Forestry 4.0
Towards a Forest Revolution
for the Canadian Timber Supply Chain

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Total wood harvest 2016

- 150,000,000 cubic metres
- 720,000 hectares

Volume comparable to Russia, Scandinavia, Brazil (less than ½ US)
Current Supply Chain Challenges in the Canadian Forest Sector

- Low margin sector (commodity product)
- Poor connectivity (cell coverage, remote and continuously changing operations, off-grid power, etc.)
- Unique environmental challenges
  - MPB, Wildfires, Spruce Budworm
- Imprecise forest inventories
- Inflexible and slow-to-react supply chain (push mode, contractor relations and risk tolerance)
- Acute labor shortages
IN 2025, FORESTRY 4.0 WILL BRING...

25

- MILLION $/WEEK, in additional value created by only cutting trees needed to satisfy a customer!
  - (4% of export value)

- MILLION M³, harvested by automated unmanned forest machines!
  - (15% of volume harvested)

- MILLION KM, driven on forest roads by driver-less autonomous forestry trucks!
  - (2.5% of total trucking distance)
Coined after **Industry 4.0** – interconnection of machines/systems/data to optimize real time decision making based on data streams generated throughout the value chain.
1. Real Environment

- Automated regeneration assessment tool: FPSilvi

**FPSilvi**: In-house developed single tree detection and establishment / FTG assessment tool implemented in ArcGIS – Python platform
1. Real Environment

- Multi-temporal LiDAR to assess growth

Vertical growth

Lateral extension (Avg = 0.39 m)

- Further RS studies in biomass availability / feasibility
1. Real Environment

- Stem and stand characterization using mobile terrestrial LiDAR (plantations and complex stands)
1. Real Environment

- Capture CTL production data with OBCs
- Capture full tree harvesting production data utilizing onboard sensors

- SLAM (simultaneous localization and mapping)
- Overlay satellite and RS data to correlate stand with harvesting costs and log values
2. Internet of Forest

- **Objective:** Real-time comm. everywhere
- **Challenge:** Remote operations, cell coverage
- **Solution:** Technology assembly
  - Cellular, Satellites, Other (e.g. LoRaWan, WiFi hotspot, LTE, DSRC)

(2 - 7 km) range
3. Data Analytics

- Analytics (integration and link to implementation)
- Descriptive, predictive and prescriptive model
- Leveraging machine data

- Machine data to improve survey data
- Geographic links to data
- Data standards need to be adapted to Canadian context
4. Advanced Procurement Systems

- Augmented reality
  - Added information to help with decision making
  - Microsoft Hololens
  - Work with Polytechnique, other Vancouver-based tech. co.
  - Challenge: Precise multi-axis positioning in space

- Automation (e.g. intelligent boom control)
- Teleoperation, Autonomous Vehicles and Robotics (e.g. Can. Field Robotics Network)
4. Advanced Procurement Systems
FPInnovations’ role – now and in future

- Act as a hub for Forestry 4.0 deployment in Canada
- Define value of individual technologies for the Canadian context
- Accelerate implementation of 4.0 technologies in forestry
- Facilitator and creator of partnerships
- Attract interest from Industry 4.0 technologies experts
- Continue to expand network of partners
- Projects with universities in the Canadian Field Robotic Network