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Potential of straw as bio-energy raw material in northern European countries

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Straw is a by-product of commercial field crops such as cereals, oilseeds (turnip rape, oilseed rape, linseed) and pulses (peas, faba beans). Seed yield of these crops is harvested by threshing when the straw material is left on field surface in swaths. In Denmark, straw is used for energy in large scale (1 million t/a), but in many other countries only a minor part of cereal straw yield is utilised: for example in Finland 20% for animal bedding in pig and cow-houses, and about 6 million kg (2400 ha) for energy (MMM 2004). The rest is chopped and mulched into soil. There is very little information about commercial use of residues from oilseeds, linseed or other combine harvested crops. Data for harvested seed yield is given for the most important species in public statistics such as Eurostat, FAOSTAT and national statistics, but there is no statistics for straw yields from practical fields.

In this study, the current bioenergy potential of straw yield was estimated for North European countries (Denmark, Estonia, Finland, Latvia, Lithuania, Norway and Sweden) by using information about seed yield, seed dry matter (DM) content, harvest index and harvest losses. Harvest index (proportion of seed yield of total biomass in dry matter), was studied separately for each species. Harvest losses due to stubble height were studied from 11 crops in field trials in Jokioinen, Finland. The straw potential and energy values were estimated in TWh for each crop and country.

Stubble height of 15-20 cm left 20 to 45% of straw DM to field depending on straw height. Losses originating from harvesting and baling can be comparable to those in haymaking. The highest straw potential from oilseed crops and cereals was in Denmark (more than 10 million tonnes DM, 51 TWh).

In the future, there is straw available for energy use. However, agricultural residues play an important role in controlling erosion and maintaining soil carbon, nutrients, and soil physical properties. Quantities of removable residues depend on crop rotation, field management practices within rotation (direct drill vs. ploughing) and climate.