend.

The improvement of modelling approach to estimate carbon stock in tree below-ground and vegetation litter requires additional data as input variables and country-specific models.

FLPP FUNDAMENTAL AND APPLIED RESEARCH PROJECTS

Evaluation carbon input with above- and below-ground litter in forests on drained and naturally wet organic soils.
LZP-2020/2-0193,
01.12.2020-31.12.2021