



Forestry Gears Up for a Technology Revolution

A conservative industry is ripe for transformation through technologies with a view to increasing yields, reducing costs and improving returns, says Fiera Comox's Ben Lee.



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Forestry is not a sector that has been historically associated with technological innovation. Trees, after all, are quite content to grow, with only modest need for human intervention.

Ben Lee, a senior principal in the timberland team at Fiera Comox, says the old paradigm is changing fast. A wide range of cutting-edge technologies are now entering the space, he tells Agri Investor, highlighting that remote sensing, automated log processing, artificial intelligence and other innovations can help asset managers secure a range of benefits with a view to generating higher returns for investors.

What are the challenges in adopting technology in forestry?

Forestry is quite conservative in terms of culture, and field-driven. Forest estates are often in remote locations and sometimes operate under harsh conditions. It's also a sector where there are long planning cycles; it can take decades for a tree to get to harvest age, and to make investments in technology early in the cycle can be daunting when the benefits may only be realized long into the future.

Part of the appeal of timberland investment is that the operations are relatively capital-light in nature. When markets are performing poorly, a timberland owner can sit back and let the trees grow and accrete in value, while investing very little incremental capital. For these reasons, over the last several decades, forestry as a sector has been underinvested in terms of technology. That's now changing quickly, creating an attractive opportunity set for investors.

What kinds of technologies are now being adopted?

Some of the most important technologies provide for remote sensing and analytics. For us, forest management starts with a deep understanding of tree inventories and operating conditions such as terrain. In the last decade, we've seen the proliferation of drones, satellite imagery and LiDAR (pulsed lasers) detection and ranging technologies to support that understanding.

Drone technology continues to improve and is a staple in our operations. Drones are becoming cheaper, they can fly longer and their ability to capture highly detailed imagery is rapidly improving.

Satellite imagery supplements the drone footage and supports long-term planning. For example, you can take a snapshot in time, and if you analyze the satellite imagery again a year later, you can use artificial intelligence to calculate the growth over that period. Estimating the age of a tree, with LiDAR and remote sensing, is also something that's being heavily utilized.

Another area is around precision forestry. After growing a stand of trees for 25-50 years, you can only harvest the tree once, you can only process it into logs once and you can only sell those logs once. With artificial intelligence and scanning tools, you can augment the accuracy and productivity of an operator.

Based on our deep operating experience having managed large timberlands at scale, we have demonstrated that the technologies significantly decrease human error; for example, there could be thousands of variations and permutations in how you convert a stand of trees into different log lengths and diameters. Each tree can potentially produce three to four logs of different lengths and qualities. In a stand of trees, there are literally millions of combinations. This is beyond the ability of a human to optimize.

The latest processing head technology uses predictive algorithms and linear optimization to maximize value. It doesn't cost any more to put in the cut in the right place, but the value uplift after a long investment period can be substantial.



Forestry can be a conservative industry. Are attitudes to technology starting to change?

The conservatism in decision-making comes from the long lifecycles of the forest. However, asset managers like us who have deep boots-on-the-ground experience differentiate ourselves by continuously evaluating and adopting new technologies to deliver superior returns for investors.

At the operator level, we are seeing an ageing workforce, and we're starting to see accelerated turnover of that workforce. As in any industry, when you've had folks that have been working in operations for many decades, there's a resistance to change. But a new cadre is coming in with new technical capabilities that we work with. That creates an opportunity to pair a new generation of technically skilled workers with new technology to add value. We are seeing an evolution in the industry in that respect.



What is the impact of these technologies on operational costs?

From our experience, for example, on the processor head automation, the payback isn't just cost reduction, although there are clearly productivity gains. An investor should understand that it can also offer increased yield. If you make the right cuts in the right places, you have less waste, and you could recover material value. Most importantly, each log length, diameter and quality has a unit price that, depending on the customer, can vary by a factor of more than 2x. Optimizing the highest-value log among your customers drives higher average prices on a unit basis.

When it comes to advanced logistics and fleet management, often trucks in a large estate can sit idle and line up at unload spots, which comes at a significant cost. Supply chain management becomes more efficient when you have advanced dispatch using telematics and GPS on equipment.

Meanwhile, with climate modeling and early detection of pests and diseases, you can start to reduce or avoid risks, and that can have a significant impact on returns.

One of the biggest challenges in the sector is labour costs and the lack of labor availability. Many of these technology advancements will offset rising labor costs. Meanwhile, just like other industries, there are safety benefits from technology, because you can take people out of hazardous conditions and make them less exposed to the safety risks that come with being in complex operational settings.

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How can technology be used to measure and verify carbon sequestration?

Previously, and in some cases today, field data used to calculate carbon sequestration was collected manually and through plot sampling. The more plots you sample, the lower the margin of error, yet the more costly it is to collect and process. However, human error can be introduced, especially when measuring tree height, which is not always easy to do using traditional methods.

More recently, LiDAR and remote sensing technologies from satellites and drones are being combined with remote sensing LiDAR at ground level to provide a more accurate picture. When these two layers of information are taken together and measured over time, you can derive with more accuracy how much carbon is being sequestered. Machine learning can then extrapolate future growth and yield, which is a function of carbon sequestration into the future.

That measurement precision is helping the industry in terms of audit compliance and verification, and it increases investors' confidence in committing to develop a carbon project.

How should managers evaluate technologies to ensure they contribute to better returns?

Technology won't be a panacea. It won't replace experienced boots on the ground like ours, people that truly understand all the variables inherent in a complex forest operation.

In forestry globally, there are still many smaller woodlot owners that typically make passive investments. The technologies we're talking about would be challenging to implement for some of these investors, and from their perspective, 'the juice may not be worth the squeeze.'

So, as technology continues to evolve, the opportunity is significant for active managers like us that have internal expertise. We want to take our deep operating experience and fold in the right systems and technologies to drive better returns through improved decision-making and reductions in production costs.

In terms of returns, scale does matter. These technologies require some trial and error to implement in the early stages. What's important when making these upfront cost decisions is understanding the value driver. Ultimately, as you're trialing new technologies, you have to understand what data you want to collect and what that will drive. It's the old adage of 'you manage what you measure.'

How do you see the landscape for technological development in the sector evolving in the coming years?

Artificial intelligence tools will continue to improve, and the real-time decision-making that these facilitate will be important in a fast-moving global market.

The other theme is electrification. Fueling heavy equipment and haul trucks comes at a significant cost. Electrification provides an opportunity to reduce exposure to rising energy costs.

We're also starting to see autonomous equipment development. In forestry, there's been experimentation with fully autonomous hauling trucks, felling machines and processors, as well as drones that can replace manual tree planting. Those technologies can make a powerful impact once they are mature and scaled. We're not too far off commercial deployment of hybrid equipment (one operator overseeing one, two or multiple semi-autonomous forestry machines).



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