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Integrated Biomass Systems

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Background

- British Columbia is experiencing fibre shortages
- Tenure system
- Market fluctuation & distortions
- Evolving secondary industry (pulp, pellets)
- Social license for open burning of biomass is getting increasing difficult
- Shift in mindset

Business as usual

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Business as usual

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Business as usual

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Business as usual

- Biomass has to be burned in burn piles during the winter season

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How do we mobilize more biomass?

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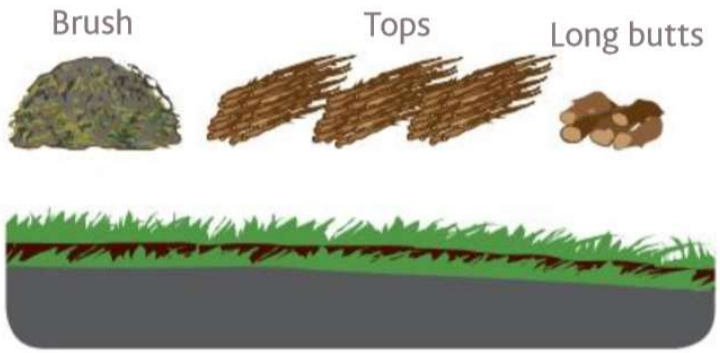
New paradigm

- Traditional forest industry, secondary users and government have been working together to find solutions to mobilize more biomass
  - Clarify liabilities
  - New approach to pricing biomass
  - New tenure types
  - Movement toward integrated biomass harvesting



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New paradigm cont.

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New paradigm cont.

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Operational challenges

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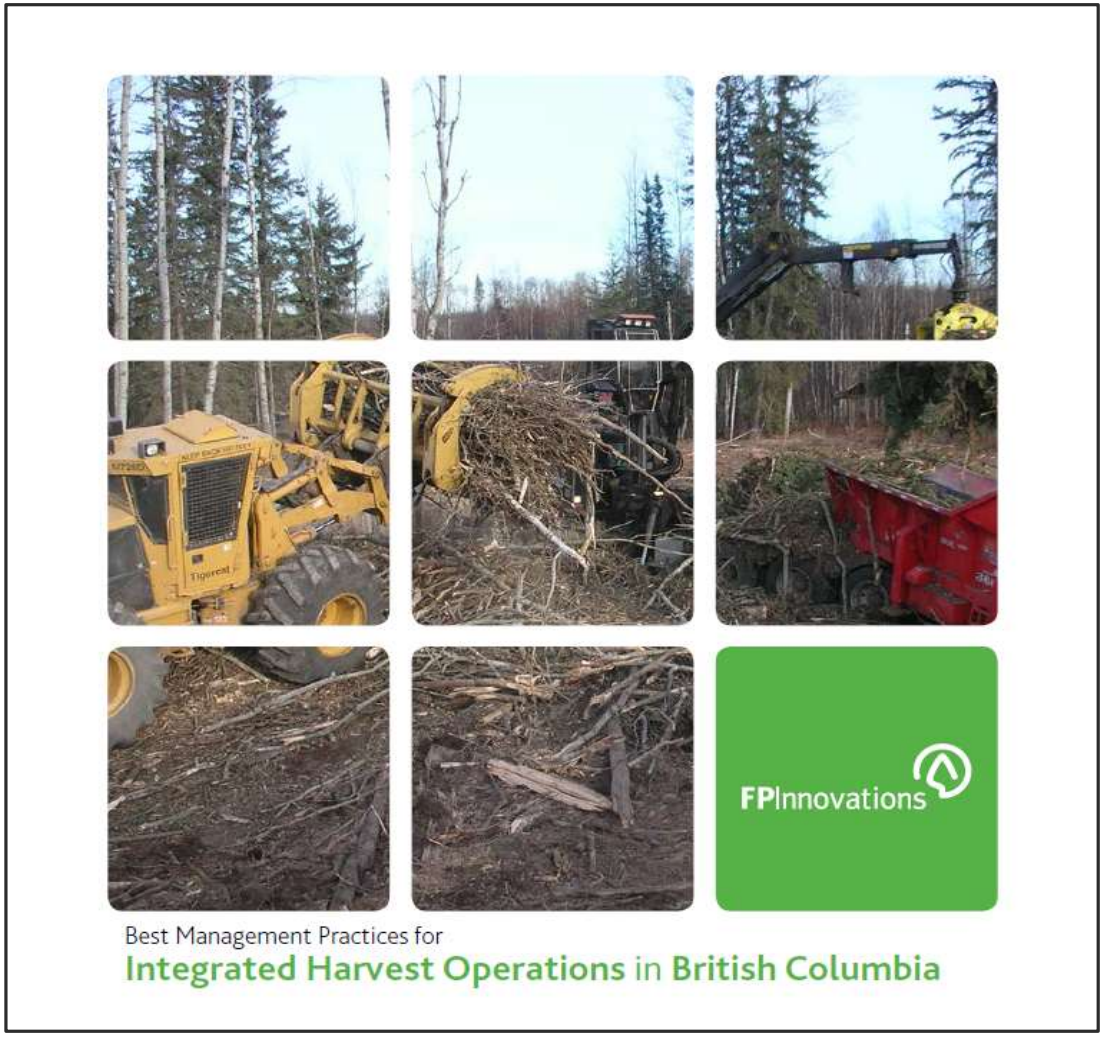
Solutions to challenge status quo



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Solutions to challenge status quo

- Series of practical trials to test the feasibility of new integrated harvesting systems
  - Trial I: **Modified piling techniques**
  - Trial II: Comparison of processing techniques
  - Trial III: System analysis

Trial I: Modified piling techniques

We divided the piles into three categories:

1. Piles where the processor operator neatly stacked the tops and long butts.
   - Logging contractor said there was no difference in productivity between arranging the piles neatly and throwing the pieces in random directions.

2. Piles built for burning.
   - Edges of the piles were folded into the piles to facilitate burning.

3. Piles built for biomass extraction.
   - The processor piles were **re-built** with all tops aligned perpendicular to the road.

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Trial I: Modified piling techniques

Results:

- When adding the piling cost to the grinding cost, the cheapest treatment was simply having the processor operators pile the residues neatly in the logging phase.

Piling Treatment	Grinding cost ($/odt)	Piling Cost ($/odt)	Total Cost ($/odt)
Processor only	$ 12.49	$ -	$ 12.49
Piling for biomass	$ 11.88	$ 2.95	$ 14.83
Piling for burning	$ 13.47	$ 3.57	$ 17.04

Trial I: Modified piling techniques

Other interesting secondary findings:

- **Contaminants**
  - By far, the fire piles had a **much** higher degree of contamination than the other two methods.
- **Fire risk**
  - Approximately 13% of the volume of the fire piles was left to be burned due to contamination. The other pile types had virtually no residue left after grinding (ie no burning costs).
- **Plantability**
  - Plantability was considered to be ‘very good’ post grinding for all methods with the exception of the residue piles left after grinding the fire piles.

Solutions

- Series of practical trials to test the feasibility of new integrated harvesting systems
  - Trial I: Modified piling techniques
  - **Trial II: Comparison of processing techniques**
  - Trial III: System analysis

Trial II: Comparison of processing techniques

- Does having the processing handle residues differently affect productivity?

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Trial II: Comparison of processing techniques

- In both cases the difference in productivity was negligible

Unprocessed Deck #	Handling Method	Productivity (m3/PMH)	Average piece size (m3/ piece)
Deck 1	Method 1 – Stacking neatly	34.6	0.33
Deck 1	Method 2 - Throwing	34.4	0.32
Deck 2	Method 1 – Stacking neatly	23.2	0.23
Deck 2	Method 2 - Throwing	25.6	0.24

Solutions

- Series of practical trials to test the feasibility of new integrated harvesting systems
  - Trial I: Modified piling techniques
  - Trial II: Comparison of processing techniques
  - **Trial III: System analysis**

Trial III: System analysis

Objectives:

- Determine productivity of handling residuals in the processing phase (piling versus flinging)
- Determine productivity of piling (burn piles), hoe-chucking, loading and transporting residuals to a central sortyard

Trial III: System analysis

Processing

- Confirmation that processing into decks does not negatively affect productivity
- Should be more commonly applied

Piling

- Average cost for building of the piles was $2.92 per oven dry tonne or $1.27 per cubic metre

Hoechucking

- Hoechucking was considerably cheaper for piled tops

Transport

- Maximize payload

	Productivity	Costs	
Pile	**m^3/SMH**	**$/ODT**	**$/$m^3$**
Oriented	129.8	1.15	2.65
Burn	19.2	6.90	15.87

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Trial III: System analysis

Bin/trailer type	Average load size (odt)	Average transport cost ($/odt)
Small bin (34.4 m^3)	4.08	$ 39.74
Big bin	5.91	$ 31.82
Roll-off and trailer	12.54	$ 23.08
Roll-off only	5.55	$ 46.78

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Trial III: System analysis

Recommendations

- Lowest cost option combined utilization of oriented piles and larger transport configurations

		Piling cost		Hoechuck cost		Loading cost		Transport cost		Total cost	
Pile Type	**Bin/trailer type**	**$/m3**	**$/odt**	**$/m3**	**$/odt**	**$/m3**	**$/odt**	**$/m3**	**$/odt**	**$/m3**	**$/odt**
Oriented pile	Small bin (34.4 m^3)	-	-	1.15	2.65	4.95	11.39	17.78	39.74	23.88	53.78
	Big bin (45.9 m^3)	-	-	1.15	2.65	4.19	9.65	13.30	31.82	18.64	44.12
	Roll off and trailer	**-**	**-**	**1.15**	**2.65**	**5.16**	**11.87**	**9.80**	**23.08**	**16.11**	**37.60**
	Roll off only	-	-	1.15	2.65	8.03	18.45	18.61	46.78	27.79	67.88
Burn pile	Small bin (34.4 m^3)	1.27	2.92	6.90	15.87	4.95	11.39	17.78	39.74	30.90	69.92
	Big bin (45.9 m^3)	1.27	2.92	6.90	15.87	4.19	9.65	13.30	31.82	25.66	60.26
	Roll off and trailer	1.27	2.92	6.90	15.87	5.16	11.87	9.80	23.08	23.13	53.74
	Roll off only	1.27	2.92	6.90	15.87	8.03	18.45	18.61	46.78	34.81	84.02

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Conclusions

- As researchers we need to make more effort to understand the drivers of the industry
- We need to be able to clearly answer the following questions
  - Is industry ready for what we are proposing?
  - How can we implement new systems with the least amount of impact on the existing methods?
  - How do we convince contractors of the benefits?
  - How do we make sure that benefits along the supply chain are shared fairly among all stakeholders?
  - How do we replicate initial positive results from studies to other areas?
  - Are all stakeholders clear about the process and desired outcomes
- How does this tie into harvesting systems of the future?

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