Supply Chains of Wood Biomass

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Objectives

The main objectives of this session are:

• To review the most common procurement and supply chains of forest biomass.
• To understand the limitations and main factors that define a supply chain
Outline

Introduction & discussion:
• General aspects of wood biomass
• Wood for Energy
• Forest Chips
• Supply Chains of Wood Biomass

Through video recording (presentation with audio):
• Specific Supply Chains of Wood Biomass
• Quality aspects of Forest Biomass
• Biomass from forests – cost supply estimation
• Where is the money – economic viability of forest bioenergy
General aspects of wood biomass

- Bioeconomy
- Forest sector in Finnish bioeconomy
- Use balance of Finnish forest industry
Bioeconomy – the next wave of economy


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Political and operational environment support bioeconomy

- EU policies and directives
  - CAP, Climate action, Cross-cutting policies, Energy and natural resources, Environment, consumers and health, Regions and local development
- Governmental goals
- Paris climate agreement

*BIOECONOMY*
Bioeconomy in Finland

Value added of bioeconomy, 2019*

- Food sector: EUR 4.3 billion
- Construction: EUR 4.6 billion
- Bioeconomy services: EUR 1.9 billion
- Water treatment and supply: EUR 0.5 billion
- Energy: EUR 2.1 billion
- Forest sector: EUR 9.0 billion
- Other industries: EUR 3.6 billion

The share of bioeconomy

Value added of national economy: EUR 208.0 billion

*Preliminary data
Sources: Statistics Finland and Natural Resources Institute Finland
Forest and food sectors in Finland’s bioeconomy, 2019*

Whole bioeconomy
- Forest sector
- Food sector
- Other bioeconomy sectors

Output 74,380 mill. €
- Forest sector
- Food sector
- Other bioeconomy sectors

Investments 5,619 mill. €
- Forest sector
- Food sector
- Other bioeconomy sectors

Exports of goods 2018*
- Forest sector
- Food sector
- Other bioeconomy sectors
19,361 mill. €

Employed 301,800 persons
- Forest sector
- Food sector
- Other bioeconomy sectors

The share of national economy
- Output 16%
- Investments 10%
- Exports of goods 31%
- Employed 11%

Forest and food sectors broken down by sub-sector
- Forestry
- Wood-products industries
- Pulp and paper industries
- Agriculture
- Food industry

* Preliminary data
Sources: Statistics Finland and Natural Resources Institute Finland
Bioeconomy responds to global growing material demand and changing climate

IN THE YEAR 2030, IN FINLAND

- Wood demand has reached 80Mm³/a
- Mean annual temperature has risen by 2°C
- Winter of Salpausselkä in 1980’s is approaching Kainuu

Green bioeconomy plays a central role in balancing the climate challenge and forest-based sourcing of goods and services

Source: A. Asikainen 2018
FROM STUMP TO MARKET
- forecast of fellings, processing and export of forest industry products 2021

Volume of growing stock
2.5 bn m³
Maximum sustained annual yield
80.5 mill. m³

Industrial roundwood removals
58.4 mill. m³
+4%

Roundwood imports
12.0 mill. m³
0%

Sawlogs
25.5 mill. m³
+6%

Pulpwood
32.9 mill. m³
+3%

Wood products industry

Pul and paper industry

Wood chips

Plywood
1.0 mill. m³
+3%

Sawnwood
10.9 mill. m³
+6%

Pulp
7.7 mill. t
+4%

Paperboard
4.1 mill. t
-13%

Paper
3.5 mill. t
-18%

Export
0.9 mill. m³
536 €/m³
+9%

Export
8.5 mill. m³
196 €/m³
+8%

Export
4.2 mill. t
476 €/t
+5%

Export
4.0 mill. t
774 €/t
+13%

Export
3.5 mill. t
666 €/t
-18%

MARKETS

% Indicates change over the previous year
Wood for Energy

- Reasons
- Consumption of wood fuels
Reasons behind: Climate
Reasons behind: **Resources**

- Forests cover 23 million ha (76%)
- Boreal forests
- Private forest cover 83% of roundwood removal
- Forestry and forest industries account for 6% of the GDP
CONSUMPTION OF WOOD FUELS, 2019

Total energy consumption: 378 TWh
- Renewable energy: 141 TWh
  - Wood fuels: 105 TWh (38%)
  - Black liquor and other concentrated liquors: 44%
  - Small-scale combustion of wood: 16%
  - Heating and power plants: 38%
  - Other forest industry by-products and waste products: 2%

- Renewable energy: 37%
- Fossil fuels: 34%
- Nuclear energy: 18%
- Others: 6%

The data for 2019 are partly preliminary

Sources: Statistics Finland, Natural Resources Institute Finland

TWh = terawatt-hour

*Other renewable energy includes wind and hydro power, heat pumps, solar energy and other biofuels.
Consumption of fossil fuels and renewables

Source: Natural Resources Institute Finland, Statistics Finland.
Total energy consumption by energy source

Source: Natural Resources Institute Finland, Statistics Finland.
Total wood fuels consumption by energy source

Source: Natural Resources Institute Finland, Statistics Finland.
Bioeconomy & integrated use of woody biomass

- Bioeconomy leans heavily on the forest sector
- Use of woody biomass is also integrated to forest industry
- A large share of productions ends in energy use
Forest Chips

- Raw materials of modern firewood
- Use of forest chips
SOLID WOOD FUEL CONSUMPTION IN HEATING AND POWER PLANTS, 2019 (mill. m³)

- Bark: 7.9
- Forest chips: 7.5
- Sawdust: 2.5
- Industrial chips: 0.2
- Recycled wood: 1.1
- Wood pellets and briquettes: 0.2
- Other solid wood fuels: 0.2

Total consumption: 20.5 mill. m³
Solid wood fuel consumption in heating and power plants

Source: OSF: Natural Resources Institute Finland, Wood in energy generation.
Solid wood fuel consumption in heating and power plants by woof fuel assortment

Source: OSF: Natural Resources Institute Finland, Wood in energy generation.
Raw materials of modern firewood

Logging residues

Small-sized wood

Stumps

Large-sized, (rotten) wood (Stem wood loss)
Consumption of forest chips in heating and power plants by raw material

Source: OSF: Natural Resources Institute Finland, Wood in energy generation.
Total consumption of forest chips

Source: OSF: Natural Resources Institute Finland, Wood in energy generation.
Consumption of forest chips by plant type

Source: OSF: Natural Resources Institute Finland, Wood in energy generation.
Supply Chains of Wood Biomass

- Forest energy supply chains
- Integration of operations
"From the first societies and economies in Egypt, Mesopotamia/Persia, China and Central America, the wellbeing of mankind depended on the ability to transport and store goods effectively and efficiently.”

Biomass supply
Generalised view of the supply chain for forest biomass

Fig. 1 A generalised view of the supply chain for forest biomass, from stump to end-use facility. Sawlog and pulpwood flows are characterised by relatively short storage times in the forest and at landings and terminals as the customers demand fresh wood. However, during sub-zero temperatures storage times can increase at landings and terminals. Supply of energy wood, on the other hand involves more and longer storage of material at all nodes in the supply chain.

Supply chains of wood biomass

- Increased use of wood for traditional pulping and sawing increases also wood energy production.
- Supply chains depend on the raw material type…
- Supply chains depend on the processing location…
- There is not one supply chain solution, there are several, depending on the operational environment.
Any questions to the part: general aspects of wood biomass?

• Specific Supply Chains of Wood Biomass in form of audio presentation
Thank you!