ENERWOODS

Doubling Nordic forest productivity

Bioenergy is the dominating renewable energy in the region. It is mainly derived from wood and woody biomass, the production of which can be doubled at the stand scale.

NORDIC ENERGY DEMAND for biofuels and waste is expected to increase from an 18 per cent share of total primary energy demand in 2013 to 35 per cent in 2050, according to the carbon neutral scenario presented in the recently published Nordic Energy Technology Perspectives (NETP) 2016.

Wood and woody biomass is already the most important source of bioenergy in the Nordic and Baltic region. According to the ENERWOODS project leader Palle Madsen, forests can contribute much more towards carbon neutrality. "Forests can become much more productive by using well-known measures. In a transition period, we can also harvest more low-grade wood material to foster an increased biofuel supply in the coming decades," he says.

NO NEED FOR IMPORTS

Net imports will be needed to meet approximately 16 per cent of the total biomass demand from all sectors in the Nordic region in 2050, according to the NETP 2016 scenario.

The ENERWOODS project researchers, on the other hand, consider it a realistic scenario to intensify management in parts of the forest area to fulfil the needs for domestically produced biomass in the Nordic and Baltic regions, even as global demand for bioenergy increases. "Societies need to act soon. There is only 35 years left, which roughly corresponds to half a forest stand rotation length in the region," Madsen says.

The project researchers assess that it is possible to increase Nordic forest productivity at the stand scale by at least 50–100 per cent of the current level.

WIDESPREAD LACK OF UNDERSTANDING

According to Madsen, areas with productive forest species can compete with energy crops. The main challenge is to increase the awareness that in spite of being long-term affairs – a typical rotation length in the region is 70 years. Forests are dynamic and potentially very productive systems. "There is a widespread lack of understanding of the dynamics and functions of forests," Madsen says.

It is also the experience of the project researchers that stakeholders representing nature and biodiversity interests tend to see more intensive forestry as counterproductive to their interests. Madsen reminds us that what the ENERWOODS project researchers have been working on is not relevant for all of the forest area. "Highly productive stands can neighbour areas that are managed for biodiversity without negative impact. It is up to society how to prioritize the different functions of forests," he says.

HARVESTING MORE

More intensive forestry must be founded on an increased use of timber, since this is the most profitable and sustainable use of the harvest. Replacing energy-intensive materials like concrete, steel or aluminium will give an important substitution effect. Subsequent recycling or burning of the wood after use, to replace fossil fuels, will be the most energy- and climate-effective use. However, large proportions of wood waste and low-grade materials are only suitable for direct use as energy, pulpwood or fibre boards, etc.

On average, 65 per cent of the annual forest growth is harvested in the Nordic and Baltic regions. In the short run, forest biomass can be increased by harvesting more. The historical need to ensure forest recovery explains why sustainable forest management so far has been equivalent to harvesting quite a lot less than the annual growth. Before ENERWOODS, other studies have indicated that a utilization of up to 89 per cent of the growth is currently within the limits of long-term sustainable use. That would also include an increased harvest of low-grade material such as small trees, branches and stumps.

INCREASING GROWTH

A stronger potential for boosting the biomass from Nordic forests can be found in increasing the growth of the forests. The measures suggested in the ENERWOODS

A Danish forest officer leans against a Norway spruce in the central part of Gotland. This is a not a native species in Denmark. While Danes are used to non-native species, this is a big issue in many other countries. (Photo: ENERWOODS)

project can typically increase productivity by at least 50–100 per cent in combined efforts and at the stand scale.

Nurse crops of fast-growing pioneer species provide shelter that favour survival of desired and slower-growing species in the regeneration and young stand phases. This requires careful management and thinning. Mixing in productive, late successional species, for instance fast-growing conifer species, can make a big difference. This would challenge forest legislation and certification schemes in most of the Nordic and Baltic countries. "The number of native tree species in Europe, and particularly in the Nordic and Baltic regions, is low compared to other continents. Forestry is primarily resting on just two tree species – Norway spruce and Scots pine. That means a very low spread of risk in our forests management when facing climate change." Madsen says.

Genetically improved material, which can be produced, for instance, by the use of breeding programmes, can increase the genetic variability and support the forest adaptation capacity towards climate change, for example. Fertilization can speed up the growth in some regions, and afforestation of abandoned farmland can further increase the forest area to a limited extent.

PROJECT AT A GLANCE:

Strengthening Nordic forestry in the development of competitive, efficient and renewable energy systems.

WELL PREPARED

"We have used an open mindset to identify and evaluate possible solutions to develop the potentials of forests and forestry much further than today. There will always be advantages and disadvantages," Madsen says. The question is whether society and decision-makers are aware of the opportunities, or willing to exploit them. The large forest areas and the well-established forest management, forest industry and infrastructure in the Nordic and Baltic regions make these regions well prepared along all of the value chains to implement a more intensive management – if there is confidence in the long-term profitability of the investments. "Nordic countries should act and speak with one voice to the EU and the rest of world, to highlight the important role of forests and forest management towards a low-carbon society," Madsen says.

"Nordic and Baltic forests can become much more productive," says Palle Madsen. (Photo: Inger Ulrich)

PROJECT FACTS:

PROJECT NAME: Wood based energy systems from Nordic and Baltic forests (ENERWOODS)

PROJECT LEADER: Senior Researcher Palle Madsen, Forest & Landscape, IGN, University of Copenhagen

PERIOD: 2011–2015

FUNDING: NOK 14 million from NER, NOK 18.6 million total budget

OUTPUT: 20 peer-reviewed publications, 75 non-peer-reviewed publications, 52 presentations, 19 workshops/seminars/conferences, 8 PhDs

PARTNERS: The University of Copenhagen, The Forestry Research Institute of Sweden, Finnish Forest Research Institute (currently Natural Resources Institute Finland), School of Engineering at Linnaeus University, Southern Swedish Forest Research Centre at Swedish University of Agricultural Sciences, School of Forest Sciences at University of Eastern Finland, Finnish Environment Institute, Norwegian Institute of Bioeconomy Research

WEBSITE: http://enerwoods.ku.dk