Potentials for Biomass Utilization for German Companies in Serbia

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2. Woody biomass: situation, challenges & opportunities for German Companies
3. Agro biomass: situation, challenges & opportunities for German Companies
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**1. Biomass potentials & realization**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest area (M ha)</td>
<td>2.25</td>
</tr>
<tr>
<td>Area of forests in total area (%)</td>
<td>29</td>
</tr>
<tr>
<td>Total timber volume (M m$^3$)</td>
<td>362.49</td>
</tr>
<tr>
<td>Average timber volume (m$^3$/ha)</td>
<td>161</td>
</tr>
<tr>
<td>Annual increment (M m$^3$)</td>
<td>9.08</td>
</tr>
<tr>
<td>Average increment (m$^3$/ha)</td>
<td>4</td>
</tr>
<tr>
<td>High forests area/volume (%)</td>
<td>27/43</td>
</tr>
<tr>
<td>Coppice forests area/volume (%)</td>
<td>65/50</td>
</tr>
<tr>
<td>Plantations area/volume (%)</td>
<td>8/7</td>
</tr>
<tr>
<td>Conifer volume (%)</td>
<td>19</td>
</tr>
<tr>
<td>Broadleaves volume (%)</td>
<td>81</td>
</tr>
<tr>
<td>State area/volume (%)</td>
<td>53/61</td>
</tr>
<tr>
<td>Private area/volume (%)</td>
<td>47/39</td>
</tr>
<tr>
<td>Annual harvest (M m$^3$)</td>
<td>4.6</td>
</tr>
<tr>
<td>Tech/firewood/residues (%)</td>
<td>43/45/12</td>
</tr>
<tr>
<td>Agricultural land area (ha)</td>
<td>5.10</td>
</tr>
<tr>
<td>Agr. Land area in total area (%)</td>
<td>58</td>
</tr>
<tr>
<td>Arable land (%)</td>
<td>65</td>
</tr>
<tr>
<td>State/Private (%)</td>
<td>17/83</td>
</tr>
<tr>
<td>Corn area/yield (M ha/M tons)</td>
<td>1.26/6.48</td>
</tr>
<tr>
<td>Wheat area/yield (M ha/M tons)</td>
<td>0.49/2.01</td>
</tr>
<tr>
<td>Sunflower area/yield (M ha/M tons)</td>
<td>0.17/0.43</td>
</tr>
<tr>
<td>Soybean area/yield (M ha/M tons)</td>
<td>0.17/0.44</td>
</tr>
<tr>
<td>Sugar bit area/yield (bit M ha/M tons)</td>
<td>0.06/2.82</td>
</tr>
</tbody>
</table>

**Estimated wood biomass:** 1 – 1.53 Mtoe  
**Estimated agricultural biomass:** 1.7 Mtoe  
**Biomass in total cca. 3.3 Mtoe – 64% of all renewables!**

**Realization (2015):**  
Operational CHPs – 0  
CHPs with energy permit – 2  
Operational wood or agro biomass based DH – 1  
Industrial users – several  
Pellet factories – over 50 wood and over 10 agro  
Chipboard factories large consumers  

**Most of raw woody and agro biomass in Serbia is not used directly for energy production, or it is used inefficiently!**
1. Biomass potentials & realization: products

<table>
<thead>
<tr>
<th>Raw material</th>
<th>Woody biomass</th>
<th>Agro biomass</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Semi product</td>
<td>Semi product</td>
</tr>
<tr>
<td></td>
<td>End Product</td>
<td>End Product</td>
</tr>
<tr>
<td>Forest residues</td>
<td>Wood chips, Firewood, Charcoal</td>
<td>Sunflower husk</td>
</tr>
<tr>
<td></td>
<td>Wood pellet, Chipboard, Heat Energy</td>
<td>Sunflower husk</td>
</tr>
<tr>
<td></td>
<td>Heat energy</td>
<td>Heat energy</td>
</tr>
<tr>
<td>Sawmill residues</td>
<td>Wood chips, Firewood</td>
<td>Corn cobs</td>
</tr>
<tr>
<td></td>
<td>Wood pellet, Chipboard, Heat energy</td>
<td>Corn cobs</td>
</tr>
<tr>
<td></td>
<td>Heat energy, bedding, extraction of celluloses</td>
<td>Heat energy, bedding, extraction of celluloses</td>
</tr>
<tr>
<td>Sawdust</td>
<td>Sawdust</td>
<td>Wheat/soya straw</td>
</tr>
<tr>
<td></td>
<td>Wood pellet, Chipboard</td>
<td>Straw bales</td>
</tr>
<tr>
<td></td>
<td>Heat energy</td>
<td>Agro pellet, Agro briquette, bedding, heat energy</td>
</tr>
<tr>
<td>Firewood</td>
<td>Firewood, wood chips, charcoal</td>
<td>Corn stalk</td>
</tr>
<tr>
<td></td>
<td>Wood pellet, Chipboard, Heat Energy</td>
<td>Straw bales</td>
</tr>
<tr>
<td></td>
<td>Heat energy</td>
<td>Agro pellet, Agro briquette, heat energy</td>
</tr>
<tr>
<td>Wood from floods</td>
<td>Firewood</td>
<td>Heat energy</td>
</tr>
</tbody>
</table>
2. Woody biomass

Quantities/quality and contracting wood biomass:

- Wood production in Serbia 4.5-5Mcbm per year + unregistered harvests + wood industry residues
- State forests:
  - most of wood contracted (pellet, chipboard, firewood, etc.)
  - contract possibility for low quality forest residues or wood from damaged forests
  - Long term contract – possible after several annual contracts or not possible
- Private forests:
  - in some regions over utilized in some underutilized
  - Large scale forest owners – most of wood contracted
  - Small scale unorganized forest owners – hard to contract the wood from individual owners, no forest owners cooperatives, several week associations
- Wood industry:
  - Most of residues utilized by wood processors (energy, production of pellet) or contracted (pellet, chipboard)
- Energy plantations
  - Starting slowly
  - Profitability compared to agricultural production?
  - Inadequately regulated lease of non used state owned agricultural land
2. Woody biomass

Biomass logistics:

• Very feasible in flat terrains and after regenerative harvest
• High delivery and logistic costs on mountain terrains
• Low quantities of biomass in selective harvest
• Poor forest infrastructure (especially in private forests)
• State and private forests: owners or subcontractors unequipped and skilled for biomass supply
• Inadequate machinery and harvest concept
• Biomass supply is feasible from State forests in some areas of Serbia – southwest, east and southeast and southern part of Vojvodina province – but system of harvest and biomass logistics should be organized adequately and expectation of quantities should be lowered!
• Biomass supply is feasible from private forests in eastern, western and southern parts of Serbia, but owners have to be organized (joint contracts with owners, cooperative or associations) or local operational logistic centers should be organized as link between large number of small scale producers or forest owners and energy producers.
2. Woody biomass

"Bioenergy in Serbia", 10.11.2015, Stuttgart

<table>
<thead>
<tr>
<th>Country</th>
<th>Annual wood production tons/year</th>
<th>Estimation on biomass processed annually for exported wood biomass products (pellets, chipboards, etc) tons/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>800.000</td>
<td></td>
</tr>
<tr>
<td>Bosnia and Herzegovina</td>
<td>5,500.000</td>
<td></td>
</tr>
<tr>
<td>Croatia</td>
<td>7,500.000</td>
<td></td>
</tr>
<tr>
<td>Kosovo*</td>
<td>1,600.000</td>
<td></td>
</tr>
<tr>
<td>FYR of Macedonia</td>
<td>750.000</td>
<td></td>
</tr>
<tr>
<td>Montenegro</td>
<td>700.000</td>
<td></td>
</tr>
<tr>
<td>Serbia</td>
<td>4,500.000</td>
<td></td>
</tr>
</tbody>
</table>

2. Woody biomass

Potentials/opportunities for German Companies:

• Forest management & harvesting
• Biomass production
  in short rotation energy plantations
• Wood pellet production
• Heat energy production
• Combined Heat and Power Production
• Machinery & equipment
2. Woody biomass: Forest management & harvesting

- State forests managed by State owned forest management companies
- Private forests managed by small scale forest owners – increasing trend of buying small scale forests by harvesting companies
- Restitution: church owned forests, some large scale PFO pending for restitution
- Harvesting in state owned forests – small scale harvesting companies
- Wood industry – mostly small to medium (sawmills, fruit crate producers, furniture) except chipboard producers
- For now no significant opportunities for investments in forest management & harvesting
- In future possible opportunity when restitution is finished and if concessions on state forest management become an option – political decision?
2. Woody biomass: Biomass production in energy plantations

• Possible and competitive on low quality agricultural land
• Productivity very good (favourable climate conditions for willow and poplar clones)
• Consumption of wood chips in Serbia still low – no CHPs or DHs
• Feasibility of energy wood export from SRC needs to be investigated
• Significant areas (over 200,000ha) of unused state owned agricultural land – legal issue which is in process of resolution (new Law on agricultural land)
• Significant areas of private owned agricultural land not adequate for usual crops – some companies consider energy plantations
• Price of agricultural land in Serbia – very high in Vojvodina, very low in Central Serbia

• Opportunity – establishment and management of energy plantations
2. Woody biomass: Wood pellet production

• Over 50 producers – growing until 2014
• In 2014 – market crisis in Italy, Serbian producers not competitive in terms of quality – stocks full even now!
• Serbian producers do not have good market position – depend on traders and situation on Italian market
• Knowledge, equipment, management in most cases not adequate
• Domestic market grows but so far haven’t follow growth in production (over 60% exported)
• Quality – predominantly beech pellet Enplus A2 or lower (industrial)
• Plenty of factories are bankrupting and will bankrupt soon – good locations, supply contracts – normal evolution process with new products
• Opportunity: Serious pellet production company/ies with strong market position in Central and Western Europe – acquisition of existing pellet factories

"Bioenergy in Serbia", 10.11.2015, Stuttgart
2. Woody biomass: Heat energy production

- All DH companies in Serbia have plenty of issues – financial, technical, etc..
- Only 1 DH on agro biomass – no wood biomass DH in Serbia
- New law on PPP – several investors interested
- KfW financed 19 pre-feasibility and 1 feasibility study
- KfW, EBRD and Meglip credit lines exists for Serbian DH companies
- Private investors from Slovenia and Austria active in PPP preparations with local admin

- Opportunity: PPP in heat production in some municipalities in Serbia

2. Woody biomass: Combined Heat and Power Production

- No operational biomass CHPs in Serbia!
- Several interested investors
- Long term biomass supply contact still an issue
- KfW, EBRD credit lines and UNDP grants available
- Profitability with existing feed in tariffs up to 5MW – from 16 KfW financed studies only few financially viable

- For now limited opportunities for biomass based CHP development
- Where enough biomass exist, heat consumption is low!
- If woody biomass demand reduce (pellet and chipboard) and feed in tariffs increase maybe an opportunity!

2. Woody biomass: Machinery & equipment

- Forestry machinery very old – in current FM system increase of demand for better forestry equipment questionable
- Pelletizing equipment – used equipment installed in most cases
- Boilers – good domestic producers but with limited capacity
- Biomass boiler application rising but market is price sensitive (including industry)

- Opportunity – cooperation with domestic boiler producers in product development
3. Agro biomass

**Quantities/quality and contracting of agro biomass:**
- Agro biomass production over 100,000 tons per year – still significantly less than potentials
- Agro biomass for now used for animal bedding and agro pellet/briquette
- Agricultural business in Serbia is 100% private
- Some agro companies already utilize or considering utilization of agro biomass for energy
- Contract possibility with agro companies, individual farmers or professional companies for agro biomass mobilization
- Long term contract – can be possible

**Biomass logistics:**
- Feasible in flat terrains on large agricultural holdings – Vojvodina – private companies and large scale owners
- Logistic concepts and adequate machinery procurement in development
- Dynamics of agro biomass mobilization – harvest in short period of time, storage throughout whole year!
3. Agro biomass

Potential for straw production (cereals, soya, sunflower)

<table>
<thead>
<tr>
<th>Country</th>
<th>Potential (tons/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>700,000</td>
</tr>
<tr>
<td>Bosnia and Herzegovina</td>
<td>1,100,000</td>
</tr>
<tr>
<td>Croatia</td>
<td>3,500,000</td>
</tr>
<tr>
<td>Kosovo*</td>
<td>500,000</td>
</tr>
<tr>
<td>FYR of Macedonia</td>
<td>400,000</td>
</tr>
<tr>
<td>Serbia</td>
<td>9,500,000</td>
</tr>
</tbody>
</table>

Agricultural land and arable land (ha)

<table>
<thead>
<tr>
<th>Country</th>
<th>Agricultural land (ha)</th>
<th>Arable land (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>1,190,000</td>
<td>578,000</td>
</tr>
<tr>
<td>Bosnia and Herzegovina</td>
<td>2,149,000</td>
<td>1,022,000</td>
</tr>
<tr>
<td>Croatia</td>
<td>1,201,000</td>
<td>852,000</td>
</tr>
<tr>
<td>Kosovo*</td>
<td>570,000</td>
<td>300,000</td>
</tr>
<tr>
<td>FYR of Macedonia</td>
<td>1,076,000</td>
<td>431,000</td>
</tr>
<tr>
<td>Serbia</td>
<td>5,053,000</td>
<td>3,299,000</td>
</tr>
</tbody>
</table>

3. Agro biomass

Opportunities:

- Agro pellet production
- Heat energy production
- Combined Heat and Power Production
- Machinery & equipment
3. Agro biomass: Agro pellet production

- Over 10 producers
- Export limited – not competitive with wood pellet
- Domestic consumption growing slowly
- As niche product very interesting – for animal bedding

- Limited Opportunity: agro pellet production for animal bedding aimed for export
3. Agro biomass: Heat energy production

• Agro biomass in Serbia very competitive with Natural Gas and heavy oil

• Application of agro biomass in steam production rising

• Opportunity: PPP in District heating

• Heat energy production in industrial zones
3. Agro biomass: Combined Heat and Power Production

- More profitable than woody biomass according to KfW studies
- Agro biomass potentials very high – corn, wheat, soybean, sunflower – partnership with local agro companies or farmers
- If in industrial zone heat consumption not an issue
- Opportunity: Development of agro biomass CHPs in Vojvodina
3. Agro biomass: Machinery & equipment

- Agriculture in Vojvodina very developed – major agro machinery producers and dealers are present - some space for used machinery sale do exist especially for agro biomass mobilization (ballers, telescopic handlers, specialized trailers, etc..)

- Domestic producers of small boilers exists, while domestic producers of large agro biomass boilers do not exist - sensitive technology

- Market for agro biomass boilers for industrial use is rising but it is price sensitive

- Opportunity: Agro biomass combustion technology developed together with domestic boiler producers
5. Conclusions

• Biomass potentials in Serbia high – realization not so good
• Biomass in Serbia in most cases not used directly for energy production but for other products (pellet, chipboard) or if used, used inefficiently (firewood)
• Wood biomass production limited – plenty of woody biomass already used
• Agro biomass production very low compared to potentials
• Opportunities for biomass utilization for German Companies:
  • Development of energy plantations (willow, poplar)
  • Serious wood pellet production if market is secured
  • PPP in biomass based DH systems (wood and agro)
  • CHPs, steam or heat energy production in industrial zones (agro biomass)
  • Machinery, equipment and technology
Thank you for your attention!

Questions?

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