Forests, bioenergy and climate change mitigation: are the worries justified?

There is heated debate about the best way to realize the potential of our forests in the fight against climate change. In the EU, the debate is currently very much focused on questioning the use of forest biomass to produce bioenergy. Our view[1] is that bioenergy from sustainably managed forests can contribute positively to climate change mitigation.

One of the criticisms against forest bioenergy refers to the observation that a tree stops growing and accumulating carbon when it is cut, and the carbon stock in a single stand decreases at harvest. But this narrow perspective overlooks **fundamental principles behind forest management, which is coordinated across the whole landscape to maintain forest growth and obtain a continuous flow of wood for the forest industry.**

In the absence of management, forest growth rates decline and disturbance risks increase as trees become mature. Therefore, while old and unharvested forests can hold large amounts of carbon per hectare, they have a lower sink strength and may become carbon sources instead of sinks. Harvesting of trees and managing stem densities and species composition helps to maintain net forest growth (i.e., carbon sink) at a high level, allowing sustained harvesting. The forest growth rates can be enhanced through silviculture, such as species selection, planting and other management options. This has been the case for example in the Nordic countries.

The carbon stock at a regional or national level can in fact increase simultaneously with increases in harvesting. Indeed, the EU forest carbon sink and forest harvesting have increased simultaneously since the 1960s. This situation is to a large extent the result of improved and more extensive forest management. **The increased demand for forest products – including bioenergy products – stimulates and provides income for active forest management that promotes regeneration, enhances growth and helps protect forests against disturbances, such as fires.**

EU forests and the forest sector currently achieve an overall climate change mitigation impact that corresponds to about 13% of the total EU emissions[2]. This includes the carbon sink of forests and harvested wood products, as well as the reduction of emissions achieved when wood products are used instead of emission-intensive materials such as concrete, steel and plastics, or when bioenergy is used instead of fossil fuels. It is important to understand that forest bioenergy is not an independent enterprise but an integral part of forestry-industry-energy systems. Bioenergy systems are often

[1] The views expressed in this Letter are those of the authors and not those of their institutions.

[2] Gert-Jan Nabuurs, Philippe Delacote, David Ellison, Marc Hanewinkel, Marcus Lindner, Martin Nesbit, Markku Ollikainen and Annalisa Savaresi. 2015. A new role for forests and the forest sector in the EU post-2020 climate targets. From Science to Policy 2. European Forest Institute.

components in value chains or production processes that also produce products such as sawnwood, paper and chemicals.

In most European countries, **sawlogs and pulpwood are the main income-generating wood assortments from managed forests**. Processing these to produce forest products generates side-streams of residues that are used for bioenergy. Small trees from thinnings, logging residues, and low-quality wood that is not suitable to produce sawnwood and paper products are also used for bioenergy. This situation is reflected in the fact that despite forest bioenergy having increased significantly in the EU in this century, the roundwood production is at the same level today as it was in the beginning of the century. The increased forest bioenergy production is neither the result of EU having increased energy wood imports. Currently, about 96% of the forest bioenergy use in the EU is based on domestic raw materials. Also, EU wood fuel imports - 4% of EU forest bioenergy use - are roughly equal to its wood fuel exports (Data: FAOSTAT).

There can be synergies and trade-offs between forest carbon sequestration and biomass production. Which approach is more beneficial depends on priorities concerning short-term vs. long-term climate objectives, expectations concerning society's future dependence on carbon based energy and materials, and whether these needs can be met in a climate friendly way without using biomass. Related to this, there is increasing concern that the Paris Agreement target – to limit global warming to well below 2ºC – will not be achieved unless large amounts of CO_2 are withdrawn from the atmosphere. Bioenergy with carbon capture and storage (BECCS) is one of the major options for atmospheric CO_2 withdrawal.

A holistic perspective that recognizes the multiple roles of forests and forest sector in the GHG balance in needed: the system assimilates CO_2 from the atmosphere, stores carbon in soils, standing biomass, and in wood-based products, and it helps to avoid GHG emissions by displacing fossil fuels and other emissions-intensive products. Very detailed regulation, such as imposing strict cascading principles or restricting eligibility for bioenergy to specific feedstocks (e.g., excluding all roundwood, irrespective of size or quality) may prevent the effective management of forest resources to economically meet multiple objectives, including climate change mitigation and adaptation.

A concern expressed in the debate is that the wood demand for bioenergy may rise enormously, threatening the existence of forests. As bioenergy is typically a side-product of forest harvesting and wood processing, and sustainable forest management (SFM) principles provide safeguards against overharvesting, the forest sector's contribution to providing biomass for bioenergy will be limited. To address sustainability concerns, the EU has set criteria to which bioenergy must comply. Several countries have set additional more strict criteria, in some cases allowing only biomass from certified sources.

In the past, the European forest sector has responded to increased demand for sawnwood and paper by expanding forests and intensifying management to increase wood production. Similarly, the likely response to increased bioenergy demand will be to devise management approaches that enable biomass production for energy in conjunction with supply of sawlogs and pulpwood. Considering market realities, SFM

requirements and existing regulations around bioenergy, we do not expect to see a paradigm shift towards large scale cutting of forests solely for bioenergy.

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