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 some satellite-based technologies are well-established in the Australian cropping industry, such as GPS for auto-steer, other applications are relatively new.

**Autonomous agriculture**

SwarmFarm has developed a 1400 kg diesel-powered autonomous spray platform. The platform can carry 600 kg of product, which is applied using an 8 m spray boom, with the platform deployed as a commercial field contracting service.1

The system uses optical spray technology. Sensors on the boom identify weeds, which are then directly spot-sprayed with herbicide, rather than spraying the entire field. This reduces herbicide use by up to 95%.2 The SwarmFarm platform uses real-time kinematic (RTK) positioning and can be controlled remotely using an iPad.

Automating tractor-driving activities reduces the need for economies of scale to maximise the return on driver labour through larger tractors. This is achieved by allowing multiple small autonomous platforms/vehicles to operate simultaneously in the place of one large machine.

This has several advantages, including lower labour cost, easier transport to site and less soil compaction. A recent study in the UK found that these technologies are already economically viable.3

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.4 This enhanced positioning technology will improve the accuracy of on-farm applications without the need for internet-enabled real-time kinematic (RTK) positioning.
Crop monitoring

DataFarming uses Sentinel satellite remote sensing to assess crops. The organisation provides free satellite images of farms with a 10 m x 10 m resolution that show normalised difference vegetation index (NDVI), which can be used to monitor crop and pasture health. NDVI measures the difference between the near-infrared light reflected by green vegetation and the red light absorbed by green vegetation. A higher NDVI value indicates more green, healthy plants.

Barry Haskins, Director and Agronomist at Ag Grow Agronomy in NSW, uses DataFarming as one of several tools to help farmers get the most from their land.

“Sometimes you can see areas that fertiliser or sowing has missed, before we go out on the farm for crop scouting,” Mr Haskins said.

“When we are dealing with very large-scale farms and paddocks, it is useful to see the area by satellite. It doesn’t save us time, but it allows us to be more targeted and more strategic.”

As well as crop scouting, Mr Haskins uses satellite imagery to assist with precision agriculture – methods of making farming techniques more accurate through technology, such as variable rate delivery of fertiliser or seed across a paddock. The benefits gained through variable rate technology differ between paddocks and years, and Mr Haskins says the return on investment is highest in paddocks with more variability.

“In some paddocks we could increase yield by up to 20%, and for others we could get a cost saving of 15%. In this space, it is extremely dictated by the individual paddock,” he said.

For a fee, people can view images captured over five years in a stacked view, allowing them to track production across multiple years or access data on new land purchases. DataFarming also has a paid service that takes on-demand high-resolution satellite images, which can show details at less than 1 m resolution. “High resolution is useful for smaller farms and when we are looking at irrigation,” Mr Haskins said.

Mr Haskins says it is also critical that the satellite platforms used indicate the amount of cloud cover, as this obscures the images. DataFarming images note the percentage of cloud cover.

Sensing on-field

Goanna Ag creates sensors for use across farms. Their GoRain and GoTank offerings allow producers to manage water without needing to visit water storages frequently. For farms where connectivity through 3G or local networks is difficult, the company provides satellite connectivity through a partnership with Myriota5. Myriota owns a constellation of small satellites that send packets of data between devices, which is ideally suited to sensor monitoring systems.

Goanna Ag also provides a service that combines local weather data with satellite imagery to forecast water use on crops. This allows farmers to schedule irrigation on specific fields and adjust for daily fluctuations in water needs.

Reference

1 Kondinin Group, Autonomous tractors – the rise of the robots, Kondinin Group, 2017.
2 Grains Research and Development Corporation (GRDC), Case study - Optical spot spraying, GRDC, 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 business.