"BIOENERGY RESEARCH ACTIVITIES IN DENMARK, FINLAND, NORWAY AND SWEDEN"

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"COMBINED PEAT - FUELWOOD PRODUCTION"

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COMBINED PEAT - FUELWOOD PRODUCTION

by Veli M. Pohjonen

1. Possibilities of boreal peatlands in biomass production

In the long run and in the global context the bioenergy research is continuously faced with the critical question: can we afford to grow fuel on an agricultural soil instead of food and feed? The energy forests, for instance, would be suitable for old agricultural fields. The surplus in agricultural production of the European Community and some other western countries has been used as one argument for transferring such presently marginal land areas from food and feed crops to energy forestry.

Competition for agricultural land resources in the future is more likely to increase than to diminish. Therefore the main agricultural crop production areas in the world, especially the grain belt on the plains of the northern hemispere, offer limited possibilities for any new bioenergy crop to be grown. In most of the densely populated areas in the industrialized countries the only realistic way to increase energy production from biomass is to utilize the residues from conventional agriculture and forestry between which the land areas have now been allocated.

If we want to clear substantial new areas for bioenergy production the possibilities must be sought outside the agricultural zone, either south or north of the grain belt. When moving northwards we come to the boreal coniferous zone. Hilly

areas and gentle slopes grow there coniferous forests to be utilized today as raw material for timber and pulp industry, or they still form large virgin areas in the taiga. But in the plains of the boreal zone the low evapotranspiration of the vegetation results in an excess of water in the soil, although the annual precipitation is usually below 1000 millimeters.

The total area of the peatlands in the world is at least 421 million hectares (KIVINEN and PAKARINEN 1980), probably about 500 million hectares, representing 3.5 per cent of the land area of the earth. Main part of this land resource is situated in the boreal zone, still largely unutilized. Could those boreal peatlands be used for bioenergy production?

Only about one per cent of the peatlands, 5 - 6 million hectares (KIVINEN 1980), has so far been cleared for crop production purposes, mainly for cereals. In general the peatland sites are, however, too cold for cereals. Short growing season (in degree days) and occurrence of night frosts hinder maturing of the crop, since the maturing of seeds is essentially based on a certain threshold value of cumulative degree days which ought to be reached every growing season.

Due to climatic limitations the peatlands suit better for growing of biomass, like grass or tree crops which are not dependent on such threshold values of degree days like cereal crops. The amount of biomass produced is proportional to the amount of growth factors - like degree days - accumulated during the growing season. A biomass yield, although a small one, can always be harvested on peatland sites, also in unfavourable summer when cereals would fail.

The northern peatlands can in fact be regarded as one of the most remarkable reserve areas in the world awaiting clearance for biomass production. The peat fuel industry has shown that with present machinery efficient drainage can be easily

carried out and the excess of water is no longer problem (POHJONEN 1980).

2. Peatlands and energy production in the Nordic countries today

Today the peatlands are already connected with energy, either in practice or in research, of the Nordic countries especially in Finland in three ways. First, the peatland forests produce conventional firewood for residential heating and more modern fuel chips for central heating plants. The most important fuel wood species of today, pubescent birch (Betula pubescens) is especially adapted to drained, fertile peatlands.

In the field of drainage of peatlands for afforestation Finland is now the leading country: 4.4 million drained hectares on over 30 cm thick peat deposits (KIVINEN 1981). A good number of such drained peatland sites has been so fertile that establishment of coniferous stands on them has been difficult. Instead, they are growing thickets of pubescent birch suitable for fuelwood production.

The potential area of such fertile, drained peatland sites for coppice forestry with birch has been estimated to be as high as 619 000 hectares (ANON 1979), representing over 10 per cent of the total drained forestry area. The pubescent birch on peatlands is therefore under intensive research for energy forestry in Finland. Methods of both conventional silviculture and coppicing forestry are being developed.

Secondly, the peatlands produce today peat fuel: milled peat for larger and sod peat for smaller combustion systems. The peat production is largest of the Nordic countries in Finland, but the plans to develop it also in Sweden are well

in progress. In Finland the production of milled peat has increased very sharply during the recent years: from 0.7 million m^3 in 1970 to exceed the level 10 million cubic-meters in ten years. In the favourable summer 1982 a new production record of about 17 million m^3 on a production area of 36 000 hectares was achieved, and the enlargening of the peat fuel industry is still rapid.

An important innovation to develop peat fuel industry in the 1970s was the introduction of a screw leveller. With it clearing up the usual stumps of under 25 cm in diameter, is no longer problem. Also new harvesting methods, like the HAKU-method, have been developed to meet the northern special conditions, especially the climate (SUONINEN 1980).

The third connection of peatlands with energy production is the cutaway peatland. Such areas recultivated after peat production are especially abundant in USSR: 364 000 ha in 1979 (KIVINEN 1980). Ireland is another country which has cutaway areas already in practical scale, 600 ha in 1979 (BARRY 1980), and the area is rapidly increasing up to 77 000 ha over forth-coming decades. In Finland the area of cutaway peatlands was in 1982 about 200 hectares, and it is expected to increase at a rate of 500 hectares per year in the mid eighties and exceed even 50 000 hectares by the year 2000.

The worked-out fuel peat basins have been found suitable for the plantations of short rotation energy forestry especially with willows (Salix sp.). Large, drained, even blocks are ideal for mechanizing the production. As free of weeds, they are also easier for plantation establishment and tending than the abandoned agricultural fields.

3. Shift from peat fuel into chip fuel

As an energy source peat is today regarded as unrenewable. Therefore the shift from peat fuel systems into chip fuel systems, or combining them together, is obvious in the near future. In this respect the cultivation experiments as new bioenergy crops on cutaway peatbogs means a challenge. By introducing biomass crop at the final stages of peat production to the abandoned peat fuel blocks, it would be possible to allocate manpower and machinery in such way that both peat fuel and chip fuel (fuelwood) production benefit.

Moreover, as a growing media for biomass production the bottom peat has been found to be even more suitable than the upper layers. The pH-values and the nitrogen contents are higher at the bottom, and the roots of the plants can also penetrate the bottom peat into mineral soil, and have thus access to nutrients. In fact, the peat mining is superior method over conventional methods when clearing peatlands for cultivation purposes. The research for biomass production after peat production is now well under progress especially in Ireland and in Finland, and the results obtained so far give indications that combined peat - fuelwood production by shifting into energy forestry, is feasible.

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PROCEEDINGS

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