Geophysical Research Abstracts
Vol. 14, EGU2012-1199, 2012
EGU General Assembly 2012

Effects of forest biomass use for energy on the European forest litter and soil carbon stocks

A. Repo (1,2), G. Kindermann (3), H. Böttcher (3), and J. Liski (1)

(1) Finnish Environment Institute, Helsinki, Finland (anna.repo@ymparisto.fi), (2) Aalto University, Department of Mathematics and Systems Analysis, Espoo, Finland, (3) International Institute for Applied Systems Analysis, Laxenburg, Austria

Producing bioenergy from forest harvest residues has been considered as an effective means to cut greenhouse gas emissions into the atmosphere and simultaneously to fulfil the renewable energy targets agreed in the European Union. Previous studies have estimated technical, realizable and sustainable potentials of forest bioenergy in Europe. However, in some cases, using bioenergy may not be only beneficial for the global climate. Increasing removals of branches, thinning wood and stumps from forest to energy use decreases carbon input to litter and soil, and therefore decreases the amount of carbon stored in dead wood, litter and soil. The carbon stock changes resulting from an increase in forest biomass extraction rates can decrease the overall net greenhouse gas emission reduction potential of forest bioenergy significantly. The decrease in the forest litter and soil carbon stocks, and the consequent effect on national greenhouse gas balances is different for different European countries due to variability e.g. in climatic conditions, biomass extraction rates and tree species composition. In this study we assess the response of European forest litter and soil carbon stocks with respect to an increase in forest residue energy use to realizable bioenergy potential and combined climate change feedbacks. We use geographically explicit model runs assuming a shift of climate variables over 2011–2100 to investigate expected effects of regional climate change on forest soil carbon stocks and contrast there results with estimates of the effects of increased forest biomass removal and energy use on litter and soil carbon stocks in Europe. The models used are G4M Global Forestry Model and Yasso07 litter and soil carbon model. By adding soil and litter carbon effects of producing bioenergy from forest residues on the forest carbon balance, a more comprehensive greenhouse gas emission budget of forest bioenergy options can be calculated.

Keywords: forest bioenergy, carbon neutrality, soil carbon, G4M, Yasso07.