GIS-ANALYSIS ON BIOMASS POTENTIAL FROM YOUNG FORESTS IN NORTH SWEDEN

Young dense forests represent an unexploited source of small-diameter trees to supply the future biorefinery industry in the Botnia-Atlantica region. A geographical information system (GIS) was applied to evaluate the distribution of young stands in the northern part of Sweden (Norrland). The analysis was based on a dataset containing all forest inventory plots in the country, provided by the National Forest Inventory of Sweden. The GIS also assisted in the calculation of the regional harvesting potentials of different wood assortments. Results from this early stage study showed the area covered by young forests in Norrland is 1.38 million ha, representing 6 % of the total forest area of Sweden.

ESTIMATING BIOMASS DISTRIBUTION AND POTENTIAL WITH GEOGRAPHICAL INFORMATION SYSTEMS (GIS)

The use of GIS represents a powerful tool to determine the suitable areas from which extract small-diameter trees for biorefinery purposes in the Botnia-Atlantica region. A spatial analysis using GIS was carried on to evaluate, first, the distribution of young, un-thinned, dense forests in Sweden. In a second analysis, the amount of different wood assortments (products) from these forests was calculated: delimbed logs, roughly delimbed logs, roughly delimbed tree sections and whole tree sections. The analysis utilized a dataset provided by the National Forest Inventory of Sweden, containing all forest inventory plots from the period 2006-2010 and their geographical coordinates. Amongst other parameters, the dataset included the above-ground biomass density (oven-dry tonnes per hectare, OD t/ha): stem wood (including bark) and living branches (including needles). A calculation of the average stem volume on bark, including the top (dm^3), was also performed for each plot. The dataset contained the forest area (ha) represented by each plot, within each county of Sweden (i.e. the "extent" of the data contained in a single plot), the average tree height, average tree diameter at breast height (DHB), total volume per ha, density of trees per ha, and if the plot had been thinned or not.

TO BE A "YOUNG-DENSE FOREST": CONDITIONS TO FULFIL

With the aim to select the young-dense stands, amongst the total forest area of Sweden, the dataset was exported to the GIS, and the following constrains were applied: not-thinned stands, above-ground biomass density over 30 OD t/ha, average tree height within the interval 3 m ≤ h < 12 m, average DBH under 20 cm and average stem volume within the interval 10 dm^3 ≤ Ø < 120 dm^3. The calculation of the harvesting volumes for each assortment was based on the proportions found in seven inventoried sample stands. The found proportions were applied to the above-ground biomass density of each of the selected plots, to obtain the removal potential (OD t/ha). This potential was multiplied by the area of each plot to calculate the regional harvesting potential (million OD t).

MAIN RESULTS OF THE ANALYSIS

For the whole Sweden, the young dense forests, fulfilling previous restrictions, extend over a total area of 2.11 million ha (9 % of total forest area of Sweden). The results showed the existence of large

areas covered by young dense forests especially in Norrland, in the counties of Västerbotten and Västernorrland. The total area covered by these stands in Norrland account for 1.38 million ha, which represents 6 % of the total forest area of Sweden. The area covered by young stands in Västerbotten is 0.34 million ha, whereas in Västernorrland they account for 0.21 million ha. The calculated potential of delimbed pulpwood logs was 8.8 million OD t, a potential of 16.4 million OD t of roughly delimbed pulpwood logs, 26.5 million OD t of roughly delimbed tree sections and finally, 29.2 million OD t of whole tree sections. Further results from this early stage study will be later implemented and discussed.

KEYWORDS

GIS, biomass potential, small trees, young-dense forests.

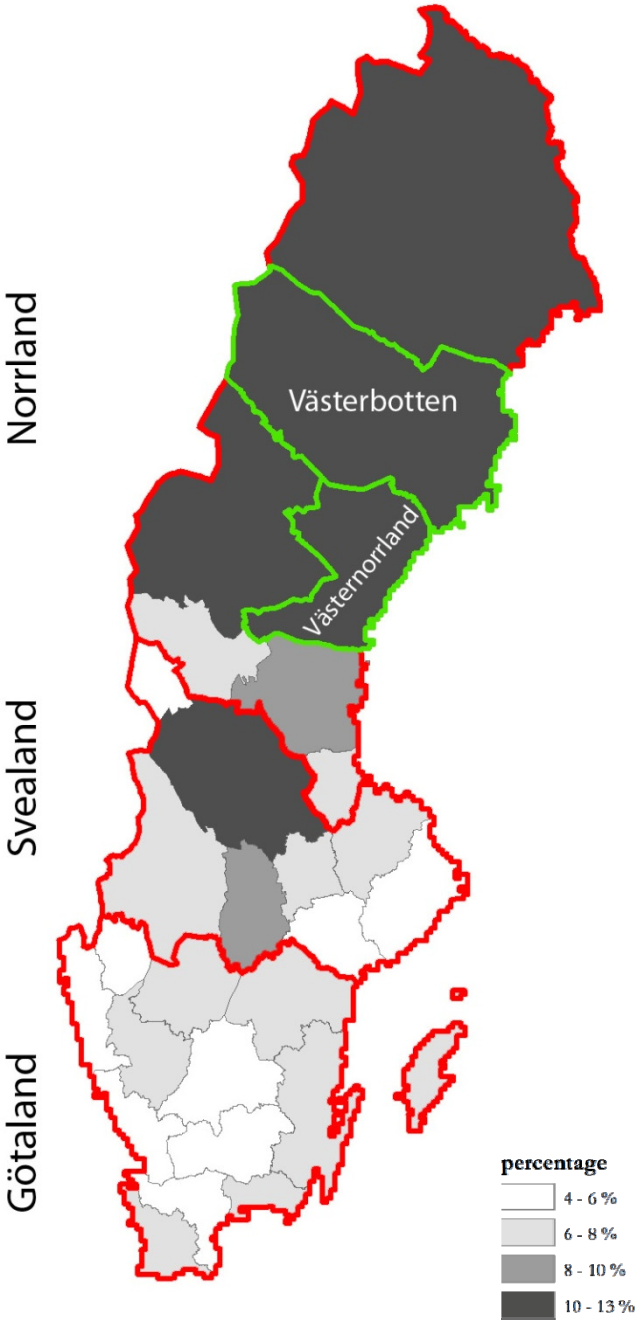

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Figure 1. Percentage of area represented by young-dense stands amongst the total forest area in each county.