Forest management for a changing world

August 28 2012

When it comes to devising a forest management strategy, recommendations for rotation lengths, thinning years and thinning intensities are usually made. However, a new EU-funded study from Finnish researchers now suggests that in light of uncertain growth and economic conditions, these methods may no longer be the most effective.

Writing in the journal *Forestry*, Timo Pukkala and Seppo Kellomäki from the University of Eastern Finland explain that forest management should adapt to changing situations, in particular the uncertainties surrounding tree growth and timber price.

The study was supported by the MOTIVE ('Models for Adaptive forest

Management') project, which received almost EUR 7 million of funding under the 'Environment' Theme of the EU's Seventh Framework Programme (FP7).

The researchers made calculations based on 'optimisation approaches' for managing a mixed stand of Scots pine, Norway spruce and birch in the northern boreal forest area. A mixed stand is timber stand in which less than 80% of the trees in the main canopy are of a single species.

The team describes both an anticipatory optimisation approach that produces fixed cutting years, cutting basal areas or cutting diameters, and an adaptive optimisation approach that produces rules on how to react to the actual state of nature. Both of these optimisation approaches lead to the same management strategy when growth and all other factors are deterministic; however, differences appear when growth or price varies.

Results show that an increase in tree growth rate under climate change does not strongly affect the optimal management if the timber price is fixed. However, when timber prices vary, it is usually beneficial to delay clear-felling, irrespective of the presence or absence of a climate-induced trend in tree growth. It is also beneficial to distribute the incomes more evenly among different cutting events when risk and risk aversion increase. In mixed stands, there will be more alternatives for the adaptation of management, as the preference for tree species can be changed over time based on their growth and the prices of the different assortments.

'The study showed what clever forest landowners already know. When future round wood prices and uses are unknown, the landowner should continuously have several tree species and timber assortments in his forest. Growing only spruce in even-aged stands is risky business. We hope that our study will promote diversified forest management, leading

to diversified forest structures,' comments Timo Pukkala.

The study comes at the same time as another study, also supported by the EU-funded project MOTIVE, warns that Swedish forests have not fully recovered from a 2005 storm that devastated the country.

The storm, known as Gudrun in Sweden, caused EUR 2.4 billion of damage to Swedish forests. The new study, from Rupert Seidl and Kristina Blennow from the University of Agricultural Sciences in Alnarp, Sweden, shows that in addition to immediately visible damage such as uprooting and stem breakage, significant long-term effects were also seen in terms of the functioning of the trees that survived the storm, and their productivity and allocation.

The study shows that growth reduction following the storm was significant and pervasive. Wind-related growth reduction in Norway spruce forests surviving the storm exceeded 10 % in the worst hit regions. Wind-related growth reduction amounted to 3.0 million cubic metres in the three years following Gudrun, exceeding the annual long-term average storm damage from uprooting and stem breakage in Sweden.

The researchers want to get the message across that the impact of strong winds on forest ecosystems is not limited to the immediately visible area of structural damage. They are calling for broader consideration of disturbance effects on ecosystem structure and functioning in the context of forest management and climate change mitigation.

More information: Pukkala, T. and Kellomäki, S., 'Anticipatory vs adaptive optimization of stand management when tree growth and timber prices are stochastic', *Forestry*, 2012. DOI:10.1093/forestry/cps043

Provided by CORDIS