Hungary’s ecological potential for biomass production
<table>
<thead>
<tr>
<th>Category</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area</td>
<td>9,303,000 ha</td>
</tr>
<tr>
<td>Vegetation</td>
<td>7,596,000 ha</td>
</tr>
<tr>
<td>Forest</td>
<td>1,760,000 ha</td>
</tr>
<tr>
<td>Cultivated area</td>
<td>5,744,000 ha</td>
</tr>
<tr>
<td>Plough land</td>
<td>4,500,000 ha</td>
</tr>
<tr>
<td>EU payment</td>
<td>3,488,000 ha</td>
</tr>
<tr>
<td>Area below 17 AK</td>
<td>1,790,000 ha</td>
</tr>
</tbody>
</table>
Why Hungary needs biomass production? General arguments

- High dependence on external energy sources (oil 86.1%, natural gaze 81.8% from import)
- International commitments, to meet EU targets (Kyoto 6%; 5.75% biofuel in 2010, 3.6%, electricity from renewable 7% of total energy use from renewable)
- To ensure income for agriculture people
- To enhance export of energy crops
Hungary’s biomass production

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Total biomass stock</td>
<td>350-360 million t</td>
</tr>
<tr>
<td>Annual reproduction</td>
<td>105-100 mt</td>
</tr>
<tr>
<td>Energy content of annual production</td>
<td>1185 PJ</td>
</tr>
<tr>
<td>Biomass available for energy</td>
<td>38-43 mt</td>
</tr>
<tr>
<td>Agricultural primer and secondary production per year</td>
<td>57-58 mt</td>
</tr>
<tr>
<td>Forest wood production per year</td>
<td>9 mt</td>
</tr>
</tbody>
</table>
Biomass potential
Agriculture officials estimation

- 105-110 million t/year biomass production
- Equivalent to 1200 PJ (wood 10 MJ/kg)
- 1120 PJ total energy need in 2007.
- Do we have 11-12 t of biomass in each hectare of the country? What percent can be utilized from this? What is the energy need to utilize this?
- If the whole country would be covered by natural forest we can produce 186 PJ on a sustainable way.
# Energy potential of some biomass stock in Hungary

<table>
<thead>
<tr>
<th>Biomass Type</th>
<th>Production Rate (mt/y)</th>
<th>Energy Potential (PJ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Straw</td>
<td>2.4-2.8</td>
<td>28-34</td>
</tr>
<tr>
<td>Maize stem</td>
<td>4-5</td>
<td>48-60</td>
</tr>
<tr>
<td>Other stem</td>
<td></td>
<td>10-12</td>
</tr>
<tr>
<td>Energy grass</td>
<td>5-6 mt/y (500-600 000ha)</td>
<td>60-70</td>
</tr>
<tr>
<td>Energy wood plantation</td>
<td>100 000 ha</td>
<td>25-30</td>
</tr>
<tr>
<td>Firewood</td>
<td>1.1</td>
<td>15.6</td>
</tr>
<tr>
<td>Biogas</td>
<td>8-10</td>
<td></td>
</tr>
</tbody>
</table>
Is there space for energy crops in Hungary?

- Petrol consumption 2 MD liter, diesel 2.8 MD liter in 2005
- If we wanted to replace this we should cultivate maize on 2 million ha, and oil rape on 2 million ha at least. We have 4,509 million ha plough land.
- The maximum potential we have is 400 000 ha, and approximately 500 million liter agro-fuel.
- The maximum replacement can be 10%
- Where is the opportunity for export?
Different scenarios in Hungary

- Total energy consumption in 2007 is 1 120 PJ
- from oil rape: (58 GJ/ha/year) 539.4 PJ Half of this energy is needed to produce the agroo-fuel!
- From the most energy intensive plantation (e.g. energy wood – 150-200 GJ/ha/year) half of Hungary’s area is required
Different estimations

- Grasselli: natural forest 15-20 GJ/ha/year, energy wood 100-120, energy plantation 150-250 GJ/ha/year
- Marosvölgyi: EU research 200-350 GJ/ha/year – energy plantation
- Gergely – Varró: forest 45 – 50 GJ/ha/year
Competition among different demands for land in Hungary

- Traditional forest industry
- Energy wood and plantation for power plants
- Plough land for different energy crops to produce agro-fuels
## Demand and potential


<table>
<thead>
<tr>
<th>Type of land use</th>
<th>Demand (existing and planned capacities)</th>
<th>opportunities (environmental friendly potential by EEA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest</td>
<td>27.5</td>
<td>8.3</td>
</tr>
<tr>
<td>Plough land</td>
<td>139.3</td>
<td>50.2</td>
</tr>
<tr>
<td>Organic waste</td>
<td>5.5</td>
<td>87.0</td>
</tr>
<tr>
<td><strong>total</strong></td>
<td><strong>172.3 PJ</strong></td>
<td><strong>145.5 PJ</strong></td>
</tr>
</tbody>
</table>
How to meet with the demanded capacities?

To produce 139.3 PJ we need:
- 7.5 million t maize
- 1 million t wheat
- 1.3 million t rape

We have
- 2 million t maize surplus a year
- We produce 0.2-0.3 million t rape in a year
Energy + food

- The demand for energy crops (to meet with existing capacities) requires 1.6 million ha land
- The demand for wood (to meet with existing capacities of power plant) requires 600,000 ha
- The food energy demand of the Hungarian population requires 3.9-5 million ha (wheat equivalent)
- We have 4.5 million ha plough land, 3.9 million ha is suitable for crops.
- The total agriculture land is 5.8 million ha
- Agricultural officials estimate 800,000 ha additional land for production, EEA estimates 413,000 ha