Satellite technologies can reduce farm labour and waste, and improve profit margins. Satellite technologies fall into three main categories:

- **Remote sensing**: Uses sensors and cameras to monitor an area from a distance
- **Connectivity**: Allows sensors, devices and computers to communicate with each other
- **Geolocation**: Provides information on positioning and navigation, for example GPS

Although the use of satellites in forestry is still emerging, field trials and research projects suggest there is potential for a good return on investment.

**Wind damage and fire**

Satellite observations can provide information on canopy height and density, vegetation cover, crown radius, and tree health, and can analyse changes over time in a forest. Indufor, a global forest sector consulting firm with offices in Australia and New Zealand, uses satellite data.

“Part of Indufor is consulting for forest valuation and due diligence,” Dr Pete Watt, Head of the Resource Monitoring and Climate Change team at Indufor, said.

“When someone is selling a forest, we check the area to make sure it’s correct and ensure trees have not been lost due to fire or wind damage.

“The saving for us is that we can direct our foresters to the right place – they actually point out where the issues are.”

He noted the satellite images provide more certainty when reporting to investors, and assist with auditing.

The main satellite Indufor uses is Sentinel 2, which provides data free for public use.

“Sentinel 2 is a landscape-level satellite that covers large areas every five days, and it’s fantastic for forestry,” Dr Watt said.

“Because it is a really well-calibrated satellite, it is easy for us to process. We have a system that can cycle through multiple images and clear the cloud off it and identify changes.”

Indufor uses Sentinel data to screen assets and create dashboards that identify changes in a forest. It splits the forest into discrete areas and measures the amount of forest cover in that area, then compares it with previous images to see how that area has changed over time. The areas that have changed are coloured orange on the dashboard.

“If there has been a wind damage event, you can compare before and after images and see where the damage has occurred. That saves time,” Dr Watt said.

Sentinel 2 is not the only satellite used by Indufor.

“We have also used Planet and Maxar satellites,” Dr Watt said.

“Planet is interesting and developing a lot, however, the images are pretty small, so we often use the data to zoom in and verify changes.

“It is not as useful for analysis as Sentinel data for widescale monitoring, but its daily revisit capability helps confirm forest changes.”

Elsewhere, data from Landsat satellites was used in Australia during the 2019-20 NSW bushfires to map the extent of wildfire damage.
Forestry and space-based technologies

The Google Earth Engine Burnt Area Map measures colour change in vegetation before and after a fire, and was a rapid way to support environmental management decisions and to understand impacts on forestry resources.

Pests and disease

The UK Government is exploring the use of Rezatec to identify and track outbreaks of sweet chestnut blight in England. Sentinel data is used to distinguish sweet chestnut trees from oak trees and to identify stressed sweet chestnut trees for targeted inspection.

Planet’s PlanetScope and SkySat constellations provide high-resolution, high-frequency satellite imagery for forestry. The data was used for early identification of bark beetle infection in forest stands in the Czech Republic, forest inventories for Pan Pac Forest Products in New Zealand, and to monitor forest carbon stocks and emissions.

Accurate locations

In 2025, a new Australian Satellite-based Augmentation System (SBAS) for geolocation that will go live will improve position accuracy from 1 m to about 10 cm across the country. This enhanced positioning technology will improve forestry applications, with industry-wide benefits estimated to be $203 million over a 30-year period.

Forestry Corporation NSW recently completed a field trial of a mechanised planter from Risutec, which is loaded with seedlings and mounted on an excavator. In the field, the machine cultivates the land and plants seedlings. Using GPS, the operator records the position of each seedling at the press of a button, and the technology then creates a map of seedling and mound locations. This data can also be integrated into value chain traceability systems for provenance purposes.

Connecting through the canopy

Connectivity remains a key challenge for forestry. The use of sensors to measure water resources and tree growth is limited in Australia, though it is expected to improve in the next five years as more satellites are launched.

Treevia, a Brazilian company, uses wireless sensors that wrap around the tree like a belt and capture forest growth in real time. This data can be paired with remote observation to inform forest management decisions and reduce labour cost. Satellite connectivity is an enabling technology that will make sensors more useful and practical.

Reference

2. European Commission, NEREUS, ESA, The ever growing use of Copernicus across Europe’s regions: a selection of 99 user stories by local and regional authorities, European Commission, NEREUS, ESA, 2018
3. S Doshi, Bark beetles are decimating forests: Satellite data can help, Planet, 2019.

Find out more

Read the full report Space-based technologies – opportunities for the rural sector.

Please note: Some commercial products have been named in this fact sheet to provide examples. The number of examples is not exhaustive and is not meant as an endorsement of any particular product or enterprise.