POTENTIAL AND DISTRIBUTION OF SMALL-DIAMETER THINNING WOOD IN FINLAND

Young forests contain a large potential of usable biomass. Generally, roundwood yields are small or negligible in thinning stands and harvesting costs tend to be high. Besides pure roundwood thinnings, the tree biomass of young stands is currently utilized as energy wood, which is either harvested as delimbed stem wood or as whole trees. In stands of sufficient stem volume, roundwood and energy wood harvestings can also be integrated. Not all thinning sites are suitable for whole tree harvesting due to possible detrimental growth effects. In these cases tree crowns must be completely delimbed and harvesting is subjected to stem wood only. In Finland, the potential of small-diameter thinning wood is larger than that of logging residues from final fellings. Most of this potential still remain unutilized.

THINNINGS OF YOUNG STANDS

The potential of non-roundwood biomass of young stands can be divided into three harvesting options. It can be estimated for harvested stem wood only, for whole tree biomass i.e. tree stems including living crown or for the small-diameter stem wood (smaller than roundwood) in integrated thinnings. All of these options offer differing biomass potentials and are suitable for different thinning sites. For instance, harvesting of delimbed stem wood is suitable for all sites regardless of the dominant tree species or site type, whereas whole tree harvesting is not recommended for sites of poor or high-risk nutrient status. However, the harvesting yield can be increased quite significantly by harvesting the crown biomass together with stem wood. Integrated harvesting can be an option for thinning sites where roundwood yield is sufficient.

The aboveground biomass of thinning wood consists of stem wood with bark and crown, which in turn consists of living and dead branches (formed of wood and bark) and needles or leaves. The chemical and physical composition of this biomass assortment is quite complex. Furthermore, the proportions of the biomass components vary between tree species and as tree size changes. The proportions of the aboveground biomass of a typical Scots pine tree found in young thinning stands are roughly 70 % of stem wood with bark and 30 % of crown biomass. The proportions are more or less the same for birches, but in a spruce of similar size crown biomass forms ca. 40 % of the total aboveground biomass.

It has been estimated by Anttila et al. (2013) on the basis of harvesting suggestions of the 10th national forest inventory that the full harvesting potential of small-diameter thinning wood (including crown) in Finland is 12.4 million m^3 per year. 5.1 million m^3 of this consists of Scots pine, 4.6 million m^3 of broadleaved species (mainly birches) and 2.7 million m^3 of Norway spruce. If the thinning wood is harvested as delimbed stem wood, the overall potential is reduced to 9.3 million m^3 per year. Using an integrated harvesting method requiring a minimum of 20 m^3 per ha yield for roundwood in a thinning, the small-diameter wood (without crown) potential would be 10.2 million m^3 per year in the whole country.

CURRENT UTILIZATION

In 2011, 4.3 million m^3 of small-diameter thinning wood was used in energy production in Finland. Regardless of the estimation basis, the utilized volume is clearly less than half of the full harvesting potential. The unutilized potential of whole-tree biomass from thinnings taking into account the utilized volume in the year 2011 would be 8.1 million m^3 per year. Respectively, the unutilized potential of delimbed stem wood would be 5.0 million m^3 and using the integrated harvesting method 5.9 million m^3.

GEOGRAPHICAL DISTRIBUTION OF SMALL WOOD POTENTIAL

Scots pine is the most abundant tree species when thinning wood potential is considered. The potential of broadleaf thinning wood is almost as large. The overall potentials of pine and broadleaved species are concentrated in the Northwestern part of Finland. Similarly, the unutilized pine and broadleaf thinning wood potentials are focused in the Western and Northern parts of the country. The potential of spruce thinning wood is concentrated in the Eastern and Southern parts of Finland, but most of the unutilized spruce potential is focused in the East.

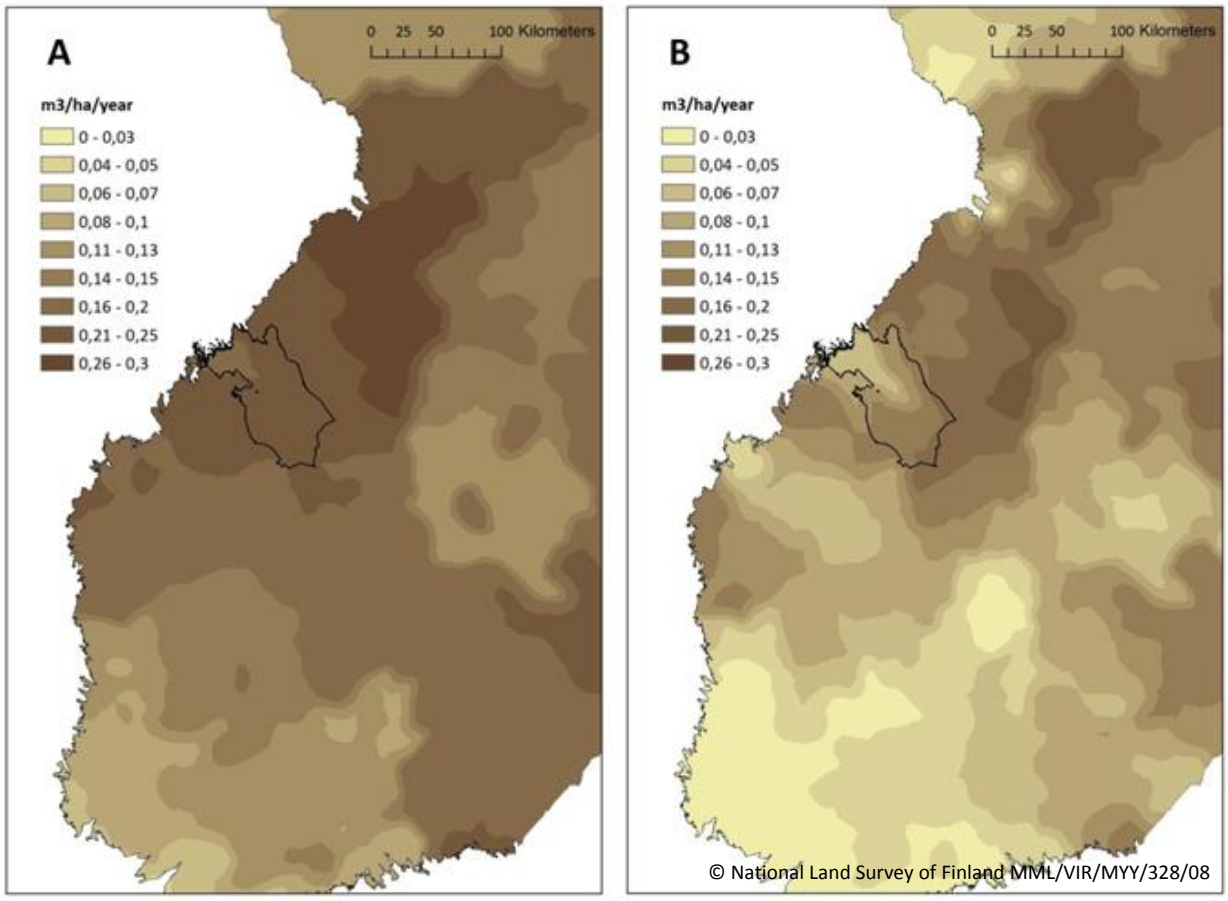

Figure 1. [A]: Volume (per hectare of forest land per year) of harvestable Scots pine small-diameter thinning wood (including crown biomass) as estimated on the basis of 10^{th} NFI; [B]: Potential of pine small-diameter thinning wood when the current utilization is extracted from the harvestable volumes in [A].; Total pine small-diameter thinning wood volumes (incl. crown) in the province of Central Ostrobothnia (outlined in the maps): 110 000 m^3 in [A] and 59 200 m^3 in [B]. The geographical distribution of smallwood utilization was estimated by Anttila et al. (2013).

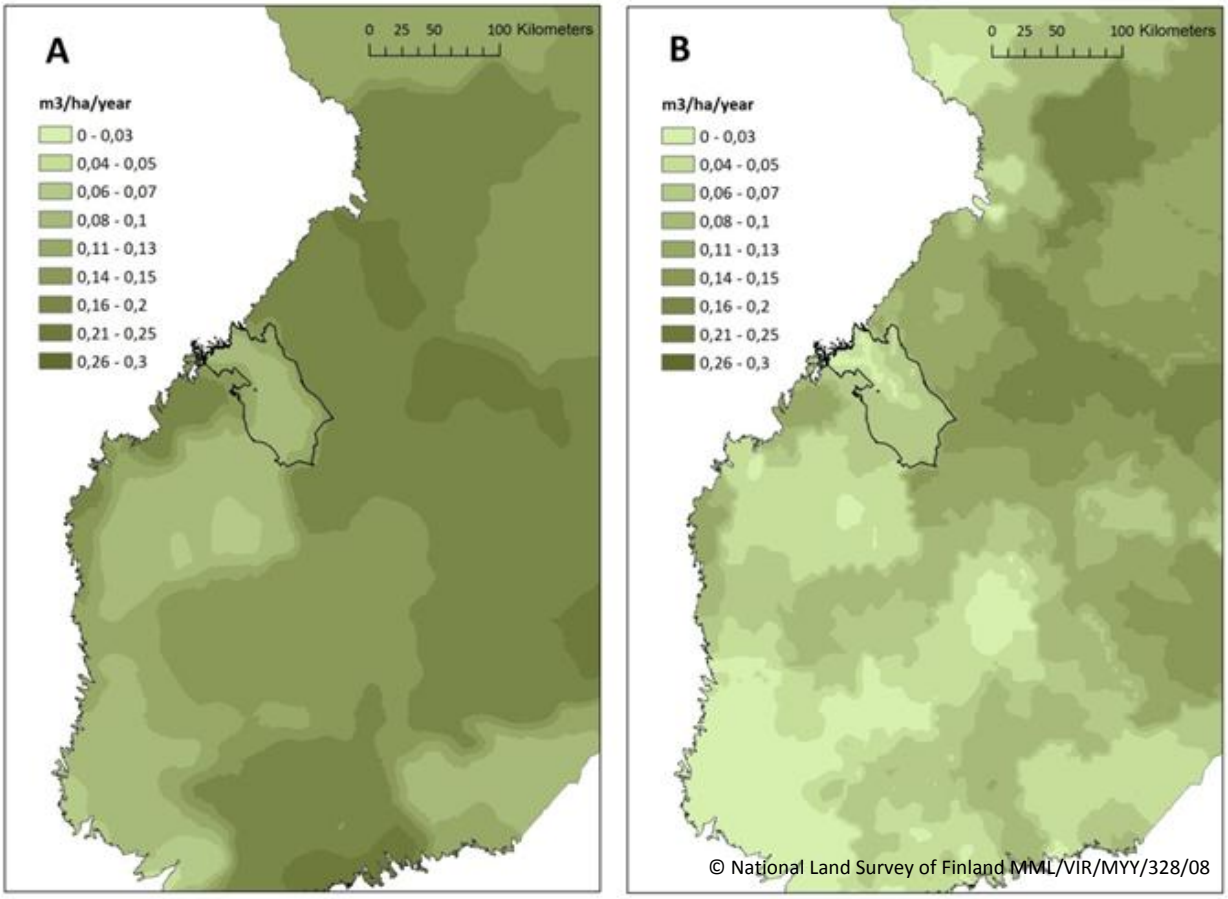

Figure 2. [A]: Volume (per hectare of forest land per year) of harvestable broadleaf small-diameter thinning wood (including crown biomass) as estimated on the basis of 10th NFI; [B]: Potential of broadleaf small-diameter thinning wood when the current utilization is extracted from the harvestable volumes in [A].; Total broadleaf small-diameter thinning wood volumes (incl. crown) in the province of Central Ostrobothnia (outlined in the maps): 49 200 m^3 in [A] and 26 300 m^3 in [B]. The geographical distribution of smallwood utilization was estimated by Anttila et al. (2013).

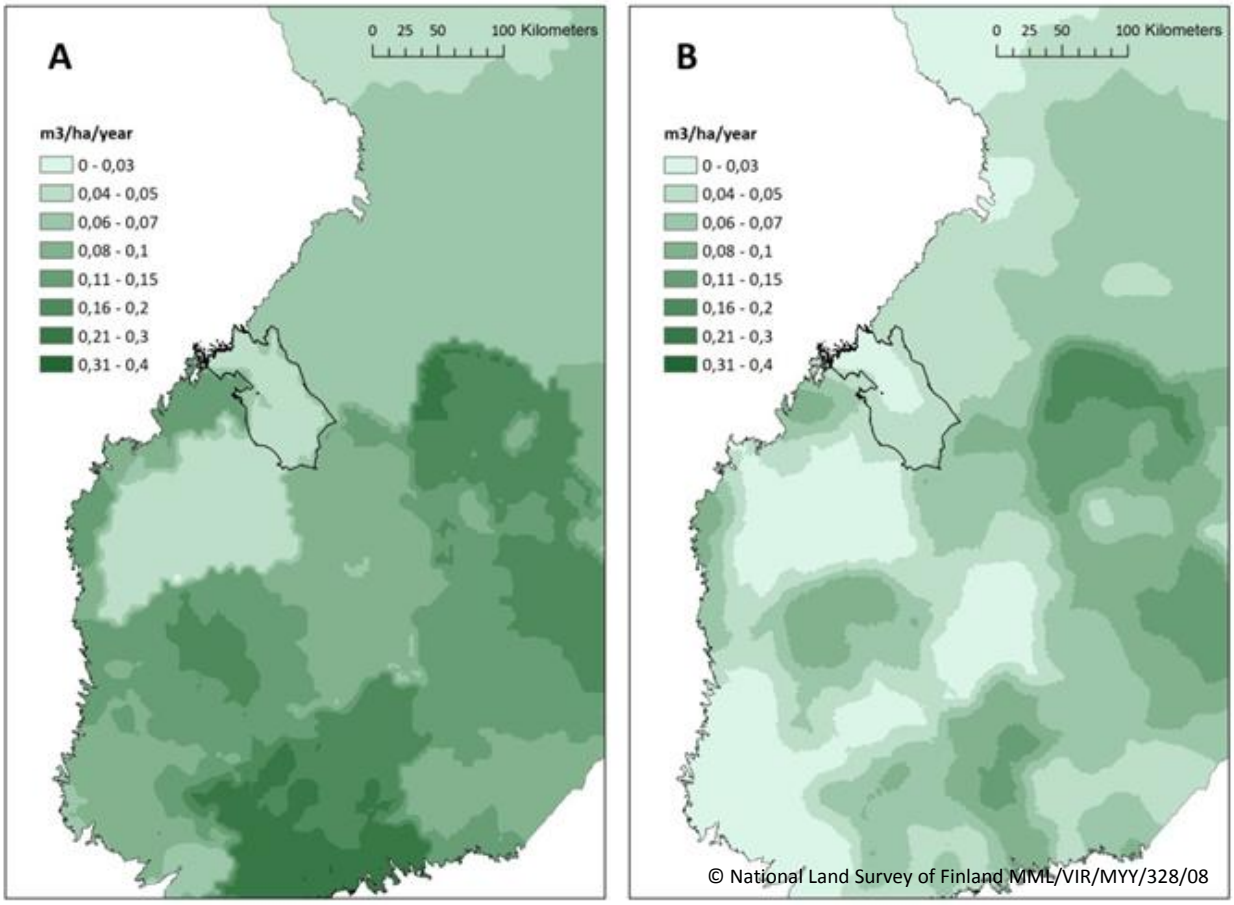

Figure 3. [A]: Volume (per hectare of forest land per year) of harvestable Norway spruce small-diameter thinning wood (including crown biomass) as estimated on the basis of 10th NFI; [B]: Potential of spruce small-diameter thinning wood when the current utilization is extracted from the harvestable volumes in [A].; Total spruce small-diameter thinning wood volumes (incl. crown) in the province of Central Ostrobothnia (outlined in the maps): 22 700 m^3 in [A] and 12 100 m^3 in [B]. The geographical distribution of smallwood utilization was estimated by Anttila et al. (2013).

LITERATURE

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