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2007–2013

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International Conference on the Utilization of Wetland Plants Reed as a Renewable Resource

February 14th - 16th 2013, University of Greifswald, Germany

Common reed as a promising natural energy crop in Estonia

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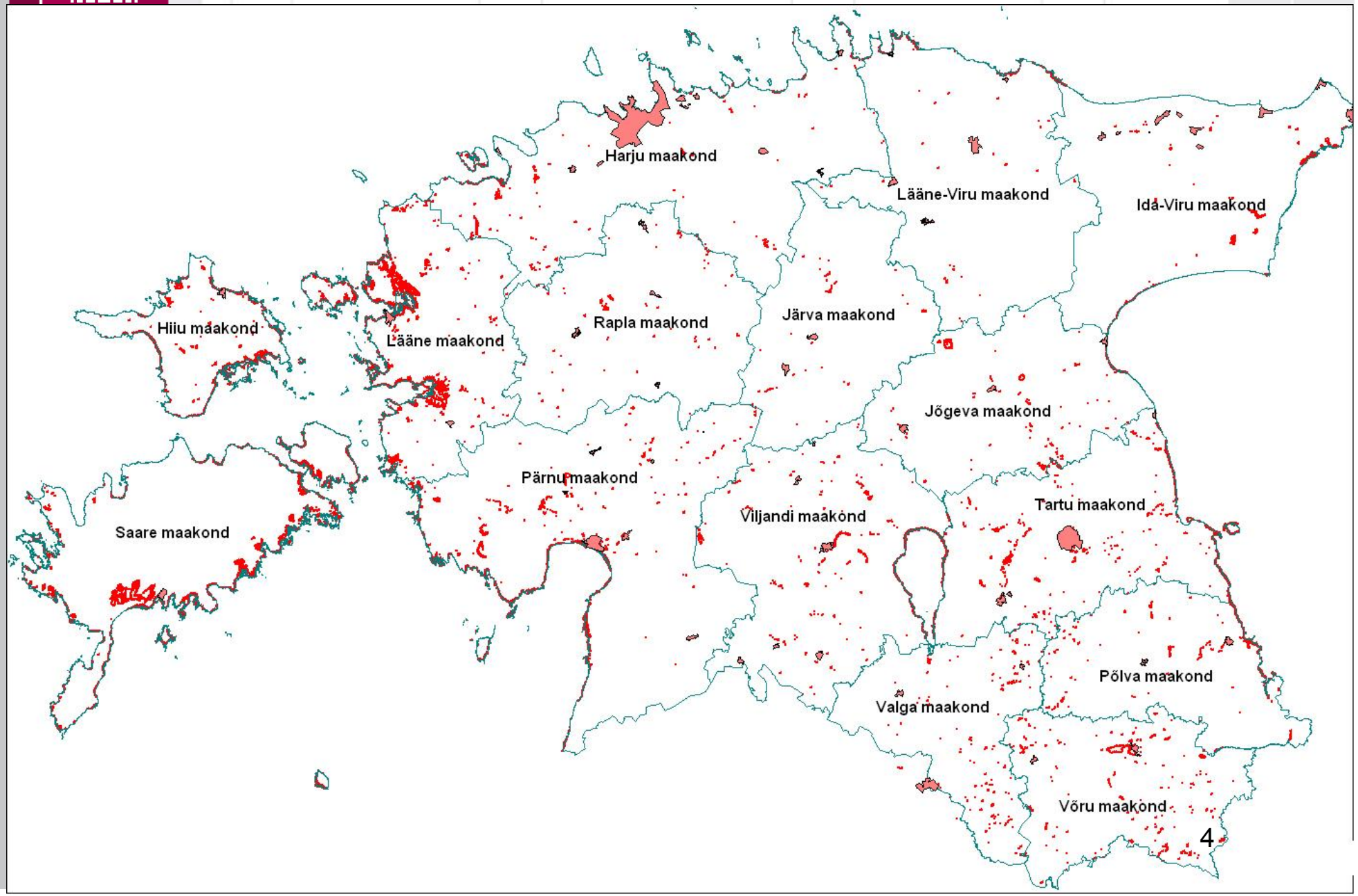
14.02.2013

Basic information

- The total area of Estonian reed beds is estimated 26 000 ha.
- Mostly reed grows in the wetlands and coastal areas, to smaller extent also shrub willows and cattail, and in between there are patches of open water.
- The potential of biomass in the wetland plants as an energy resource (fuel) is quite promising due to the high yield of the plants growing there.

Location of Estonian reed beds



The largest reed beds in Estonia

- The largest reed beds in Estonia are in Matsalu Wetland, 3 000 ha,
- The Mullutu and Suurlahe reed growing areas on island Saaremaa cover about 2 200 ha,
- The Lake Võrtsjärve reed beds stretch to almost 1 200 ha,
- in Lake Peipsi the area of reed beds is almost 930 ha.
- On the island of Hiiumaa in the Käina Bay the area of reed beds is 180 ha.

Which does determine the compatibility of natural crop as fuel?

- High yield. Highest yield of reed 8,36 kg/m^2 - 83,6 t/ha, has measured in Turbuneeme 07.2009

Which does determine the compatibility of natural crop as fuel?

- Growing over large areas. Reed beds in Muhu island, hundreds hectares.

Which does determine the compatibility of natural crop as fuel?

- Accessibility and sufficiency in every year

Which does determine the compatibility of natural crop as fuel?

- Suitable characteristics (moisture under 20%, less ash, high ash-fusibility (melting) temperatures, low chlorine content), suitable forms - briquettes, pellets (or shape – pieces of stems, bales).

Which does determine the compatibility of natural crop as fuel?

- Harvesting and collecting profitability

Risks of lay in a supply

- When dry reed is very light and therefore, without preliminary treatment, its transportation costs are high.
- Reed could be used as an additional local source of energy in coastal areas and if pre-treated, also further afield.
- Risks of reed harvesting:
  - Winter storms, much snow, floods, ice
  - Reed cannot be harvested any time, by anyone and from anywhere.

High snow in harvesting period

Too much snow in harvesting period and storm damages (Small Strait 02.2011)

The storm, waves ´and floods have broken reed on large areas (Saaremaa 04.2007)

The storm, waves ´and floods have broken reed on large areas (Rocca-al-Mare Bay 04.2011)

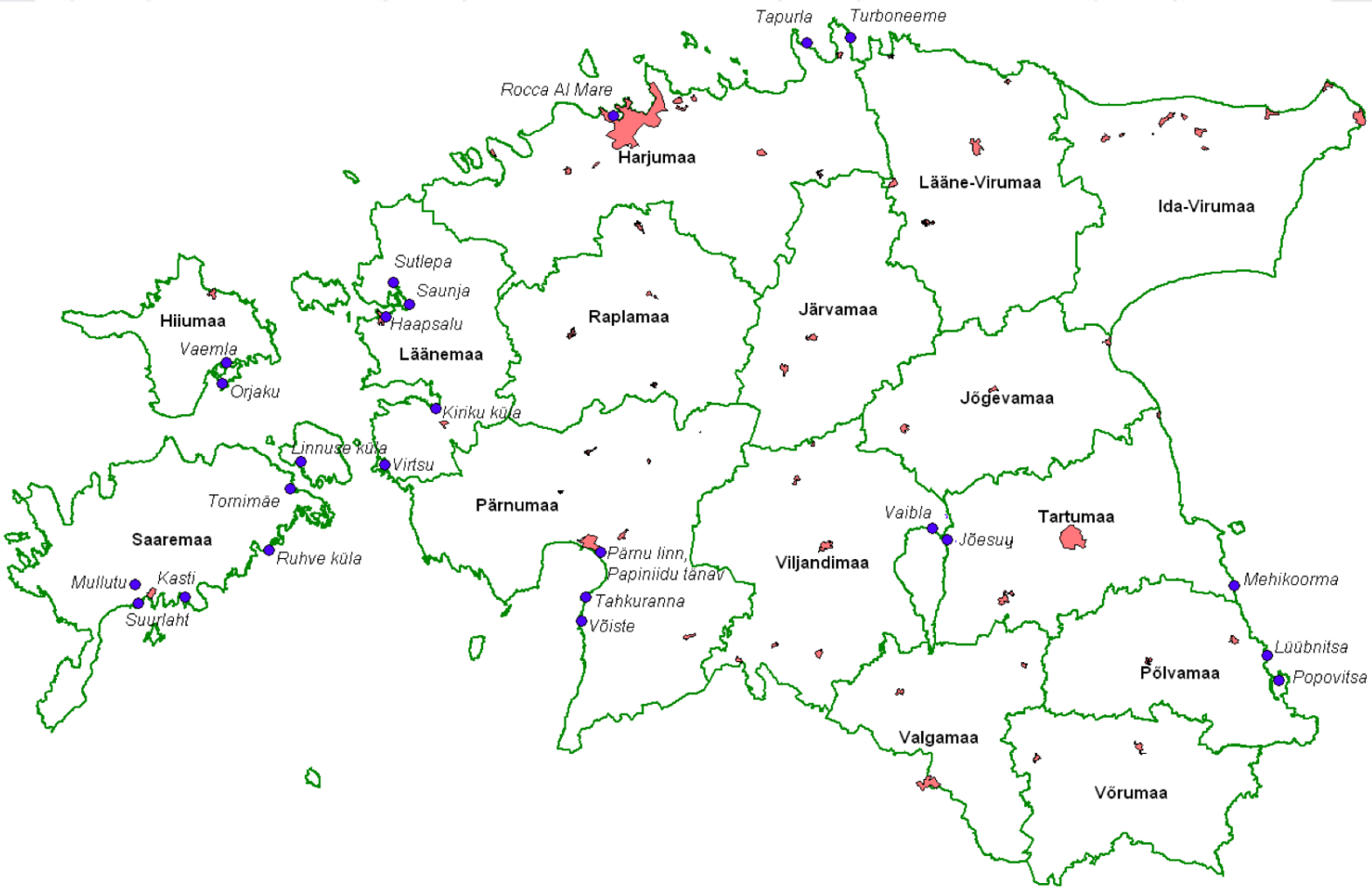
Measurements of reed yield

- According to the winter measurements in 2006, at the moisture content 20% the average energy content of reed was 3,94 MWh/t (TUT TED).
- The total theoretical amount of reed harvested from Estonian reed beds in winter 2006 would be max 2,14 PJ or 0,595 TWh. Realistic harvestable amount don't exceed 0,3 TWh.
- The biomass yield per hectare of reed beds depends on:
  - location of reed beds,
  - soil content,
  - climatic conditions of the year,
  - availability of nutrients, etc.

Measurements of reed yield

- The TUT TED (Tallinn University of Technology, thermal engineering department) has arranged measurements of reed yield in 27 different sites of 9 Estonian counties in period 2006-2007 (summer and winter).
- For the providing sustainability of reed beds, it is not reasonable to cut reed in the same areas each year and to harvest in all the areas is also not realistic due to unfavourable environmental conditions and ownership relations.

Places in Estonia were taking samples of reed , 2006-2007



The results of yield measurements

Period of measurements	Average yield, reed fuel as received, t/ha	Average yield of dry matter, t/ha	Average moisture content of samples %
1	*2*	*3*	*4*
Spring-winter 2006	8,06	6,30	20,52
Summer 2006	19,98	8,55	57,67
Winter 2007	9,09	6,59	26,39

Remarks

- The two year average yield in the winter period is 6,45 t/ha.
- The yield of dry matter is 32,5% higher for summer samples than that in winter samples.
- The main reason lies in the fact that the actual amount of dry biomass in the winter harvest is smaller. Leaves have fallen down and nutrients are in the roots.
- As an average for years, the reed with the moisture content not exceeding 20% can be harvested in the spring-winter period.

Conclusions

- Reed spread on wide areas in many countries,
- Yield of reed is quite high,
- Reed characteristics are suitable to prepare fuels and burn in boilers,
- The supply chains of reed have to be improve and calculate by technical-economically,
- For harvesting and supplying of reed must be taken into account a number of risks,
- Reed can be regarded as a raw material of energy fuel,
- and reed is suitable for other applications (construction, pulp, chemical raw materjal, handicraft etc).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Photography


Thank you for attention!
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