Journal of Forest Economics 17 (2011) 197–213

Contents lists available at ScienceDirect

Journal of Forest Economics

journal homepage: www.elsevier.de/jfe

An economic analysis of the potential contribution of forest biomass to the EU RES target and its implications for the EU forest industries

Alexander Moiseyev[a,*], Birger Solberg[a], A. Maarit I. Kallio[b], Marcus Lindner[c]

[a] *Department of Ecology and Natural Resource Management, Norwegian University of Life Science, Ås, Norway*
[b] *METLA (Finnish Forest Research Institute), Vantaa, Finland*
[c] *European Forest Institute, Joensuu, Finland*

ARTICLE INFO

Article history:
Received 30 July 2010
Accepted 15 February 2011

JEL classification:
O13
Q21
Q23
L73

Keywords:
Forest sector model
Biomass
Wood supply
IPCC scenarios

ABSTRACT

This study addresses the effects of increasing energy wood prices on the EU forest sector and on the use of wood biomass for energy. We examine different energy wood price levels under two contrasting scenarios of future global development, defined by the A1 and B2 storylines of IPCC. A1 depicts increased globalization and rapid economic growth. In B2, the economic growth is more modest, and the world is more environmentally conscious and regionally oriented. The analysis carried out using the global forest sector model EFI-GTM shows that as energy wood prices increase, the wood imports and reallocation of wood from competing industrial users such as board manufacturers or the pulp and paper industry also increase strongly. The quantity of wood directed from the forest industry to the energy sector would at most be around 20 Mtoe (million tons of oil equivalent) in terms of energy, given a price of 100 €/m^3 of energy wood. Still, this would cover only around 8% of the European Union's RES target for 2020, and an even lower share for 2030. For some forest industry sectors like production of pulp and panels that would mean an important output reduction, around 20–25%. Additional felling could be an important source of wood for bioenergy in the near future, when utilization of the forest resource potential is still not very high. However, toward 2030, forest resource utilization is projected to increase and might become a limiting factor for additional biomass potentials. Given the relatively high economic growth assumed in the scenarios and

* Corresponding author. Tel.: +358 10 773 4328.
E-mail address: moiseyev@efi.int (A. Moiseyev).

1104-6899/$ – see front matter
doi:10.1016/j.jfe.2011.02.010

the rather strong development in the demand for forest industry products, there is a considerable chance that the supply of wood biomass for energy will be largely limited to logging residues in the long run.

Introduction

The EU policy on increasing the use of renewable energy sources (RES) aims at reducing greenhouse gas emissions, diversifying energy supply, and reducing dependence on volatile fossil fuel markets. The new directive (EU, 2009) on renewable energy sets ambitious targets for all Member States. The EU should reach a 20% share of energy from renewable sources by 2020 and a 10% share of renewable energy in the transport sector. The directive also requires national action plans for the development of renewable energy sources, and it establishes sustainability criteria for biofuels.

Wood biomass is an important component of RES. A number of studies have examined the supply potential and costs of various types of biomass in EU. Some of these studies cover physical supply estimates with simple and straightforward assumptions regarding biomass productivity and land availability (e.g., Ericsson and Nilsson, 2006). Others (e.g., de Wit and Faaij, 2010) collect costs estimates from literature and apply them to form supply curves, providing essential information regarding the cost efficiency of different sources of biomass supply.

Building on a methodology applied in a study for the European Environment Agency (EEA, 2006, 2007), we analyse how the EU's RES policy might affect the wood fiber markets and the forest industry production in Europe, considering specifically the competition for wood between bioenergy production and the forest industries. We explore these effects in two IPCC scenarios for global development – the A1 and B2 (only the B2 scenario was used in the EEA study) – which represent very different views on the future. A1 depicts an increased globalization and rapid economic growth, whereas B2 is more environmentally conscious, regionally oriented and with more modest economic growth.

We also provide additional sensitivity analyses in order to gain insight into the impacts of different assumptions regarding forest plantations in developing countries and regarding the availability of wood for energy in the EU region.

Methodology and inputs

Modelling methodology

In the analysis, we use the EFI-GTM (European Forest Institute Global Trade Model), a regionalized partial equilibrium model of the global forest sector with a special emphasis on Europe. Its previous applications include e.g., addressing the impacts of accelerated forest growth in Europe due to climate change (Solberg et al., 2003), studying the impacts of Russian roundwood tariffs on the global forest sector (Solberg et al., 2010), examining the consequences of forest biodiversity protection on the forest sector (Kallio et al., 2006), and analysing alternative EU policies for combatting illegal logging (Moiseyev et al., 2010).

The EFI-GTM simulates the behaviour of the profit maximizing producers and consumers in the global markets for wood and forest products. The competitive market equilibrium is found by using a mathematical programming formulation, presented briefly below. A detailed description is provided in Kallio et al. (2004).

Let $y^i = (y^i_l)$ be the vector of the production quantities (forest industry production, roundwood harvests, waste paper recovery, conversion of products from one type to another) related to the use of activities l in region i, and let K^i_l be the upper limit (production capacity, maximal harvest) for the production with an activity. Let $A_i = (a_{kl})$ be a matrix of input–output coefficients of endogenous sector products k in activities l in region i, so that for outputs $a_{kl} \geq 0$ and for inputs $a_{kl} \leq 0$. Let $C^i_l(y^i_l)$ be the function of marginal costs related to the use of activity l. It only includes the costs of exogenous