Development of forest machinery and labour in the EU in 2010-2030
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FORMEC 2011
10.10.2011, Graz, Austria
Storyline

• Wood supply and demand in EU
• Machinery and labour demand
• Harvesting technology
  – Roundwood
  – Energy wood
• R&D drivers and trends
• Conclusions
Woody biomass supply and demand in EU

Potential

- Forest resources
- Other woody biomass

Demand

- Energy use
- Forest industry

million m³ yr⁻¹

2010 2020 2030

2010 2020 2030
Forest biomass supply in EU
# Annual capacities of machines

<table>
<thead>
<tr>
<th></th>
<th>Timber</th>
<th>Energy Stemwood</th>
<th>Energy Residues</th>
<th>Energy Stumps</th>
<th>Energy Early Thinning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvester</td>
<td>35 000</td>
<td>35 000</td>
<td></td>
<td></td>
<td>10 000</td>
</tr>
<tr>
<td>Excavator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17 000</td>
</tr>
<tr>
<td>Forwarder</td>
<td>35 000</td>
<td>35 000</td>
<td>30 000</td>
<td>30 000</td>
<td>30 000</td>
</tr>
<tr>
<td>Chipper</td>
<td></td>
<td>30 000</td>
<td>30 000</td>
<td>30 000</td>
<td>30 000</td>
</tr>
<tr>
<td>Truck</td>
<td>30 000</td>
<td>30 000</td>
<td>18 000</td>
<td>18 000</td>
<td>18 000</td>
</tr>
</tbody>
</table>
Forest machine and transport demand

![Bar chart showing forest machine and transport demand across different scenarios and time periods. The chart includes categories for current (2010), low (2030), medium (2030), and high (2030) demand. Each category is further differentiated by types of machines such as harvesters, excavators, foragers, chipper crushers, and trucks. The bars are color-coded to represent early thinnings, stumps, residues, stemwood, and timber.](image-url)
Harvesting and transport fleet demand

- **Real (2009)**
- **Current potential (2010)**
- **Low (2030)**
- **Medium (2030)**
- **High (2030)**
Labour demand

Labour input, man years

Energy

Timber

Real (2009)
Potential (2010)
Low (2030)
Medium (2030)
High (2030)
Average annual storage volumes, EU

![Graph showing storage volume, million m³, for different years and scenarios: Real(2009), Current(2010), Low(2030), Medium(2030), High(2030). Categories include Energy biomass and Timber.](image-url)
Mechanization in cutting
CTL vs. TL –methods globally

Forest machine markets, units/year

- Tree length method
- CTL method
Harvesting systems for logging residues

Source: Diaz 2010
Intelligent car

Driver assistant systems
- ABS, ESC
- ACC (Adaptive Cruise Control)
- Driver Drowsiness

Cooperative systems
- Extended Environment Info
- Obstacle and Collision Warning

Location based systems
- In-vehicle emergency call
- Car-to-Car Communication

Source: Intelligent Car 2011
Intelligent forest machine

Operator assistant systems
- Tutoring and feedback on work cycles
- Economic driving
- Driver drowsiness

Cooperative systems
- Sensing of trees, soil
- Obstacle, power line, hiker warning

Location based systems
- Tree map generation
- Machine to machine communication (location of timber, soil trafficability)
Where virtual tutor could be used?

Source: Riala 2011
On-the-job tutoring: where to load?

Clear cutting

Source: Lamminen & Väätäinen 2010
Conclusions

• Demand of woody biomass increases inducing large investments in harvesting and transport fleet
  – Technology selection
  – Operator availability

• Energy biomass demand a main development driver of harvesting technology

• Labour input can be reduced
  – Operator tutoring and semi automation will penetrate commercial level in a decade
  – Mechanization in cutting continues
Conclusions

• CTL: cutting edge development in EU
  – Growth of markets outside EU

• Decline of European pulp & paper industries may reduce the demand
  – Emerging biorefineries enter the scene in late 2020’s
  – Switch from fresh to dry wood deliveries

• Massive biomass storages and need for their monitoring and management increases
Thank you