Biochar: Climate saving soils

Rob van Haren & Irmgard Starmann (InKnowCom)
Kiemkracht

- Is an alliance from Product Board Arable Products and InnovationNetwork from the ministry of Economy, Agriculture & Innovation and represents 18,000 arable farmers

- The objective is to develop and implement ground breaking concepts

- Kiemkracht opens up new horizons for arable farming in Netherlands and NW-Europe
voor een appel
en een emmer klei
Remediation of climate change by climate resilient soils

• CO2 sequestration with BioChar

• Zero soil emissions

• Increased soil quality and stability

• Increased water holding capacity
Biochar: Climate saving soils

- Biochar is produced by pyrolysis of biomass
- with co-generation of bio-energy
- Biochar amendments to soils increases soil fertility and it sequesters CO2 for centuries
  - one ton biomass can sequester one ton CO2
Slow and fast carbon cycles
BioChar can fix Dutch Kyoto targets

- NL produces yearly 18 Mton (dm) residual biomass (Platform Groene Grondstoffen)
- 2-3 ton Biomass yields 1 ton BioChar and energy
- 1 ton BioChar fixes 2 ton CO2 (1,3-3 ton)
- Kyoto target NL (2010): 13 Mton CO2 reduction
- 18 Mton biomass increases organic matter in soil with 1% for 200,000 ha (30 cm soil)

- **18 Mton biomass sequesters 18 Mton CO2 permanently in soil**
And BioChar is co-product of bio-oil or syngas production........

- Carbo negative bio-energy
- Carbo negative chemical building blocks
- New developments Functional Carbon nanostructures
### Biomass availability in EU

<table>
<thead>
<tr>
<th>in dry matter</th>
<th>2002 EU25 Mton</th>
<th>2006 EU25 Mton</th>
</tr>
</thead>
<tbody>
<tr>
<td>biomass &amp; wastes</td>
<td>161</td>
<td>215</td>
</tr>
<tr>
<td>cereals</td>
<td>252</td>
<td>233</td>
</tr>
<tr>
<td>sugar beet</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>potato</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>round wood</td>
<td>119</td>
<td>138</td>
</tr>
<tr>
<td>wheat straw*</td>
<td>76</td>
<td>70</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>647</strong></td>
<td><strong>695</strong></td>
</tr>
</tbody>
</table>
Local availability
N-Netherlands (ha)

- Total 857,000
- arable: 234,684
- greenhouse: 14,981
- Grass/corn: 523,557
- combination: 74,000
- Nature/Forest 164,000
Biomassa availability in N-NL (2005) (prv Gn, Dr & Fr)

- Biomass production  5,500,000 ton dm
- residues:  1,000,000 ton from which 800,000 ton agricultural residues
Fotosynthesis
1.5 Tg CO₂, 0.4 Tg C

Biomass waste
1.0 Tg mass
0.4 Tg C

Biochar
0.2 Tg mass
0.13 Tg C
0.46 Mt CO₂e

Syngas
0.2 Tg CO₂
0.1 Tg C

Bio-oil
0.6 Tg
0.3 Tg C

CO₂e
0.6 Tg
0.2 Tg Biofuel
0.2 Tg C

Biofuel
0.7 Tg CO₂
0.2 Tg C
Global cost curve of GHG abatement opportunities beyond business as usual

- ~27 GtCO₂e below 40 EUR/ton (-46% vs. BAU)
- ~7 Gt of negative and zero cost opportunities
- Fragmentation of opportunities

Biochar

• Promising concept by quadruple-win:
  • Energy from biomass
  • Carbon Captured Storage (permanent CO₂-sequestration)
  • Positive agronomic and environmental effects
  • Improves soil quality

• Many issues left...
  • Logistics and upscaling to industrial scale
  • LCA and environmental assessments of biochar-chain
  • Agronomic issues
  • Development protocols and certification schemes
Biochar: Climate saving soils

- develop, implement and disseminate the Biochar strategy
  - Implementation biochar knowledge
  - Transnational knowledge compilation
  - Transnational knowledge development
- 7 countries, 13 partners
Biochar

- NL: Prov Groningen
- NL: Productschap Akkerbouw
- NL: NMI
- NL: WUR-Alterra
- BE: ILVO
- BE: University Gent
- D: HAWK-Göttingen
- D: 3N-Werlte
- DK: Risoe University
- S: University Uppsala
- N: Bioforsk
- UK: University Edinburg
- UK: University Newcastle
Climate saving soils

- **project management**
  - Partnership agreement
  - Financial administration
  - Project reporting
  - Overall project management

- **WP2: project publicity & communication**
  - Website
  - Transnational steering group, transnational focus groups, national steering groups
  - National biochar competence centres
  - Information media
  - Biochar transnational conferences
Climate saving soils

- **Biochar production and joint strategy**
  - Biochar Feedstock logistics
  - Biochar production technology
  - LCA and carbon targets
  - Standard protocols biochar and soil assessment

- **Biochar Application**
  - Biochar soil conditioner
  - Biochar soil remediation
  - Biochar soil CCS
Biochar Climate saving soils

national competence centres