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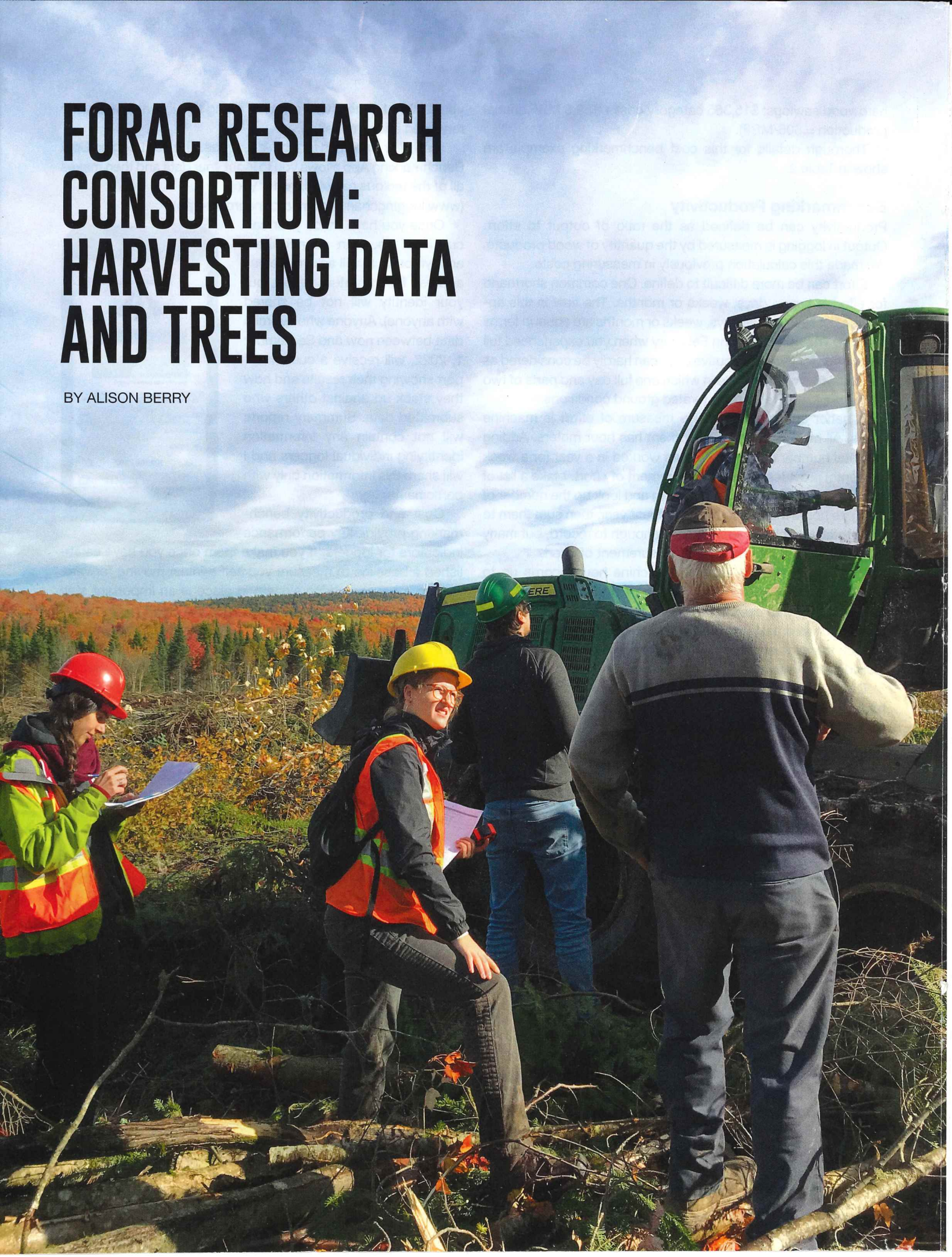
FORAC RESEARCH CONSORTIUM: HARVESTING DATA AND TREES

BY ALISON BERRY



What if every business in the forest products industry had access to a crack team of experts working on applied research to innovate cutting-edge solutions for everyday problems? In some ways, FORAC research consortium provides exactly that for businesses in Quebec.

Based at Université Laval in Quebec City, FORAC is a university-industry-government partnership that works to help the forest products industry. In operation for more than twenty years, FORAC grew out of a recognized need for better collaboration throughout the forest sector.

At the time, FORAC director, Luc LeBel was involved in research focusing on making timber harvesting more efficient. "I would complain," he says, about the lack of coordination. "The woodyard people...the mill, they don't understand what we do...It was a traditional case of where you don't have integration within the supply chain."

LeBel was approached by Sophie D'Amours, a colleague in the industrial engineering department, who suggested bringing together a diverse group of industry stakeholders, including foresters, business managers, industrial engineers, software engineers, and others. They got to work developing a research group to try to make the forest sector's supply chain function in a more cohesive fashion.

In the decades since, FORAC has made headway towards its goals. The program has graduated more than 250 students who have gone on to key positions in the forest products industry. FORAC researchers have published more than 600 articles and produced more than 300 presentations.

LeBel emphasizes that FORAC's work is devoted to creating solutions for real-world problems. "We don't do research just to do the research," he says. Each project evolves from a need identified by one of FORAC's industry partners. "From these guys, we get the ideas, the challenges, the problems," says LeBel. FORAC then develops targeted research to answer questions, and trains students to fill roles in the industry.

Cast of Characters

At the Université Laval, FORAC includes 25 professors working in the fields of forest operations, industrial engineering, business administration, and computer science. FORAC also employs 6 research and coordination professionals, and currently has 42 graduate students enrolled in master's and doctorate programs.

One major partner is NSERC – the National Sciences and Engineering Research Council of Canada, which is the primary agency funding Canadian research in natural sciences and engineering. NSERC provides a portion of FORAC's funding, and also offers some oversight to ensure that FORAC is meeting industry needs.

Pierre-Olivier Morency, a manager with forest products manufacturer, Kruger, notes that NSERC is careful to check in periodically. "They want to make sure that the industry is satisfied with FORAC's work," he said. Morency adds that FORAC has been a great resource for Kruger, "We are quite happy with it."

FORAC students learn from industry professionals in the field.

Kruger is a founding member of FORAC's research consortium, a group of 8 partners from industry, government, and non-profit sectors. Other current industrial partners include manufacturers Domtar and Resolute, as well as Groupe Lebel, the region's largest sawmiller (no relation to FORAC director, Luc LeBel).

Small businesses also have a voice in the consortium, represented by the Quebec Federation of Forestry Cooperatives. Other consortium members are Groupe PG, a company focused on software engineering for the forest products industry, and FP Innovations, a non-profit providing research and development for the forest sector.

Finally, Quebec's Ministry of Forests, Wildlife and Parks (MFFP) has been a member of consortium for nearly a decade. Maxime Renaud, MFFP's director of the Department of Forest Management and Environment notes that "FORAC has a wide range of interests and skills." He adds, "Their expertise has been useful to us in many ways over the past eight years."

Members of the consortium provide additional research funding and suggest ideas for projects based on challenges they face in their operations. FORAC staff, students and interns work closely with industry partners to develop research studies and to implement solutions. Many FORAC students go on to find permanent positions with industry partners after graduation.

FORAC Research

FORAC research addresses every aspect of the forest products industry. The common denominator is that the projects help bridge the gap from forest to customer. In fact, FORAC's name is based on this philosophy, from the French, "Forêt au Client." Much of FORAC's research focuses on incorporating data-based decision making, or using new, cutting-edge technology to update forest operations.

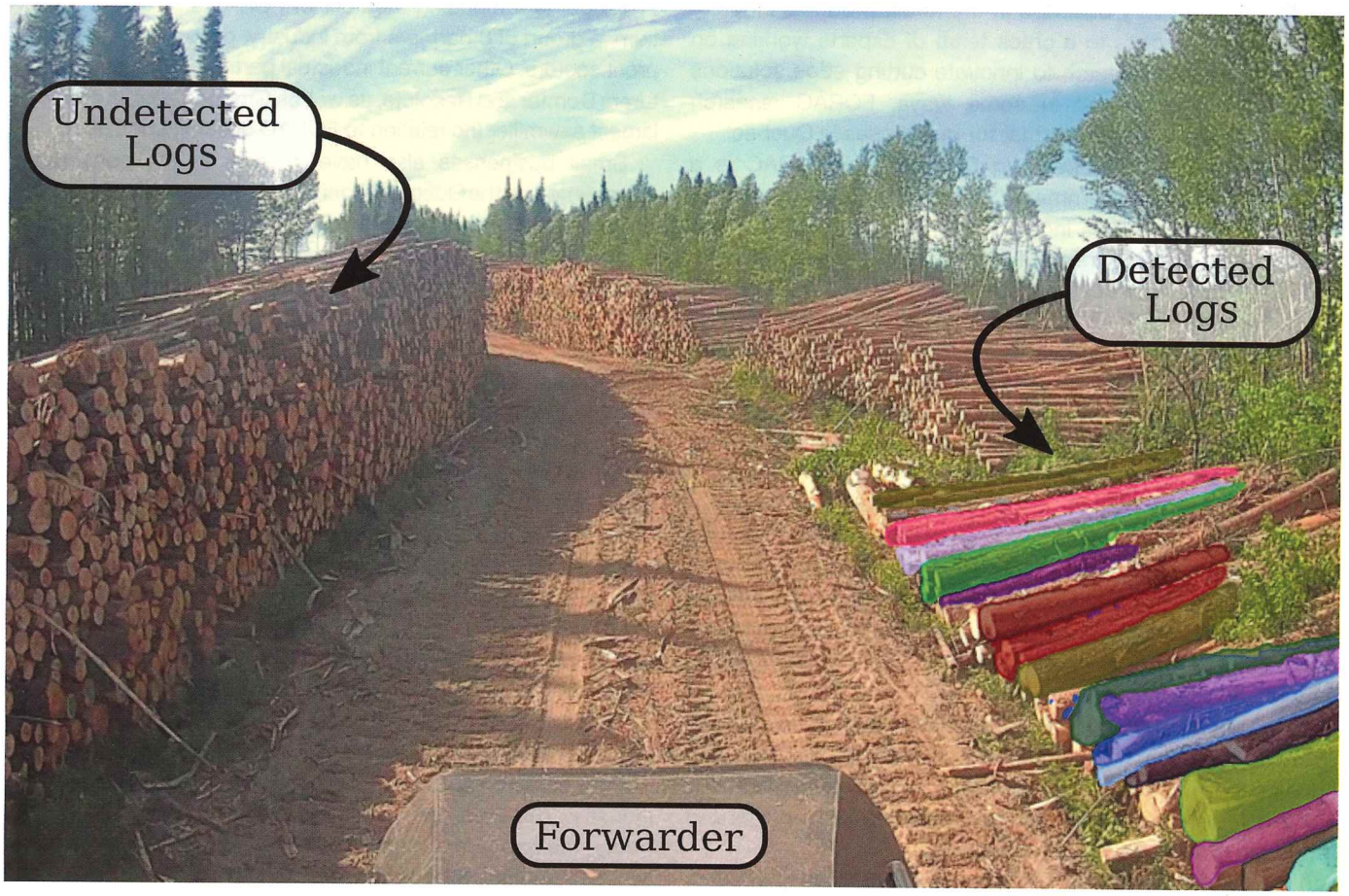
Transportation

One concentration of FORAC research is optimizing transportation systems. FORAC Director, Luc LeBel notes, "transportation is a big challenge in Quebec, our forests are not very dense, so you cover a lot of area to get your wood out."

Several FORAC research projects are helping businesses streamline their approaches to transport of forest products. In one recent project, FORAC researchers developed an automated decision support system that helped Resolute Forest Products reduce distribution costs by 7 percent. The system incorporates information on transport volume, fuel costs, and exchange rates, and helps Resolute determine appropriate routes and modes of transportation, whether via truck or rail.

In addition, FORAC is exploring the potential role of a network of woodyards or warehouses to allow forest products to dry slightly before trucking. The drier wood is lighter and costs less to transport. A recent student project with Kruger showed that strategic use of warehouses in the distribution chain could reduce transportation costs by nearly 18 percent.

Kruger manager, Carl Tremblay, emphasizes that transportation is a "big issue," adding that their work with FORAC has been "very rewarding for the company."



Using artificial intelligence researchers are developing the machine capacity to precisely locate and identify logs. This photo shows how the harvesting head can identify species and share information with a forwarder.

Data-based decisions

Sawmiller Groupe Lebel is one of the newer members of FORAC's research consortium. One of their first projects with FORAC developing a data-oriented approach for optimizing the flow of roundwood to sawmills.

According to Groupe Lebel Manager Pierre-Olivier Morency, this project's name loosely translates to "Good wood/good plant." He notes that each sawmill is specialized for certain types of wood and end products. Groupe Lebel's work with FORAC is about making sure that mills are receiving the correct raw materials. After one year, this data-based system has already increased efficiency over previous systems which relied on judgement calls based on imperfect information streams.

Collaboration

Another priority for FORAC is fostering collaboration among forest products businesses. "We should work together to be more efficient," notes Luc LeBel. Along those lines, FORAC is developing a proposal for a connected collaborative network for the transport of chips, planing residue and sawdust.

LeBel draws an analogy to decades ago, when logging companies floated roundwood downstream to mills. Companies would work together and agree to take out the same amount of wood that they put in. "We could learn from this and create applications for trucking," LeBel says.

Part of the challenge is that businesses can be reluctant to partner with their competitors. FORAC has found success by identifying economic advantages of collaboration for all participants. LeBel notes, "we need to find solutions that will improve profits for all businesses."

He says these efforts toward collaboration are a key role for FORAC, "This is really what would define us best." A collaborative industry will give Quebec's forest products industry an advantage, according to LeBel, "That's how I think we can be more competitive at the international level."

Maxime Renaud from the Ministry of Forests, Wildlife and Parks appreciates FORAC's collaborative and multidisciplinary approach. He says this makes it possible to set up projects and share opinions on a wide range of topics. He adds, "This, in turn, allows us to significantly improve our forest management."

Carl Tremblay from Kruger commented that one benefit for the industry partners in the consortium is shared access to research findings. "Each project is available for all of the companies involved," he said. "That's a good thing," he adds, providing an opportunity for businesses to learn from each other.

Technology

FORAC explores how technology can improve the forest sector, adopting an "Industry 4.0" approach which merges cyber and physical systems for automated decision-making. "That's a huge step," says Luc LeBel, and it is already connecting the supply chain and making the forest sector more agile.

One example of FORAC's research in this area is developing a harvesting head that can identify the species of each log in a landing area. The machine can keep count of logs by species type, and track where each log goes so that information can be provided to a forwarder. This advanced cut-to-length system would move towards reduced duties for the forwarder operator, or possibly a fully-automated forwarder.

Ideally, species information would be transmitted to transporters and mills in real-time so that both would have an idea of what materials are headed their way.

Tools and Tricks

The research projects listed above are just a small example of what FORAC is exploring within Quebec's forest sector. FORAC's website, www.forac.ulaval.ca provides a more complete picture of current and past projects, including many tools available for industry use.

One tool can help you pack a rail car with lumber or other bundled products; the user simply enters the size of the rail car, and the dimensions and number of bundles that need to be packed. The tool produces a graphic design showing how to best fit as many items as possible.

FORAC developed a similar tool using machine learning for kiln operation planning. For most mills "the kiln is the bottleneck," according to LeBel. FORAC has worked with Resolute Forest Products to develop a prize-winning kiln loading system that is now used by 60 companies throughout the region.

Secrets to Success

What are the unique conditions that fostered the development of a research facility like FORAC in Quebec, while no parallel institution exists south of the border in the northeastern United States?

No one seems to have a single answer to this question, but Luc LeBel offered a few ideas. It comes down to the culture and the history of the forest products industry in Quebec.

Quebec is a relatively small jurisdiction with a single forestry school. Many industry leaders are former classmates. While these common roots may sometimes result in a lack of diversity, according to LeBel, "there is a connection, a trust," that creates fertile ground for collaboration. Furthermore, the Quebecois bond together as French speakers on a continent dominated by the English language.

More than half of Quebec's land area is forested, and the forest products industry plays an important role in the provincial economy, representing 8 percent of exports. The forest sector supports approximately 60,000 jobs in Quebec, according to recent statistics. In many small towns, the forest products sector is the primary industry, with more than 140 municipalities depending on forests economically.

A large portion of the fiber supplying Quebec's mills comes from public land – 92 percent of Quebec's forests are owned by the government. LeBel notes that Quebec's land tenure policies force companies to come together for long-term planning. It is not a large additional step for companies to collaborate on research and industry efficiency.

Historically, Quebec was a world leader in the production of newsprint. When FORAC was founded in 2002, Quebec's forest products industry was struggling to adapt to reduced demand for this product as media outlets switched to online publications. "We could feel a shift in the industry," says LeBel. FORAC was able to help find new ways to move forward during this difficult time.

Looking to the future, as the forest products industry continues to grow and change and to face environmental and political challenges, innovative approaches such as those offered by FORAC will become even more important to the success of the forest sector, and to the portion of Quebec's economy that depends on it. "This is a solution space," says LeBel – just what every business needs.

Alison Berry is a research consultant and founder of Woodland Resources in Bozeman, Montana.