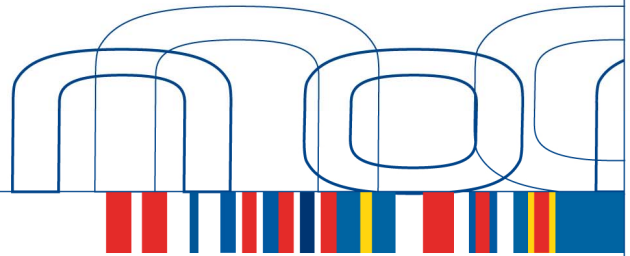




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## Increased biomass harvesting for bioenergy Effects on biodiversity, landscape and cultural heritage values

As part of a strategy to combat climate change, the Nordic countries intend to greatly increase the production and use of renewable energy. Bioenergy is one important form of renewable energy where Finland, Norway and Sweden in particular have considerable potential.

Greater use of biomass for energy may have wide-reaching consequences for our land management and for associated environmental values. In a recent review, effects of increased biomass harvesting on biodiversity, landscape amenities, and cultural heritage values are assessed for Fennoscandia. The review is based on existing studies and general knowledge of the production and harvesting systems and their effects.

### Main biomass harvesting options

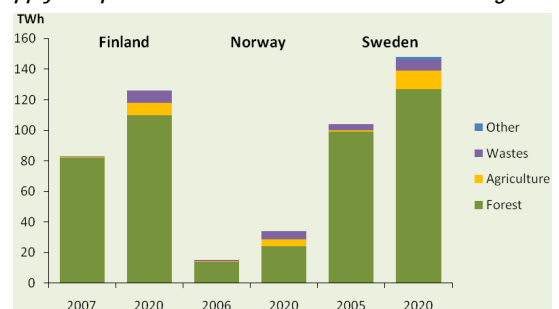
Based on public recommendations and the current debate on the use of biomass, the following harvesting options need to be considered from forests, farmland, mires and wetlands:

- Increased harvesting of logging residues, stumps, trees from tending and thinning of young forest, and non-standard wood from current logging areas, especially from forestry districts near roads and facilities for effective use of the biomass resources (e.g., heating plants, industrial facilities).
- Increased intensity of forest cultivation activities, such as building of forest roads, soil preparation, nitrogen fertilization, planting, various thinning regimes, use of high-yield varieties or species, and shorter rotation time, on current logging areas.
- Increased harvesting of woody residues from clearing of power line corridors and along roads where effective transportation to facilities for use of the biomass is possible.
- Increased harvesting from currently non-commercial forest as well as increased afforestation may be relevant under suitable economical constraints, especially in Norway.
- Increased cultivation of energy crops on arable land, such as grains, oilseed crops, and grasses, primarily in Finland and Sweden.
- Increased short rotation forestry with willows and poplars on farmland, primarily in Finland and Sweden.
- Increased harvesting of wood resources from marginal agricultural land, field edges etc, to a limited extent where the biomass can be exploited locally.
- Biomass harvesting from mires and wetlands may primarily be in the form of harvesting of *Sphagnum* and canary reed grass on former peat mining areas and harvesting reed in shallow water bodies, mainly in Finland.



Finland, Norway and Sweden have a high potential of harvesting biomass for energy but this will affect the landscape and its environmental values. Photo: V Gundersen

### Supply and potential for renewable biomass harvesting



The current supply of renewable bioenergy in Finland, Norway, and Sweden is equivalent to 83 TWh, 15 TWh, and 104 TWh, respectively, of which more than 90% comes from the forest sector. Assessments for total supplies of bioenergy by 2020 vary but are in the order of 126 TWh, 34 TWh, and 151 TWh for Finland, Norway and Sweden, respectively.

### More information:

Framstad, E., Berglund, H., Gundersen, V., Heikkilä, R., Lankinen, N., Peltola, T., Risbøl, O. & Weih, M. 2009. Increased biomass harvesting for bioenergy – effects on biodiversity, landscape amenities and cultural heritage values. TemaNord 2009:591

**Acceptable or marginal negative effects**

The following biomass harvesting measures will in most cases be acceptable or have only minor negative effects:

- Harvesting of logging residues, including trees from tending of young forest and thinning, seems to be among the more acceptable forms of biomass harvesting. It will probably have only marginally negative or few effects on biodiversity and cultural heritage values and a positive effect for landscape appreciation and outdoor recreation. However, the general environmental concerns in forestry should then be strengthened and appropriate measures taken to avoid damage to important resources for biodiversity (e.g., coarse dead wood, old deciduous trees) and cultural heritage remains.
- Harvesting of biomass from power line corridors and along roads will have similar limited effects for biodiversity and cultural heritage values and positive effects for landscape appreciation as removal of logging residues.
- Harvesting of bushes and trees from marginal farmland will reduce the negative effects of succession to woody vegetation and is likely to have mainly positive effects for biodiversity, landscape appreciation and cultural heritage values. However, particular measures are needed to avoid damage to cultural heritage values and to preserve valuable resources for biodiversity, especially old deciduous trees.

**Mainly negative effects**

The following biomass harvesting measures will have mainly or even serious negative environmental effects:

- Harvesting of stumps will have a negative effect particularly on landscape appreciation and cultural heritage values. The effects on biodiversity are inadequately known.
- Intensification of silviculture will magnify the various negative effects of current forestry activities for biodiversity, landscape appreciation and cultural heritage values through a more schematic and less diverse forest landscape, less unexploited forest area, shorter rotation time, more extensive use of non-native species, and more disturbance. Shorter rotation time will be particularly negative for biodiversity.
- Harvesting of biomass from currently non-commercial forests is likely to have a negative effect on biodiversity, landscape appreciation and outdoor recreation, as well as cultural heritage values, since such forest areas probably have had less human impact in the recent past. However, we need better information about the distribution of biodiversity and cultural heritage values in such areas.
- Natural succession of woody vegetation or planned afforestation on former marginal agricultural land will have a strong negative effect on biodiversity, landscape appreciation and cultural heritage values as open landscapes characterised by extensive traditional farming activities are among the most valuable for biodiversity and landscape appreciation as well as often important locations for cultural heritage remains.
- Increased use of bioenergy crops like reed canary grass and short rotation forestry with willows etc on arable land will in most cases have a negative effect on biodiversity and landscape appreciation through its dense and closed vegetation, and on cultural heritage values both by changing the cultural environment and by risking disturbance of remains in the soil through deep and powerful root systems. The effects of reed canary grass and willows on biodiversity and landscape appreciation may be more positive in landscapes dominated by intensive agriculture.



*Piles of logging residues. Photo: R Heikkilä*



*Woody vegetation from marginal farmland. Photo: V Gundersen*



*Piles of extracted stumps after clear-cutting. Photo: H Berglund*



*Willows in short rotation forestry on farmland. Photo: M Weih*

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