



DE LA FORÊT AU CLIENT

Benefits on supply chain performance of implementing a regional logistic centre

Luc LeBel, ing.f., Ph.D.

François Sarrazin, M.Sc.

Nadia Lehoux, ing. Ph.D.

FORAC research consortium – Université Laval

Precision Forestry

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Sorting : Think Trees

- **2 800 species of trees and shrubs in Canada's forests**

- Fir, Spruce, Pine, Birch, Poplar, Larch, Ash, Cypress, Cedar, Linden, Willow, ...

→ Sizes vary greatly

ex: In Quebec, 2 to 20 m (height), Avg stem size 0.130 m³ (SPF)

- **Biological product**

- Freshness, heterogeneity

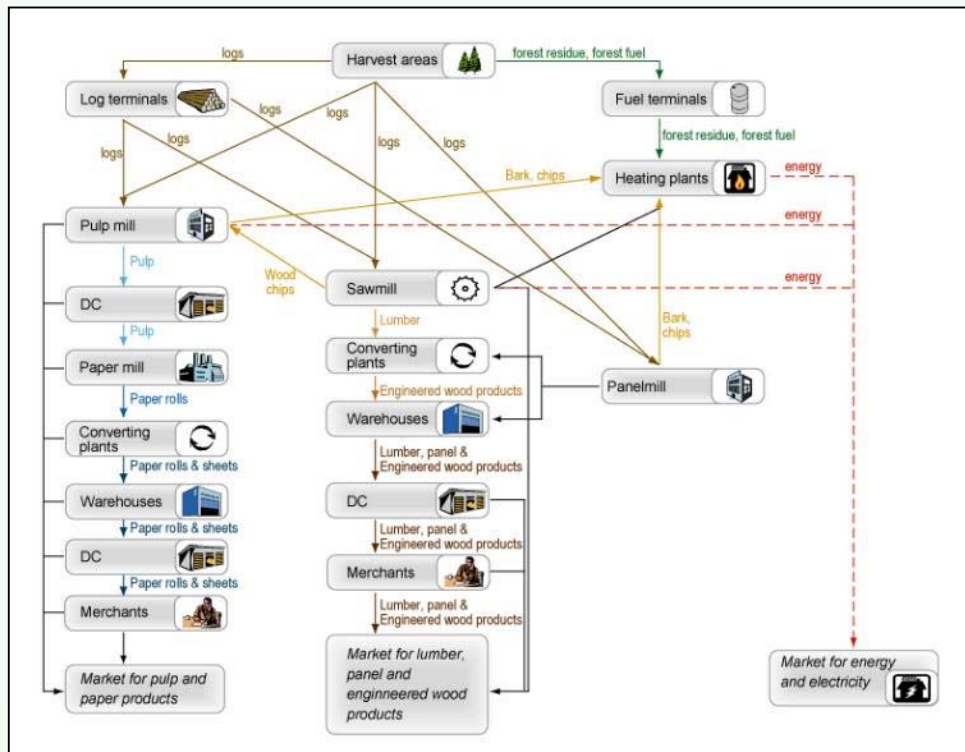


Operations in the forest are expensive



Typical logging camp Author: Groupe Rémabec

Forest product industry network



Source: Lehoux *et al.*, 2012

• The Forest Products Network involves...

- Numerous and diversified stakeholders for the procurement, production and transportation of products to the market
- Divergent processes
- 4 different supply chains

→ Different activities related to each other

On the Road Again



Source: <http://www.scotiana.com>



Author: L. LeBel



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Author: L. LeBel



Extra-heavy load (100 000kg pay load) Author: Groupe Rétabec



TRANS-SHIPMENT YARD



SORTING YARD



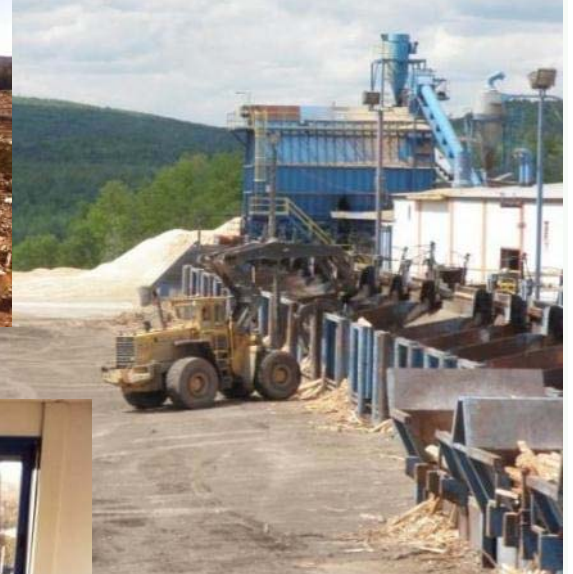
MERCHANDISING YARD



VALORISATION YARD



**VALORISATION YARD
+
LOGISTIC HUB**



Photos: L. LeBel



Senaste Nyheterna

- » Vägavstängning G:a Hjälmseryd - Stockaryd
- » Öppet Hus på Stockarydsterminalen 3 - 5 juni 2014
- » Personal BTO utbildade.
- » Anställd personal ansvarar för materialhantering.
- » Driftpersonal till Stockarydsterminalen AB sökes

Terminalområdet

Järnvägsterminalen består idag av 50000 kvm asfalterad och hårdgjord yta för tillfällig lagring av kunders gods.

Stockarydsterminalen

OM TERMINALEN | MILJÖ & KVALITÉ | JÄRNVÄGSTRAFIK



Modern logistik skapar goda affärer!

Här passerar 200000 kubikmeter råvara varje år

Source: stockarydsterminalen

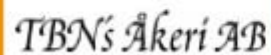


Efficient and effective logistics facilitate competitiveness for businesses in Skaraborg and create jobs!

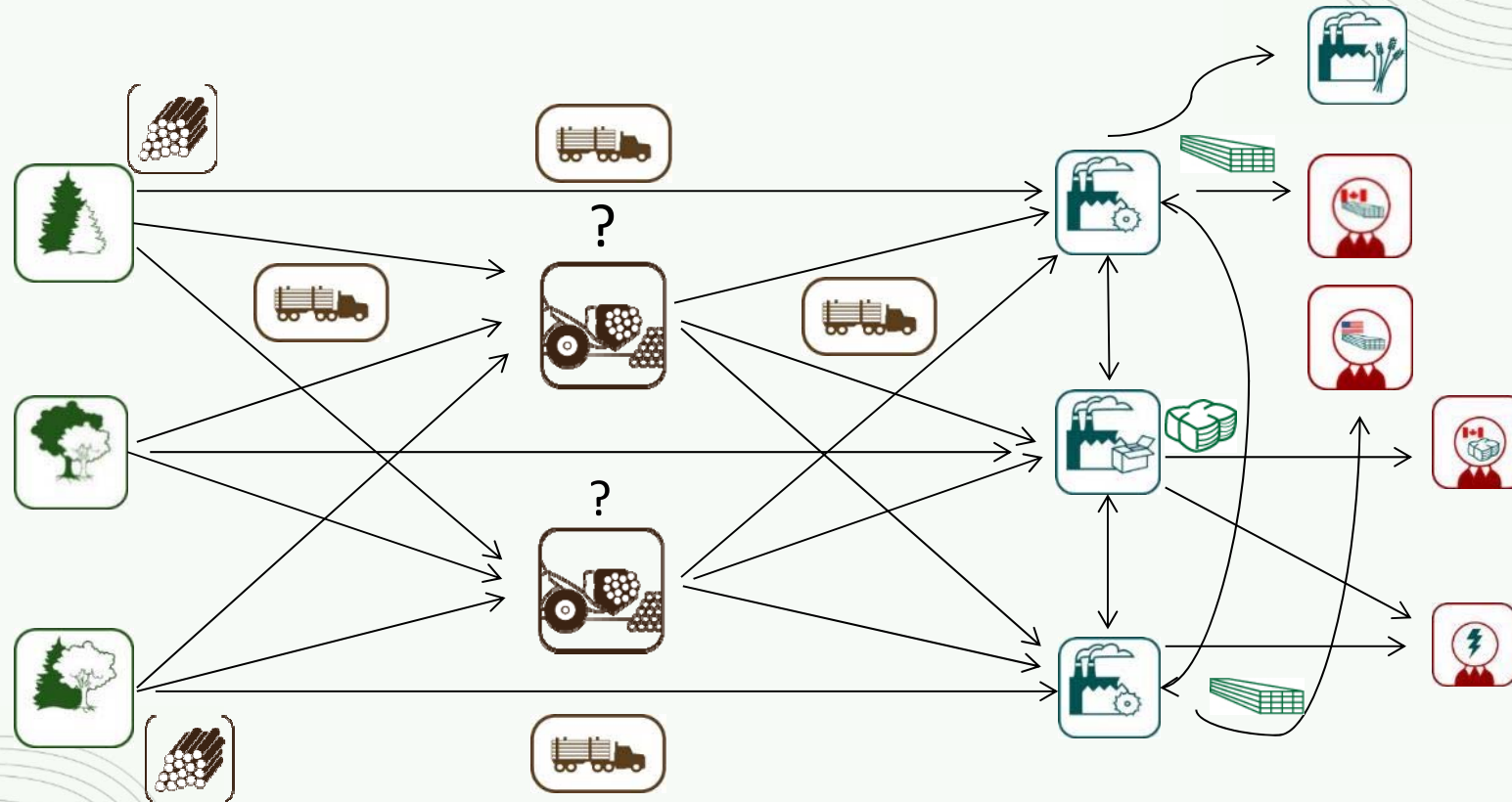


FALKÖPING
– A hub with traditions

<http://www.skaraborglogisticcenter.se/>



Integration of the logistical centre in the forest network



Research objectives

- Establish a model for conceiving and piloting a logistical centre
- Identify the key parameters in regards to the profitability of this centre
- Test the model to a real case
- Develop the business model



Source: Cloutier *et al.* (2009)

Pros and cons of sorting and processing yards

- **Pros :**
 - Lower sorting cost
 - Fewer sorting errors
 - Make possible the use of heavy-load trucks
 - Coordination hub

- **Cons :**
 - Additional wood handling
 - Fewer direct deliveries
 - Capital costs of implementing the yard

Model : Profit maximisation

Objective function :

Network revenues

$$\sum_i \sum_{u|u \in U^+} \sum_{p|p \in PDV} \sum_l V^p x_{iu}^{pl}$$

- Harvesting costs

$$- \sum_f \sum_{p \in MP} \sum_l c_f^{pl} x_f^{pl}$$

- Stumpage and fees

$$- \sum_{p \in LP} \sum_f \sum_{j \in Y \cup M} c_f^p x_{ff}^p$$

- Sorting costs

$$- \sum_s \sum_{p \in PE} \sum_l \sum_i c_i^{spl} x_i^{spl}$$

- Transport cost

$$- \sum_i \sum_j \sum_p \sum_l \sum_t c_{ij}^{plt} x_{ij}^{plt} - \sum_i \sum_j \sum_p \sum_l \sum_t c_{ij}^t x_{ij}^{plt}$$

- Yard costs

$$- \sum_y \sum_l c_y z_y - \sum_y c_y^+ n_y$$

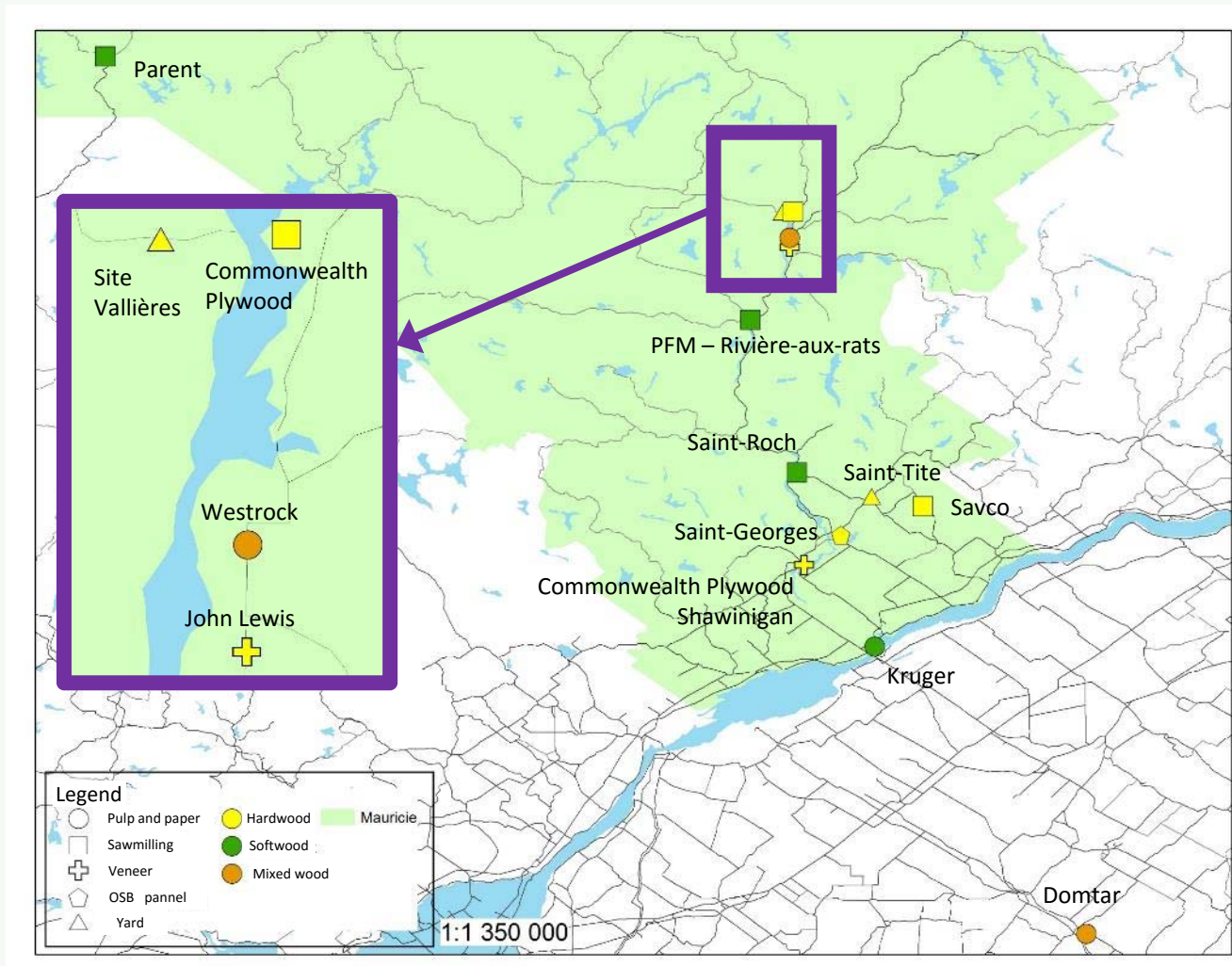
- Storage costs

$$- \sum_i \sum_p \sum_l c_i^p n_{bM ois}^l I_i^{pl}$$

Optimization – Mauricie region

Category/Parameter	Realistic	Specific case
Sources for data	MÉRIS + Harvest allocations + VTM project (FORAC)	Same as Realistic + industry
Harvest allocation	3 788 000 m ³	3 679 000 m ³
Time period	8	8
Planning horizon	Two years	Two years
# of species	11	9
End products	103	88
Truck types	4	4
Harvest zones	9	12

Specific case : industry network



Results : specific case

Profit change (\$/m³ *)

Sorting yard /Transport	Yard only (no BH)	Yard +Routing
Site Vallières only	-	+ 1,20\$
Vallières & Saint-Georges	+ 0,87\$	+ 1,39\$
Vallières & Saint-Tite	+ 0,34\$	+ 1,63\$
Vallières & Rivière-aux-Rats	+ 1,02\$	+ 2,18\$

* Total available volume

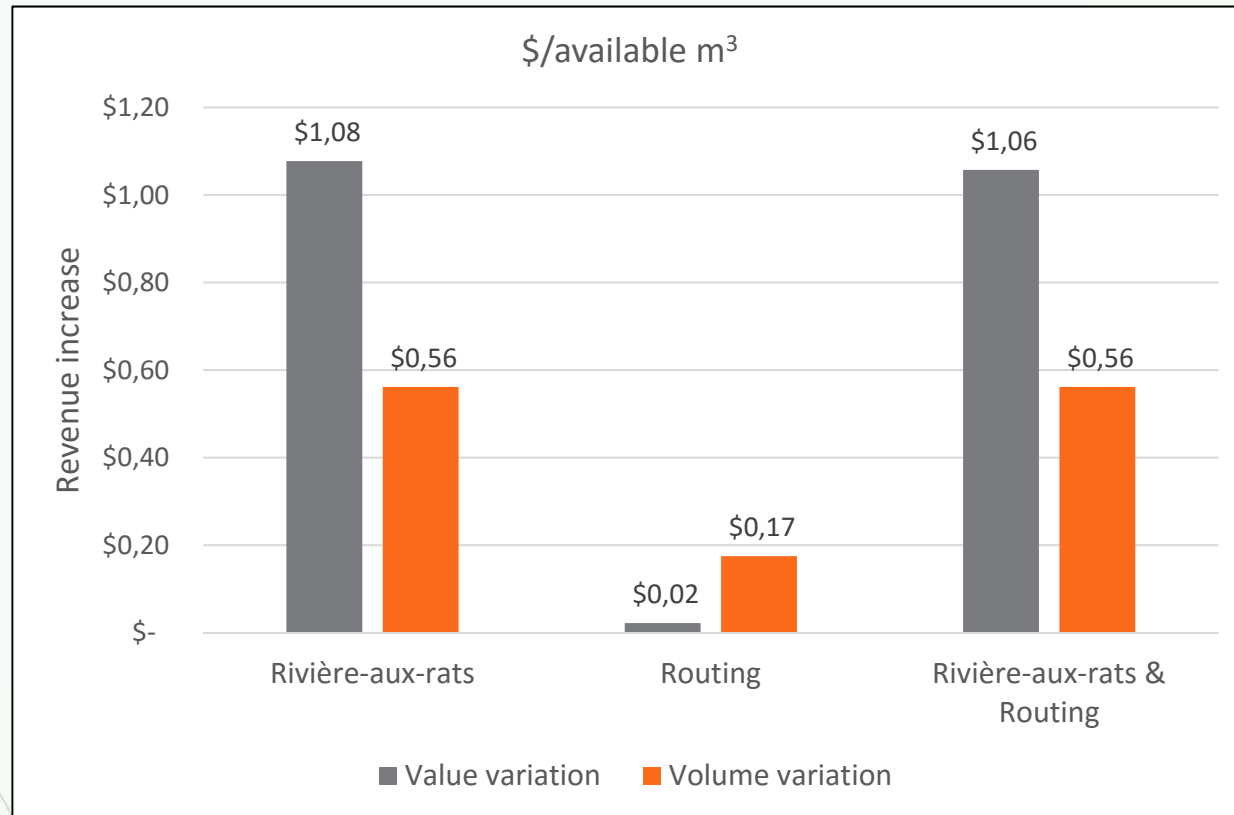
Results : specific case

Profit change (\$/m³ *)

Sorting Yard /Transportation	No Routing	Routing
Status quo	-	+ 0,11\$
Rivière-aux-Rats	+ 0,53\$	+ 0,71\$

* Total available volume

Results : Specific Case



Results : Specific Case

Category/Scenario		Status quo	Rivière-aux-rats	Gain (\$)	Gain (\$/available m ³)
Revenues		248 656 076 \$	254 684 982 \$	6 028 906 \$	1,64 \$
Costs	Harvesting & Royalties	108 576 828 \$	109 458 450 \$	(881 621) \$	(0,24) \$
	Sorting & Production	94 315 600 \$	93 364 593 \$	951 006 \$	0,26 \$
	Transportation	43 456 878 \$	46 869 600 \$	(3 412 722) \$	(0,93) \$
	Yard Implementation	- \$	738 684 \$	(738 684) \$	(0,20) \$
	Inventory	711 728 \$	702 299 \$	9 429 \$	0,00 \$
PROFITS		1 595 042 \$	3 551 357 \$	1 956 315 \$	0,53 \$

Results : Specific Case

Category/Scenario		Status quo	Rivière-aux-rats & Routing	Gain (\$)	Gain (\$/available m ³)
Revenues		248 656 076 \$	254 610 516 \$	5 954 440 \$	1,62 \$
Costs	Harvesting & Royalties	108 576 828 \$	109 458 379 \$	(881 551) \$	(0,24) \$
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	Inventory	711 728 \$	717 245 \$	(5 517) \$	(0,00) \$
PROFITS		1 595 042 \$	4 221 862 \$	2 626 820 \$	0,71 \$

Results : specific case

- Additional volume is obtained
 - Comes from distant sectors and lower value wood
 - Less wood is abandoned in the forest
 - More harvest, more value creation
- Deliveries from more distant sectors can be more difficult to combine for return trips
- Sites that can get deliveries from extra-heavy loads (such as Rivière-aux-rats) are favoured
- For our case study, only make sense if you can extract more value out of each log

Conclusion

- Results :
 - A means to estimate cost/benefits of sort yard/logistic centre
 - Greater distances and higher hauling costs favour routing, with or without sort yard
 - Most interesting sites in the case study provided access to extra-heavy trucks
 - Next steps:
 - Test more parameters
 - Test different networks configurations
 - **Work out the economics**
 - Define business model



Source: <http://www.apbb.qc.ca/fr>

FORAC

FOREST TO CUSTOMER

