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Natural drying treatments during seasonal storage of wood for bioenergy in different European locations

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ABSTRACT

Research into the methods of producing high quality wood chips for a rapidly growing energy sector is becoming increasingly important. For example, small wood chip heating plants require high quality wood chips to ensure efficient operation, thereby minimizing maintenance costs. Moisture content is considered to be an important quality parameter regarding wood based fuels. The objective of this study is to investigate methods to promote the natural drying of wood for bioenergy purposes. The effects on the drying process through covering the wood piles and partial debarking of stems were tested in order to identify methods to reduce the moisture content of the woody material in the storage. Drying trials were established in Finland, Italy and Scotland, utilizing tree species typically used for energy purposes in each area. The results show that natural drying is a viable and effective method to enhance the energy efficiency of wood based fuel products in all the regions studied. Furthermore, by adapting current harvesting methods and storage procedures even better results can be achieved. In addition, the results also indicate that broadleaved trees dry more effectively, if some partial debarking is carried out and that covering of piles is of utmost importance in Scotland and Finland.

1. Introduction

The use of forest and agricultural biomass for energy has become an increasingly important issue, particularly in light of the recent developments regarding climate change, energy security and employment in rural areas. In order to mitigate climate change, many countries, including those within the European Union, have set ambitious targets to increase the share of renewable energy sources [1]. To meet these objectives, a large share of this increase will come from forest biomass [2]. In the European context, forest biomass offers the largest and the highest economic potential as a renewable fuel when managed on a sustainable basis [3]. However, to ensure a reliable and sustainable supply of forest fuel new technological solutions to procure and process forest biomass are needed.

One of the biggest challenges to increase the use of forest biomass is the availability and proper use of suitable harvesting technology and methods to meet the growing demand for raw material while concurrently ensuring the sustainable use of the forest ecosystems [3]. Currently, forest biomass technology and supply systems are still developing

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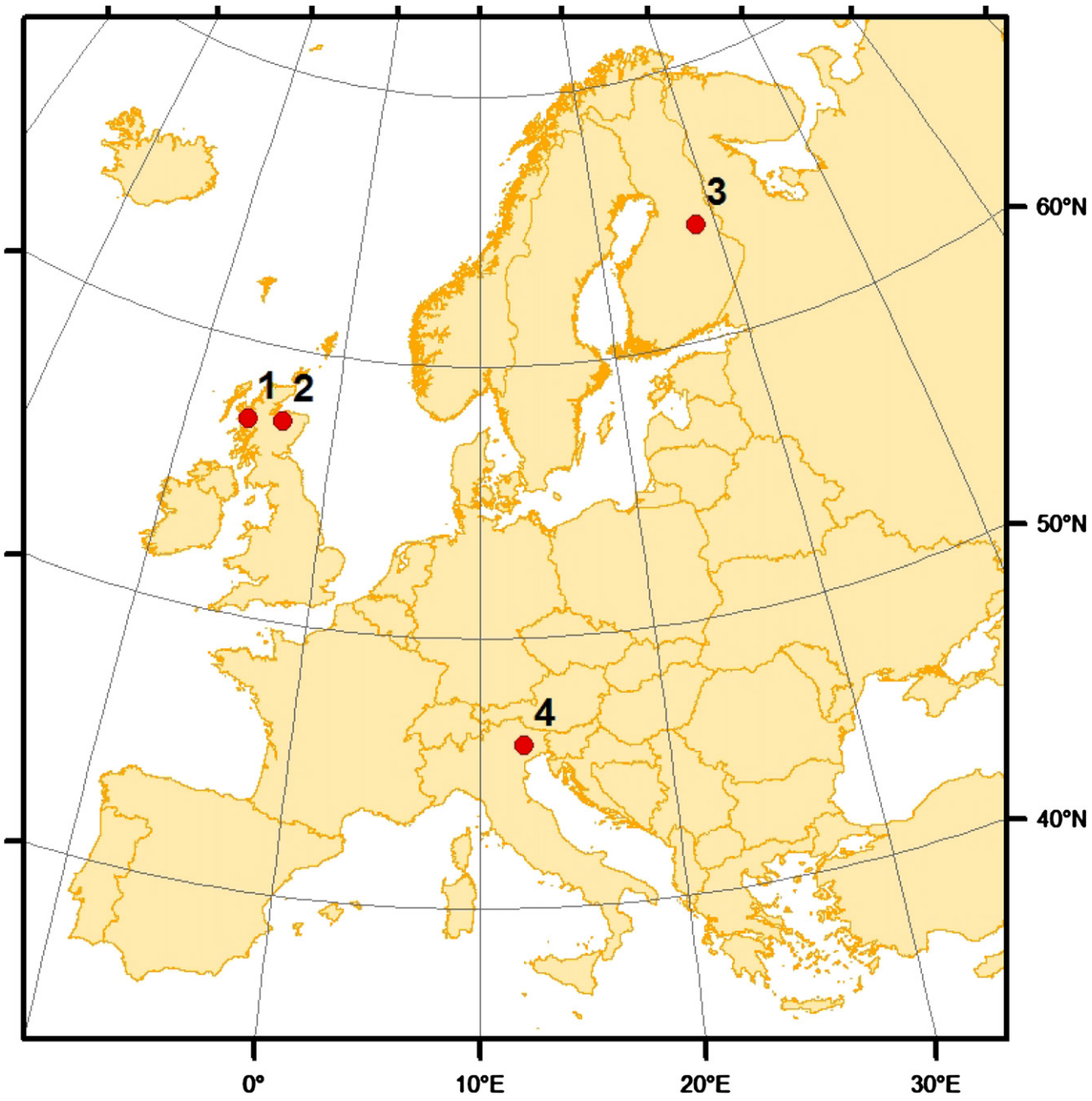

Fig. 1 – Location of the trial sites in Finland, Italy and Scotland. 1: Skye; 2: Glenlivet; 3: Sotkamo; 4: Capella Maggiore.

and in some countries experimental trials have only recently started.

Consequently, methods to produce high quality wood chips are essential for the development of the bioenergy sector, particularly in Central Europe, where a substantial share of the installed heating capacity is based on small scale heating systems [4]. One issue with small wood chip heating plants, however, is that they require wood chips of high quality to ensure efficient operation, thereby minimizing maintenance costs [5].

Various factors affect the quality of wood chips, including moisture content [6]. Low moisture content increase the heating value of the fuel, as well as improves the boiler efficiency and reduces the transportation costs of wood chips. Therefore, to facilitate the drying process and thereby ensure the availability of high quality fuel in the short and long term, supply chains for wood chips should be designed to also promote the natural drying of timber during the procurement processes, as a cost efficient method.

The bark percentage of the fuel is another important quality factor in the production and combustion of wood chips as well as pellets. The bark's energy density is not as high as that of stemwood and high bark contents also causes high ash contents in the combustion process [7]. This in turn will increase maintenance costs of the heating systems and also lowers the energy efficiency. As a result, in order to produce