

What is remote monitoring?

A remote monitoring system is a technology that allows properties to remotely monitor their production systems via the internet. These technologies are designed to use data to increase efficiency and save time and money.

An increase in data collection is designed to assist with decision making for your business. There is a range of technologies and monitoring systems on offer, so how do you choose the best system for you? Multiple connectivity options exist for remote monitoring today. Four major considerations for each connectivity option include:



Range: How far away can end devices (the devices doing the sensing) be located from edge devices (the devices sending data to the cloud or network)?



Bandwidth: How much data needs to be sent over the connection?



Power: How much power does the solution require? Are batteries enough, or is solar power an option to power the devices?



Cost: System price matters, especially when you're scaling up a solution over a large operation

What connection options are available?

LoRaWan

(Long Range Wide Area Network) is a network that allows battery-operated devices to wirelessly connect and send data over the internet.



- LoRaWAN networks have small data limits, which in turn limits power usage and data uploads to the internet. This results in long battery life and lower data costs.
- LoRaWAN is a "market ready" product, meaning it can be readily purchased to create your own network, configure devices and start receiving data straight away. Agricultural sensors include soil moisture probes, weather stations, animal livestock trackers, vehicle trackers, water flow and water storage meters, with more becoming available all the time.
- Creating your own network requires you to develop your own dashboard or subscribe to a service provider who will do this for you.
- A third party LoRaWAN connection may not always be reliable. If this is the case, it may be best to purchase your own LoRaWAN gateway.
- LoRaWAN is likely to have more upfront costs when purchasing a gateway, but lower on-going costs.
- There are limited options for support services if you create your own network. Topography and natural barriers can interrupt network effectiveness and may require additional gateways, extended aerials or alternate networks.



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Connection options (continued)

Satellite

- Extensive range due to satellite coverage available nearly everywhere on the planet.
- Limited bandwidth and high power requirements (usually solar powered).
- Requires line of site with one or more satellites so needs to be in an open space.
- Satellite hardware and data subscriptions.



Cellular

Cellular devices share many of the benefits of WiFi, and can be more flexible. The main constraint is that it is only available in very limited areas in the pastoral region.

- Depending on the network your cellular device connects to, they can have very high bandwidth.
- High bandwidth also increases power requirements for devices.
- Very limited coverage in the pastoral region.
- If each device has its own cellular connection, it will require its own subscription, and those subscriptions costs can add up.
- A cellular connection can connect to the cloud wherever there's cellular coverage.



WiFi

WiFi generally works across a few buildings, but expanding the range of your signal to fields and other areas of your operation can get tricky.

- A WiFi signal is reduced by obstructions such as hills, equipment and bodies of water. It is possible to set up a WiFi network across large properties, but it can prove a costly exercise.
- The major benefit of WiFi is that you can send a large amount of data over the connection. After all, this is the same type of connectivity you'd use to stream Netflix.
- WiFi hardware is also relatively power-hungry compared to other connectivity options designed for embedded devices. Connecting devices with WiFi also assumes that there is an uplink to the rest of the internet at the wireless access point your devices are connecting to.



Case studies of remote monitoring applications in the SA Arid Lands

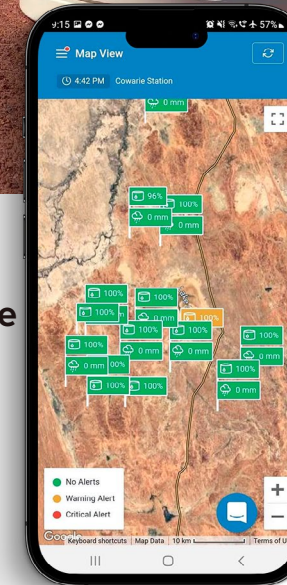


Remote water monitoring – satellite Cowarie Station has implemented an extensive satellite-based remote water monitoring system across their property.

Water level sensors and rain gauges were installed at various locations across the property. The water level sensors are used to monitor tank levels, enabling real-time reporting on water trends, consumption and alerts. Following big rain events, these sites are inaccessible, preventing direct assessment of rainfall levels. Rain gauges are able to be checked remotely to capture accurate rainfall records across the property.

Benefits of the system include:

- Significant time savings on water runs
- Significant reduction in fuels and wear and tear on motor vehicles
- Ability to understand trends in water consumption to identify a problem prior to an alert being raised
- Alert function notifies of a problem without having to constantly check the app
- Understanding animal behaviour and watering habits
- The capacity to monitor waters remotely provides freedom and opportunity to leave the property, having confidence that water levels are being sustained.



Walk over weigh

In 2020, Lyndavale Cattle Company were successful in implementing a Walk Over Weigh (WOW) system at De Rose Hill station, through a Pastoral Sustainability grant supported by the SA Arid Lands Landscape (SAAL) Board.

The WOW system is a remote set of scales that has an Electronic Identification (EID) tag reader and auto-drafting capabilities. The satellite dish communicates the weights of cattle in real time as they walk over the scales. The data is uploaded to a cloud-based system where it can be accessed anywhere you have an internet connection. The Stanes Family from Lyndavale Cattle Co have their system set up at De Rose Hill Station in far northwestern SA, as it's predominantly a fattening block. The WOW itself is set up at the 'Out trap' at a set of cattle yards. Cattle enter the yards through the 'In trap' to access water, then exit through the out trap where they are weighed upon passing over the WOW. The WOW system uses Datamars tag readers which compliments the readers and software that the Stanes family were already using. They induct their cattle into the Datamars database at weaning which allows specific information about each animal to be stored, e.g. breed, sex, weight, polled etc. This capability will allow the unit to be set to auto draft off animals that meet specific criteria such as age/weight/sex.

Benefits of the project include:

- Knowing in real-time when the average weight of the herd is reaching the target turn off weight
- Make decisions to turn off or relocate stock to eliminate the risk of overgrazing, this can be achieved by observing the daily weight gain and noticing when it begins to plateau
- Saves time by avoiding extra handling when it comes to yard work
- Ability to weigh livestock in a stress free environment which has good welfare outcomes and therefore improves meat quality
- The unit is portable and can be moved between watering points. ➤

Case studies (continued)



Ceres tags

Crown Point Pastoral Co trialled the use of CERES satellite tracking tags after being awarded a Pastoral Sustainability grant through the SAAL Board's Building Pastoral Sustainability Project.

150 tags were purchased and applied to steers brought in from Ruby Plains and weaners. Every fourth eligible animal in the herd was tagged. The ear tags have two pins to assist with higher retention rates, and a battery that has a 10 year lifespan. The ear tag works via satellite and sends data to the platform every 3-4 hours, as well as sends out alerts in real time if an animal is under duress. The Costellos combined the tracking tags with Cibo Labs' PastureKey

feed base monitoring program which proved useful to merge data and assist with decision making. Monitoring cattle movement, combined with pasture changes over time offered true insight to how the country is faring.

Benefits of the project include:

- Reduction in cattle mortality
- Ability to locate animals who wander and reduce the risk of theft
- Increased time efficiency (especially during mustering), reduced staffing requirements, higher yarding rate, and fewer aircraft hours necessary
- Ability to match grazing patterns with rainfall and seasonal events, particularly when teamed with Cibo Labs feed base and pasture availability monitoring software
- Real-time data to make decisions regarding pasture under/over utilisation
- Increased traceability and opportunity to pursue provenance focussed markets
- Identifying external triggers that alter animal movement (e.g. storms, aircraft disturbance, increased tourist activity).

Challenges of the project include:

- Tag retention, losses were higher than 10%, and require application by an experienced person to minimise retention issues. Work is being done to improve retention within CERES.



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