Wood supply digitalization in Finland

Jarmo Hämäläinen
Metsäteho Oy

Industrial Scale Bioeconomy and its Requirements conference
June 14th – 16th 2017
Lappeenranta, Finland
Vision: Efficient Wood Supply 2025

"Efficient and precise wood supply improves the competitiveness of the forest industry and guarantees its growth and regeneration potential."

Development goal 2025

Wood supply produces added value to the value chain while being 30% more cost-efficient than today.
Digitalization enables a major leap in value chain

“Digitalization is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities” (Gartner).

- More efficient timber logistics
- Organisation and leadership reforms
- Profitable wood production
- Well-functioning timber market
Some milestones of digitalization so far


Planning and control systems for wood supply

Cross-cutting and simulation systems

StanForD

Automatic wood measurement at mill

X-ray systems at sawmills

Harvester measurement system

Digital data sources in forest inventory

Laser scanning in forest inventory (grid level)

Web based wood trade

Wood Force

Log Force

Fleet management

Digital maps

GSM

GNSS
Technology drivers

- Sensor and automation technology
- Data transferring and storing capacity
- Open data sources
- Data standards and interfaces
- Big Data analysing methods
Forest Big Data vision – more precise and cost-effective wood supply through improved data and advanced decision support systems

- Web-based wood market, Decision Support Systems
- Planning & control of wood flow, DSS
- Topography, terrain wetness index, soil type, rainfall, road conditions.

What is needed?

Application development
Utilization concepts (POC)
Legislation and rules
Data management and analysing (methods)
Data transfer and fusion (methods)
Data acquisition and modelling (methods)

Vision and targets

Goal: Next generations Forest Data Ecosystem
Examples of activities and results
The prediction of single-tree biomass, logging recoveries and quality attributes with laser scanning techniques

• Automatic processing of Terrestrial Laser Scanning (TLS) data was demonstrated to be effective and accurate and could be utilized to make future TLS measurements more efficient.

• Multisource approaches provide new possibilities to improve the accuracy of single-tree measurements but also for predicting values for larger areas.
Towards automatic work quality measurement in harvesting

**Thinning intensity**
- Laser

**Rut depth**
- Time-of-flight imaging or laser

**Strip road density**
- GNSS

**Tree damages**
- Camera

Wood supply digitalization in Finland

Pictures:
- Lari Melander, TUT
- Jyry Eronen, UEF
Road conditions through mobile phone data, machine vision and sensor fusion – pilot project

Source: Viominer service (Vionice Ltd.)
Collecting harvester data into a common or company-specific data warehouse (proof-of-concept)

**Forest data platform**

- **Data warehouse operator**
  - Selection of harvesting objects and adding of descriptive data
  - Removing or pseudonymization of sensitive data

- **Forest companies**
  - Forest company A information system
  - Forest company B information system
  - Forest company C information system

- **ICT provider**
  - WoodForce (wood supply planning service)

- **Contractors**
  - Contractors’ cloud services provided by forest machine manufacturers

- **Applications (examples)**
  - Wood supply and production planning systems, e.g. cross-cutting control and simulation
  - Update of forest resource data
  - Field reference data for remote sensing
  - Development of wood quality models

**Data warehouse**

- • data validation and pre-processing
- • calculation of stem profiles and volumes
- • wood quality attributes based on cross-cutting data (stand level)
- • stand delineation based on harvester locations

**Stem data**

- • diameters and length
- • log dimensions and assortment
- • quality attributes
- • coordinates and time stamps

Tapio Räsänen, Metsäteho 2017
Method to Generate Stand Delineation Based on Harvester Locations

Data collection by harvester and pre-processing of STM-files

Importing data to GIS - software and performing coordinate transformations

Separation of strip roads, which lead to the stand.

Creating basic patterns based on Delanay triangulation and buffering

Creating final stands delineations and calculating the area of the stand.
Forest Big Data Platform

- How to make the access and utilization of heterogeneous data simple for the applications?
- Goal: reduce the threshold for developing and implementing new forestry applications → new businesses, e.g., related to wood trade and forestry planning
- Solution: platform enabling uniform view to varying heterogeneous forest data sources
  - Data inquiry interface
  - Data structure
  - Basic services for data updating and fusion

Source: Miika Rajala & Risto Ritala (2014), Tampere University of Technology
Terrain trafficability maps for timber harvesting

Trafficability class
- Mineral soil/thaw
- Mineral soil/normal summer
- Mineral soil/low rainfall summer
- Peatland/normal summer
- Peatland/low rainfall summer
- Winter

Source: Arbonaut Ltd
Web based wood trade service - Kuutio.fi

**Forest owner**
- Secure authentication
- Forest resource data from Metsään.fi -service
- Call for offers
- Comparison of offers
- Service requests

**Object trader**
- eg. consultant to forest owner

**Kuutio.fi**
- Market place for trade objects
- Standardized reliable data transfer
- Available with different devices

**Buyer**
- Receiving of offer requests
- Offer making
- Receiving of contact requests *

Mobile applications
- Interfaces (API)

*) Finalization of wood trade/purchase contracts outside Kuutio
Implementation of R&D results in full flow

• Web based wood trade platform released (Kuutio.fi)
• New timber cross-cutting service under construction in forest companies
• Soil trafficability maps into operational use 2017
• Forest Hub data transfer service under construction
• FBD Platform under construction (prototype)
• Harvester database under construction (prototype)
• Most promising new forest inventory methods into practice by Finnish Forest Centre
• “ForestDigiroad” system under planning
• Updating of forest data legislation and recommendations concerning machine data ownership and availability in process
• Several further research and proof-of-concept projects have started
Thank you!

jarmo.hamalainen@metsateho.fi

www.metsateho.fi