Canadian wood pellet fibre sourcing
– a regional review of volumes, methods, and costs

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Canada has a lot to offer

- 9,984,670 km²
- 400 million ha forest land
  - 8% private land
  - 78% Provincial Crown land
- 140 million m³/a

- 338,424 km²
- 21 million ha forest land
  - 70% private
  - 30% public
- 55 million m³/a
Common forest biomass sources

- Harvest residues
- Low quality roundwood
- Under-utilized standing trees
- Burnt & Insect killed
- Harvest residues
Potential biomass sources

- Non-commercial stands
- Purpose grown crops
- Early thinning
- FireSmart treatments

Source: New Energy Farms, Arundo Donax
British Columbia & the Prairies

Potential Availability

Sawmill Residues
Harvest Residues
Roundwood

Suitability for pellets
British Columbia & the Prairies

BC:
- There are large untapped volumes of harvest residues (Vancouver Island, Kootenays, etc.)
- The Interior is already facing a fibre shortage
- Upcoming shortage of MPB wood will have a large effect on availability of sawmill residues
- Relative closeness to shipping ports is a major advantage
- Challenges around quality/contamination with harvest residues
- Potential sources of residues may become available from thinnings, FireSmart treatments, right-of-ways, road sites, urban forestry

The Prairies:
- Low availability of sawmill residues in SK, MB
- Large share of small(er) diameter residues
- Unwanted roundwood assortments have potential
- Distance to pellet market
Eastern Canada

Potential Availability

Sawmill Residues

Harvest Residues

Roundwood

Suitability for pellets
Eastern Canada

- Smaller trees & more hardwood compared to the West
- Good availability of roundwood
- Surplus of pulp chips in the Maritimes – but can the industry afford the price point of pulp chips?
- Higher cost of CTL vs. TL chips
- Harvest residues not suitable for pellets
- Sawmill residues are already used very efficiently
Biomass prices Canada

- Sawmill Residues: 10 – 60
- Harvest Residues: 40 – 120
- Roundwood: 80 – 120

Cost $/odt
Fibre availability and procurement

Fibre availability in Canada is great BUT it depends where you are.
Feedstock cost is key to competitiveness

- Delivered wood cost to mill is the single largest component of final product cost (40 to 60%)
- Failures of bioenergy projects are often due to insufficient attention to the feedstock supply (volumes, costs, quality & fluctuations)
- Currently no high value product for biomass, therefore low cost is expected
Current methods of obtaining fibre
Harvest residues from full-tree

Stroke delimber or roadside processor

Delimber-debarker-chipper (DDC)

55 $/odt (100 km)
Chips at the mill
Harvest residues from cut-to-length

80 $/odt (100 km)
Chips at the mill
Low-quality pulpwood

100-120 $/odt (100 km)
Chips at the mill
Unallocated or non-commercial sources

Potential:
- High unutilized volumes
- Removal can improve the forest and facilitate regeneration activities

Challenge:
- to reduce costs lower than conventional harvesting costs (120 $/ODt)
- some silvicultural systems make biomass recovery difficult
Short Rotation Woody Crops

Potential:
- May be able to provide large and sustained volumes of feedstock
- Could supplement existing feedstock sources

Challenges:
- Seasonal availability
- High establishment costs
- High risk of not achieving expected yields
- Expensive specialized planting and harvesting equipment
- Land availability – farmer/land owner participation in a SRWC program is unknown and unpredictable
- Land productivity – the so much acclaimed marginal land may not sustain the high yields required to make these crops feasible
- Chlorine content

Yield/Cost:
- Yield: 5-10 odt/ha
- Cost: 85 – 150 $/odt
Fibre availability assessment

- Tenure is one of the biggest issues in relation to availability
  - Who owns what?

- Realistic assessment of fibre volumes is essential
  - How much is out there?
  - What is accessible and sustainable?
  - What type of biomass and it’s location?
  - How much does it cost?

- Define parameters that are unique to each site
  - Public or Private forests?
  - Harvesting system used?
  - Local competition or integration potential?
  - Infrastructure?
  - Feasibility for export market?
Fibre availability

### Williams Lake 10-year supply

#### 10-YEAR HARVEST

<table>
<thead>
<tr>
<th>Transit point</th>
<th>Oven-dried tonnes (odt) available for:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$60/odt</td>
</tr>
<tr>
<td>Hanceville</td>
<td>640,745</td>
</tr>
<tr>
<td>Anahim Lake</td>
<td>1,845,700</td>
</tr>
<tr>
<td>Williams Lake</td>
<td>1,691</td>
</tr>
<tr>
<td>Horsefly</td>
<td>75,575</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,563,711</strong></td>
</tr>
</tbody>
</table>
Reducing the cost of biomass supply

Cost Availability - 10 yr base case

Available now: $60

What we're missing

- 760,000 odt/y at $80
- 520,000 odt/y at $70
- 250,000 odt/y at $60

$/odt delivered to nearest mill

- $10
- $30
- $50
- $70
- $90
- $110
- $130
- $150
- $170
- $190
- $210
- $230
- $250
How can we achieve these cost savings?
Improving efficiency of biomass supply

- Productivity studies
- Fuel consumption improvements
- Integrated harvesting
- Machine evaluations:
  - Grinders vs. Chippers
- Effect of feedstock type on operations
  - Knife and hammer wear
  - Grate size and design
Improving efficiency of biomass supply

Extending the raw material base for pellets

Trial objective:

- Test a microchipper for productivity and product quality in pellet feedstock comminution
- Full size sawlogs were used to simulate leftover tops
- Pacific Peterson 4300 microchipper
Improving efficiency of biomass supply

Extending the raw material base for pellets

Conclusions:
• High productivity
• Low bark content
• Low ash content
• Uniform particle size distribution
Improving efficiency of biomass supply

Biomass storage

- Store the logging residues in a “ready to load” fashion
- Air-dry the residues in the field
- Tarping
- Chip residues only when needed
- Covered storage
- Minimize biomass handling
- Implement Quality Control
Feedstock quality monitoring & upgrading

Upgrading existing raw materials

Trial objective:
- To determine the effectiveness of a starscreener’s ability to remove fines from mixed mill residues
- Komptech Multistar L3 starscreener

Conclusion:
- Fines portion is suitable for pellet production
Feedstock quality monitoring & upgrading

Limiting contamination

Fuel contamination study (Southern BC)
- Too much rock (inorganic) in boiler
- Identify sources of hog fuel contamination
- Examine supply chain and identify contamination amount at each stage
What is the competition for feedstocks

New High-Value Applications

Value-Added Products

Traditional Commodity Products

New Bio-Product Opportunities

New BioMaterials from Wood

- CNF
- NCC
- Lignin
- Sugars
Conclusions

- There is lots of biomass but sustainable and economic volumes need to be established on a local case-by-case basis
  - Pellet producers’ access to fibre is problematic if not a primary forest product manufacturer
- Development of residue recovery systems
  - Better integration with conventional harvest
  - Tailored biomass supply chains
- Value of residues need to be recognized
  - not a mature market
  - treated as a co-product
- New breakthrough technologies are required to:
  - Develop innovative logistic solutions
  - create clean white wood from harvest residues
- We need a joint vision!
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