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DEVELOPMENT OF NEW SOD PEAT PRODUCTION TECHNOLOGY IN FINLAND

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SUMMARY

The main focus of the development of peat production technology in Finland is on technologies, which are less dependent on weather conditions, and technologies, which can decrease environmental impacts on water and air. The new Multi-Layer drying method for sod peat, being developed by SampoTech Oy and VTT in 2009-2011, is the method by which the dependence of weather conditions in peat production can be decreased. The target has also been to increase productivity and to minimize the costs of sod peat production. The production costs for the Multi-Layer method seem to be lowered to the level of milled peat production costs.

In this new Multi-Layer method the main idea is to dry several sod peat production cycles partly at the same time on the same drainage bed without turning and windrowing the produced sod peat as has been done in the current method. The first sod layer is extracted and spread on the shaped and compressed drainage bed. When the first sod layer is dry enough, it will be covered with a new sod layer. New sod peat layers are always produced on the earlier layers. In the new method the effect of rain on drying process will be diminished because of the formation of drainage bed and the layered drying. In the end of the season or between harvesting cycles, depending on the weather conditions, sod peat loading can be carried out in a normal way. There are several advantages in the new method: less working phases and harvesting losses, lower production costs and significant increasing of production.

KEY WORDS: sod peat, drying, production

INTRODUCTION

Sod peat is produced by cutting peat from the peat land to a depth of 30-50 cm with a cutting disc or screw. Cut peat is macerated mechanically and extruded into sods or strips and dried on the production field. The annual sod peat production in Finland is approximately 1,800 GWh, which is 6-7% of the total energy peat production in Finland. Sod peat is used for heat and power production in power plants, heating plants and in individual buildings. It is also used for space heating on farms, in greenhouses and in residential buildings.

Sod peat has significant advantages compared to milled peat. Sod peat is more homogeneous and it absorbs less water than milled peat. It has higher bulk density and higher net calorific value and it is thus more energy efficient to handle and transport. High net calorific value as

received makes sod peat the superior local solid fuel for peak loads during the winter time. Environmental impact of sod peat production is lower than in milled peat production (Röpelinen 2000). However, the current sod peat production process is more energy intensive than milled peat production process. In Finland, the price of sod peat as delivered for heat production was 15-16 €/MWh, which was 2-3 euros higher than the price of milled peat (Ministry of Employment and the Economy 2011).

MATERIALS AND METHODS

The main focus of the development of peat production technology is on technologies, which are less dependent on weather conditions, and technologies, which can decrease environmental impacts on water systems and air. The target is also to increase productivity and minimize the costs of the sod peat production. The new Multi-Layer sod peat drying method, being developed by SampoTech Oy and VTT in 2009-2011, is the method by which the dependence on weather conditions in peat production can be decreased. Also special machines have been developed for the new multi-layer drying method.

In this method the main idea is to dry several sod peat production cycles partly at the same time without turning and windrowing the produced sod peat as has been done in the current method. The first sod layer is extracted and spread on the shaped and compressed field surface, e.g. at the centre of a strip (Fig 1). When the first sod layer is dry enough, it will be covered with a new sod layer. When the mean moisture content of the sod layer is about 60 weight-%, a new harvest can be spread on the earlier layer. The procedure continues in this way during the whole harvest season (Fig 2). At the end of season, or also once during the summer if needed to minimize risks, sod peat is loaded and transported by trailer to the storage pile in a normal way.

Figure 1. Sod peat cutting machine developed for Multi-Layer method.

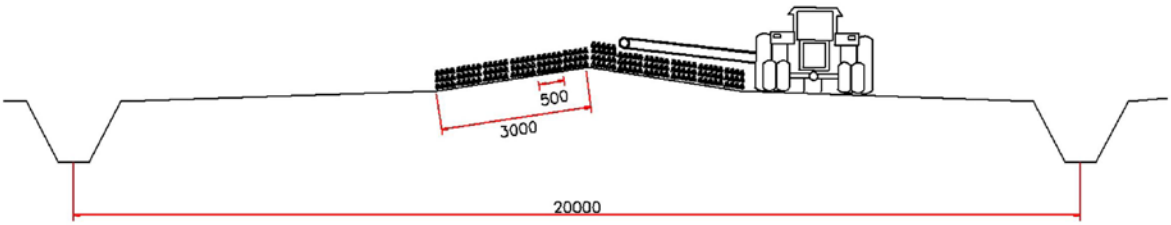

Figure 2. The principle of the new Multi-Layer drying method for sod peat. A new sod peat harvest is spread on the earlier layer.

RESULTS

Field tests in summers 2009, 2010 and 2011 have shown that the sod peat dries out very well on the lower layers. About five times more harvest cycles can be achieved with the new method compared to the current method. During summer 2011, six harvests with multi-layer method and one harvest with current sod peat method as reference method were produced (Fig. 3). The target moisture was 30 weight-%. The production period was 3.6.-16.8.2011. The total precipitation was 109 mm and evaporation 274 mm.

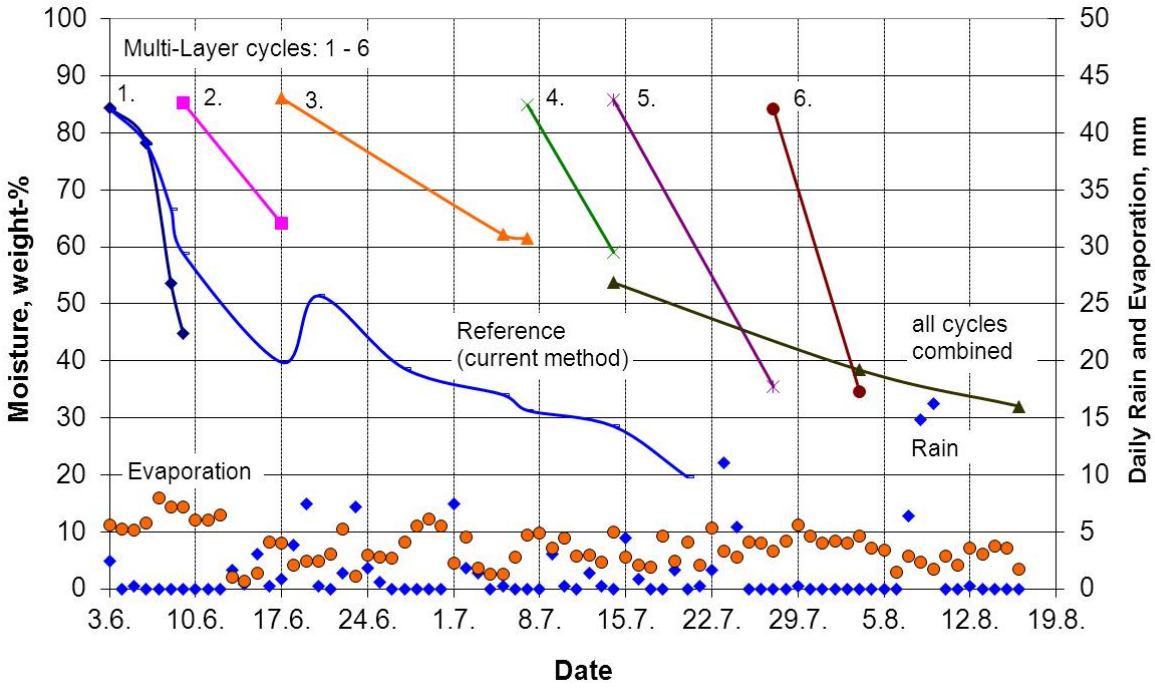

Figure 3. Drying of sod peat harvests and weather conditions in 2011. Jämiänkeidas, peat production site owned by Vapo Oy is located near the town of Kankaanpää in Finland. Multi-Layer cycles: 1.-6. Current sod peat method as reference.

Based on the sod peat drying tests and theoretical calculations, the seasonal sod peat yield of Multi-Layer method can rise to more than 1500 MWh per hectare depending on the number of harvests (Fig. 4) (Erkkilä 2011).

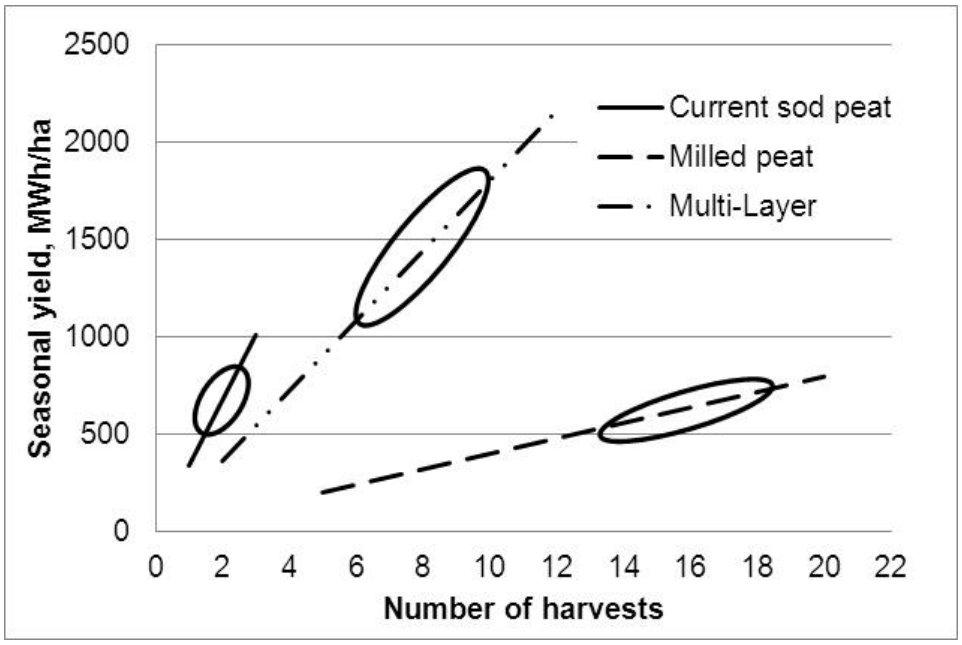

Figure 4. The impact of number of harvests on the seasonal peat yield. Typical numbers of harvests are surrounded. Curves from left: Current sod peat method, Multi-Layer-method, Milled peat method.

Thanks to the new machines used in the Multi-layer method, the productivity of sod peat production can be increased significantly. The calculation results show that fuel consumption of the production stages is reduced by 50%. The variable costs of the production stages are reduced by about 40% and productivity per working hour is increased by 60%, compared to the present sod peat method (Erkkilä, 2011). The total costs of the peat production stages are reduced by 45-50% and it is possible to reach even lower costs than the cost level of milled peat production (Fig. 5). The calculation does not take into account the construction of peat storage or storing costs.

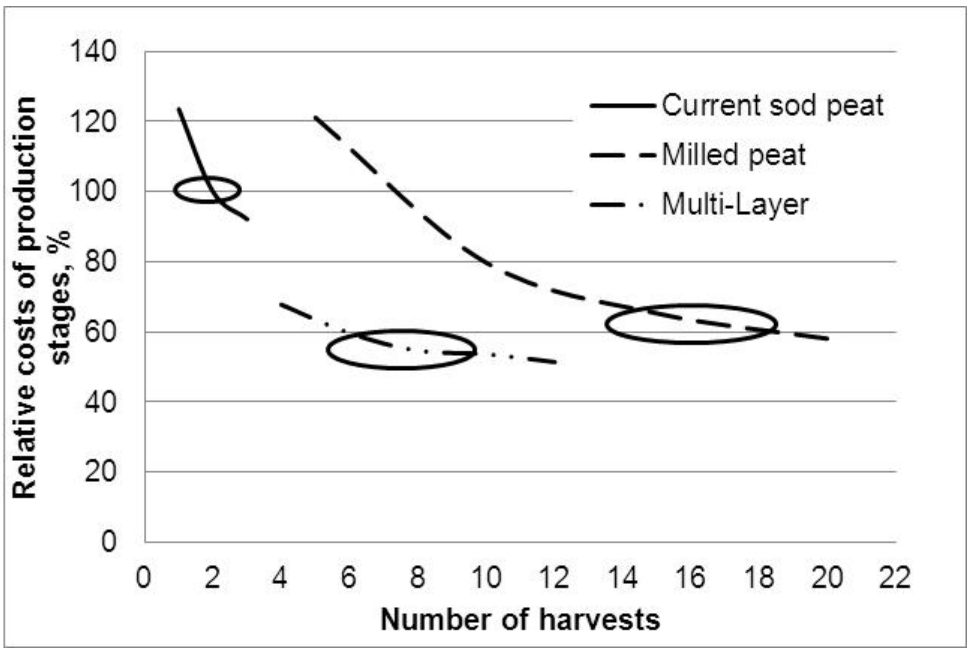

Figure 5. The impact of the number of harvests on the relative production costs of the production stages at peat field. Typical numbers of harvests are surrounded. Curves from left: Current sod peat method, Multi-Layer-method, Milled peat method.

CONCLUSIONS

The field test results are promising. The risks of production losses are reduced compared with the current sod peat production method. In the new method the effect of rain on drying process will diminish because of the formation of drying base and the layered drying. Also, less number of work phases causes less harvesting losses. The next step is to enhance the new Multi-Layer method to larger pilot production. The target is to produce about fivefold number of sod peat cycles in one summer compared with the current sod peat production method. Because of the narrower effective drying area, approximately threefold seasonal yield can be achieved. The new harvesting method and machines offer several advantages: less harvesting losses; lower equipment investment costs and production costs; increased seasonal peat yield per hectare and ability to deliver larger quantities of sod peat at a competitive price.

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