# Initial Impressions: Technology & Innovation

## Winter 2017

CLUSTER RESEARCH REPORT: Forestry

### Introduction

The *Future of Forestry* project, part of the overarching Regional Workforce Development in Rural BC program, is focused on better understanding the fundamental issues facing the forestry sector today. One of the project's objectives is to understand the role of technology and innovation in the future of the forestry sector.

Between August and December 2017, 30 targeted interviews were completed with participants from the forestry sector in the Columbia-Basin Boundary region of British Columbia (BC), Canada (18) and Scotland, United Kingdom (12). Participants included representation from academic, government, industry, and other civil organizations (e.g., professional bodies). Participants were asked questions about the role and primary application of technology and innovation in the forestry sector today, what major changes participants had seen and the impacts these changes have had, and what their expectations were for the future.

This document has two objectives:

1) To summarize initial impressions from the data related specifically to technology and innovation; and
2) To provide these initial impressions to participants for their review and comment.

## Technology & Innovation at All Stages

Data collected shows a broad range of applications of technology and innovation across forestry, from seed to board and beyond. Below is an overview of the major applications discussed.

### Planning & Management

Planning and management was the most commonly cited application of technology and innovation in the forestry sector. This was also where many participants felt they had seen the greatest changes over their careers. Comments reflected a range of uses related to the planning and management of a sustainable resource, including data collection, inventory (e.g., land type and species classification), assessment, modelling, and forecasting. Examples of technology included GPS, GIS and other mapping software, remote sensing, and UAVs.

### Silviculture

A small number of participants focused on the application of technology and innovation to silviculture. These comments typically focused on stand management and inventory (e.g., use of remote sensing), however participants also noted innovation relating to genetic modification of trees (e.g., disease resistance, growth speed), and use of technology and innovative processes to decrease restocking costs and improve stand management.

### Harvesting

Harvesting was widely recognized by participants as having undergone a number of changes related to technology and innovation. The two most commonly noted changes related to 1) harvesting method (e.g., increased mechanization, computerization of machines, and “smart” technology), and 2) harvesting location (e.g., the use of advanced technology to support safe harvesting on steep slopes). Applications relating to the grading and scaling of timber were noted, as was the potential related to use of residual fibre (e.g., on site chipping).

### Processing

Next to planning and management, the most common comments related to changes in processing as a result of technology and innovation. The majority of these comments related to how mechanization and computerization have enhanced both the quantity and quality of outputs. For example, scanning and modelling technology to assess timber for it’s quality and strength. Beyond simple mechanization, computerization and “smart” technology that gathers and analyses data was credited for optimization of operations.

### End Use

Discussions related to the end use of outputs included developing new products, as well as targeting new markets. In BC the majority of such comments related to residual fibre and the potential for technology and innovation - both new and transferred from other places - to turn the residual fibre that is often seen as waste into an economic opportunity. A number of participants in Scotland discussed opportunities related to glued laminated timber and cross-laminated timber, and how these and other composite products will impact construction industries and enhance the potential applications of timber.

### Training & Education

Many comments related to changing skills within the workforce (see Key Themes: Resourcing & Workforce below). However, there were also comments from participants relating

specifically to the use of technology in training and education. Multiple participants noted that there is a need to highlight the high tech nature of the sector in recruitment, something many participants felt was not well understood by the general public. Another application of technology related directly to training and the ability to use technology (e.g., virtual reality) to help create "real world" training experiences. Lastly, many interviewees noted that the fast pace of change makes it difficult to develop and execute technology specific curriculum.

### General

There were three other groups of comments that came up repeatedly in terms of application of technology and innovation to each of the elements discussed above: safety, transportation, and communication. Safety was one of the dominant topics related to technology and innovation. The ability to create a safer working environment was seen as a major improvement within the sector (see Key Themes: Safety). Transportation was noted by several participants as change they expect when looking to the future, particularly with consideration of self driving vehicles and electric vehicles. Lastly, technology (e.g., social media) was noted as an important tool for facilitating communication and engagement.

## Key Themes

Four themes, or overarching groups of related topics, were identified related to the role of innovation and technology in the forest sector. These four themes were present in responses to multiple questions, not just those related directly to technology and innovation.

### Safety

As noted above, safety is a critical part of the conversation related to technology and innovation. Participant responses clearly reflected that worker safety was as a major driver and benefit of the use of technology and innovation. Examples provided included enhanced safety related to lone or remote working, whether through the elimination of remote working all together or through advanced communication technology. Also noted was the application of mechanization to reduce or eliminate dangerous jobs, and innovations related to personal protective gear to enhance working conditions. Improvements in safety link directly to other themes like Efficiency (e.g., reduction of lost time injury) and Resourcing & Workforce.

### Efficiency

After safety, efficiency was noted by the majority of interviewees as a key driver, influencing factor, and benefit of technology and innovation. Participants commented that enhancing efficiency is increasingly important as the sector faces greater competition. Comments on efficiency related to both gains and savings. Gains noted by participants included increased productivity, increased value per hectare, and increased profits. Common savings noted were decreased labour costs, decreased waste, and reduced environmental footprint.

Beyond the above is the efficiency that comes through enhanced intelligence associated with technology and information. Data collection related to landscape information (e.g., remote sensing, UAVs) as well as harvesting and processing (e.g., computerized data collection in new machines) was universally noted as providing better information, often in real time. While this was noted as a potential challenge due to having more data to process (see Resourcing and Workforce), participants noted the ability for this increased amount and quality of information to support decision making, to allow agencies to better target scarce resources, to identify areas for improvement, and to make better predictions related to the resource and outputs.

### Resourcing & Workforce

Another dominant and complex theme discussed by participants is the relationship between technology and innovation and resourcing and workforce. As noted above efficiencies were noted in terms of reducing labour costs and the ability to better target limited human resources. The majority of participants felt that the application of technology and innovation is not a replacement for boots on the ground, but rather is complementary to it. Many noted that in an era where there are limited financial and human resources, the use of technology and innovation is particularly relevant when it comes to directing existing resources.

However, several participants noted that particularly when it comes to public sector management, the ability for innovation can be limited by resource restrictions and downsizing (see Policy & Governance). It was noted that in the past, considerable research and development was conducted by the public sector, the results of which were publically available. Some interviewees felt that when research and development is led by the private sector any resulting patents, intellectual property, and information are less accessible.

The question of risk versus benefit was raised frequently in conversations related to technology and innovation, including the need to weigh capital investment against potential gains. For example, small forest blocks like some found in Scotland may not wish to invest in the use of advanced remote sensing (e.g., LIDAR) or UAV applications as the gains in knowledge may not equal their investment due to the small scale. On the other hand, the considerably larger forest blocks in BC where comprehensive field studies are not possible, were seen to warrant the investment in remote sensing. These comments demonstrate the important role scale of operations plays in influencing technology and innovation, in terms of who uses what and who is leading versus following. For example, one participant in Scotland felt their industry was better positioned to capitalize on the technology and innovations developed elsewhere where the forestry industry is larger (e.g., Scandinavia).

Also, as noted above, comments related to workforce in connection to technology and innovation were common. This included the quickly changing skills and experience workers needed, as well as the importance of buy-in from staff on new technology and innovation in order for it to be implemented and used. Additionally, some noted that where equipment or machinery costs increasingly required high levels of capital investment, there is a preference on the part of employers toward those who already have skills and experience, as mistakes from untrained staff can be costly.

### Policy & governance

Lastly is the theme of policy and governance. As noted, this links to resourcing and workforce through the impact of downsizing of the public sector on innovation, compliance and enforcement, and the amount of human resources available generally. Policy and governance were also discussed as factors that can either help or hinder technology and innovation outside the public sector. For example, government policies were noted by several interviewees as causing innovation and change in the private sector either through incentives (e.g., funding programs) or requirements (e.g., regulations). In BC several participants noted that policy change related to residual fibre is necessary in order to support innovation. Additionally, it was noted that fragmentation within government can play a role in stopping the spread and uptake of new technology and innovation.