FERIC: An innovation driver for the Canadian forest sector

by G. Paillé,¹ E. Heidersdorf² and I. Hedin³

Introduction

According to the Organisation for Economic Co-operation and Development (OECD 1997), the innovation system includes not only academic, governmental and private research centres, but also the environment influencing the behaviour of innovative organizations, the institutional linkages between organizations, and the inner capacity of organizations to innovate.

The Forest Engineering Research Institute of Canada (FERIC) is a private non-profit research consortium that has been part of the Canadian forestry innovation system for the last 25 years. It has built and maintained a national team capable of innovation; it has created, together with its members and partners, an environment that has been conducive to innovation; and it has established linkages with a host of academic and governmental research organizations at home and abroad. Moreover, since its establishment, FERIC has focussed the bulk of its activities in a well-defined niche, forest operations. This targeted focus has enabled the Institute to channel its innovation process to solving specific problems, and thus acquire its reputation as an effective and efficient applied research organization.

This paper provides information on the FERIC team and network, on its track record, and on a road map that defines future innovation needs.

The FERIC Team

FERIC's research strategy has involved the use of small teams of dedicated researchers of varied core competencies to deal with practical forest engineering problems. Given that its research addresses the operational aspects of forest harvesting and silviculture, road building, and wood transportation, the nucleus of the research team is formed of a blend of foresters, engineers and computer experts, along with their support staff.

These people were recruited from the forest industry, university graduates, and governmental organizations for their knowledge of the everyday problems encountered on forest operations, and for their desire and ability to improve existing equipment, existing mechanical systems, and current or historical practice.

The secret of their success has been the use of teamwork to address complex problems in a multi-faceted manner. More-

G. Paillé

E. Heidersdorf

I. Hedin

over, the work of FERIC's researchers is guided and evaluated regularly by their peers, both inside the Institute and within industry. Finally, technology transfer and implementation of results are considered an integral part of the research activity. Indeed, researchers spend about equal time between actual research work and technology transfer activities, be it writing reports, presenting their findings to members and partners, or helping clients apply the results on their operations.

The FERIC Link With Its Members

Above all, the secret of FERIC's success is the knowledge that someone is waiting for the results of the research. This is because the subject matter itself has been defined as a problem and has been prioritized by our clients working for the Institute's members and partners. This direct linkage to the user of the research results via our systematic consultation and the advisory process has been key in ensuring that the work has remained focussed and relevant.

The FERIC Network of Research Organizations

Another element favouring success has been the networking around each research project, so as to facilitate its definition, and bring around the table the expertise needed to tackle it.

University professors, scientific researchers, manufacturers, practitioners, and other experts have been recruited to work with FERIC's researchers at finding solutions to the problems defined.

The FERIC Track Record

During its first 25 years, FERIC has succeeded in repeatedly developing innovative solutions. Highlights of past innovations were presented recently in a booklet entitled *A Quarter Century of Success*. They included the following:

- a circular saw to reduce butt damage of harvested trees (1977+)
- methods to dispose of wood waste and debris (1978+)
- wide tires for skidders operating on wet ground (1979+)
- onboard weigh scales for logging trucks (1983+)
- devices to ensure load security on logging trucks (1984+)
- alternative harvesting methods to replace clearcuts (1989+)
- seedling transportation units (1989+)

¹ President and Chief Executive Officer, FERIC.

² Research Director - Eastern Division, FERIC.

³ Research Director - Western Division, FERIC.

- central tire inflation systems on logging trucks (1990+)
- tridem-drive tractors to improve traction of logging trucks (1990+)
- truck simulation software (1990+)
- alternative silvicultural systems for high elevation forests (1991+)
- pre-seeded shelter cones to regenerate the forest (1993+)
- application of robotics to forestry equipment for training machine operators (1994+)
- use of global positioning systems to navigate forestry equipment (1995+)
- development of plastic retaining walls for culverts (1996+)

Since then, FERIC has continued to develop equipment and methods that made forest operations more cost-effective and environmentally sensitive, while improving the quality of forest products delivered to mill. Examples are:

- working with a member in developing a standing stem method of helicopter logging;
- designing with a manufacturer a made-in-Canada multi-use trailer that can haul both logs and chips;
- development of easy-to-use ways of crossing streams with a minimum of environmental impact;
- designing an onboard response kit to mitigate the consequences of oil spills from forest equipment;
- conception and production of data loggers, which are now commonly used in the industry to monitor machine activity and manage road grading frequency.

And the list goes on!

The FERIC Road Map

In 1996, FERIC, in collaboration with Industry Canada, developed a "Technology Road Map for Forest Operations." This road map defined many of the innovation needs of our industry with regard to existing technologies. They were regrouped into three work areas and some of the research work carried out by FERIC since then is briefly described to indicate the type of innovative solutions that have been searched for.

Wood Harvesting

Lower-cost commercial thinning equipment

We have evaluated and implemented a host of equipment and work methods suitable for commercial thinning in different stand conditions, for different prescriptions, and for both industrial and small-scale operations.

Harvesting systems for better fibre recovery and value

We have done a trial comparing different harvesting strategies to recover the small diameter component of very dense stands. Other trials have focused on reducing stem breakage during harvesting. We now work with pulp mills to quantify fibre loss and recommend strategies to increase recovery.

Waste disposal at sort yards and satellite merchandizing yards

We have worked with members to evaluate the effectiveness of the bin-debarking technology to produce pulp quality chips from residues at sort yards and mill yards, and on landings.

Mechanized systems for steep terrain

We have studied the potential for using clambunk skidders to recover wood on slopes beyond the capability of conven-

tional grapple skidders, and investigated innovative cable yarding systems suitable to eastern Canadian conditions.

Transportation

Road development and deactivation equipment

We have been examining alternatives to the traditional culvert pipe. This provides practitioners with options when working in areas of fish habitat. We have done work on designing temporary forest roads and winter roads. We have conducted endhauling case studies; this has provided more information on steep slope road construction in landslide prone terrain. The focus has been on ways to reduce the amount of material that needs to be excavated and on stabilizing slopes.

Silvicultural Operations

Site preparation for partial cutting

We have started looking at regeneration in partial cuts. We will be studying areas where no site preparation has been done, as well as where equipment has been used. Where current treatments are not effective in achieving regeneration, future work will focus on developing methods to ensure successful regeneration.

Treatment of roadside slash

We are examining the impact of slash piles on the control and ignition of wildfires. We have also looked at the range of options for either returning the debris to the bush or treating it at roadside, including recovery for biomass energy.

The road map also defined a number of technologies that could provide us with breakthrough advances in the future. For example:

- machine automation and robotics
- lightweight materials
- global positioning systems
- training simulators
- artificial vision
- computerized decision-support tools
- soft-footprint technologies
- voice and data acquisition and transfer systems
- operator-machine systems
- remote sensing

FERIC is currently active in introducing many of these technologies into forest operations. For example, the use of lightweight materials is increasing the payload of forest trucks and reducing fuel consumption, GPS technology is now commonplace for surveying forest areas and tracking and navigating equipment, and training simulators are facilitating the selection and development of harvester operators.

Conclusion

The road map's list of needed technological improvements and breakthrough technologies identified in 1996 remains valid as we enter the new millennium. While we have made strides, there is no shortage of opportunities for further innovation into the future. For example, the Swedes, at a recent international conference on "Efficient Systems for Sustainable Forestry," were forecasting that, during the XXIst century, all forest operation functions would have to be automated. Automation will surely open a whole new field for innovation in forestry. We can now foresee that the need for innovation will not decrease in the future but rather increase substantially.

Even more important, forestry will not be practised in Canada unless the forestry people obtain a social license to do so. Therefore, researchers at FERIC and in other research centres together with forest practitioners will need to innovate in developing new tools and also find new ways of relating with people concerned with the future of our forest and of our forest industry.

Reference

OECD. 1997. Manuel d'Oslo : principes directeurs proposés pour le recueil et l'interprétation des données sur l'innovation technologique. Paris. 103 p.