

First steps to a model-based optimization of the trade-offs between biomass production, climate feedback and water consumption in short rotation coppice forestry.

Toon De Groot^{a,b}, Anne Gobin^b

^aResearch Group Plant and Vegetation Ecology, Department of Biology, University of Antwerp, Universiteitsplein 1, BE-2610 Wilrijk, Belgium

^bUnit Environmental Modelling, VITO, Boeretang 200, BE-2400 Mol, Belgium

email: Toon.DeGroot@ua.ac.be

Abstract

At present 81% of global energy production comes from fossil fuels, which are finite and emit CO₂ into the atmosphere. For these reasons, alternative energy sources are constantly being sought after. Bioenergy, in particular Short Rotation Coppice (SRC), is a promising alternative for the generation of energy. SRCs can be defined as carefully tended, high-density plantations of fast-growing trees, in this project poplar, which are harvested every 2-5 years. The harvest is then burned or gasified to generate electricity. The CO₂ that is emitted by this process was withdrawn from the atmosphere when the crop was growing; so theoretically there is no new carbon added to the atmosphere. However, SRC management (transport, harvest, fertilizers, irrigation), produces certain amounts of CO₂ and other greenhouse gases. Moreover, SRC consumes a great deal of water, which may be needed for other ecosystems. The research introduced in this paper will use a computer model to predict biomass production, greenhouse gas balance and water use of SRC plantations, for different management types in different regions throughout Europe. In this paper we show the results of the first adaptations to the model ORCHIDEE. The adapted version of ORCHIDEE shows significant improvements in biomass prediction. The model, however, still has to be further parameterized and other predictions have yet to be tested. The final overall objective is to determine, for each region, the optimal management that maximizes wood production, while minimizing the impact on natural resources.