

# SMART-DEVICES FOR RANCH MANAGEMENT



**Sustainable Southwest Beef**  
 Knowledge and tools for ranch and rangeland resiliency

## What is Precision Ranching?

Precision ranching involves the use of smart sensors for automated monitoring of livestock, water tanks, rainfall, and forage growth. Precision systems are more common in intensive animal agriculture than in extensive ranching operations. As sensor technologies, wireless data transmission networks, and sophisticated data analytics tools become more common and less expensive, new and exciting opportunities are rapidly emerging. Long-range wide area networks (LoRaWAN) are systems that use long-range radio frequency communication to transmit small packets of data from sensors in real-time. The method is highly suitable for use in remote locations and on extensive ranching systems. A well calibrated, user-friendly precision ranching system could aid ranchers in making rapid decisions to address issues of animal health or welfare and issues relating to forage conditions, thus potentially preventing losses.

## Devices We're Researching

The Sustainable Southwest Beef Project is evaluating a suite of devices that work using LoRaWAN communication and allow the user to monitor various features of their ranch from a computer or smartphone interface. The project is also developing an integrated dashboard where all devices can be checked on in one place, rather than having a different interface for each device.

### GPS Tracking Collars

GPS collars provide real time geolocation for all collared cattle, allowing a user to check locations from a computer or smartphone. This can help with minimizing the time it takes to locate cattle; identifying sick, injured, or escaped cattle; and potentially allows for more closely monitoring cattle during sensitive periods like calving time.

### Ultrasonic Water Level Sensors

Ultrasonic water level sensors are installed above drinking tanks to monitor the water levels in real time. The system can also be customized with predefined thresholds to proactively alert the user to low-water/high-water issues in tanks.

### Real Time Data Tipping Bucket Rain Gauge

Rain gauges are installed on a stable structure that won't be interfered with by livestock or wildlife. Once operational, rainfall events can be monitored remotely. The rain gauges are extremely sensitive and can record precipitation amounts of a fraction of a centimeter.



GPS tracking collar worn by a Raramuri Criollo cow.



Ultrasonic water level sensor mounted on stock tank



Real time data tipping bucket rain gauge installed near a holding pen.



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# FAQs

## How does the system work?

Devices are installed on water tanks, in pastures where rainfall is to be recorded, or in the case of GPS trackers, mounted on collars that the cattle will wear. The devices use LoRaWAN (radio frequency communication) to send data long-range to receiver stations placed strategically across the ranch to maximize coverage. Each receiver station then uses WiFi or cell-service to send the data to a centralized server and dashboard that processes and prepares it to be viewed in real time. A smartphone or computer app displays the relevant information from the sensor.

## Does it need internet/cell-service?

While the devices themselves don't need internet/cell-service to send data to the receiver stations, the receiver stations do need either internet, WiFi, or cell-service to send data to the network server before it's accessible on the dashboard app. The sensor doesn't need to be in an area of internet or cell service, but the receiver station does.

## What infrastructure do I need?

You will need: 1) The device(s) to be installed; 2) one or more solar-powered receiver stations; 3) a cloud-based network server (cellular, Ethernet, satellite, or Wi-Fi); and 4) either a cell phone or internet-enabled computer to access the data on the dashboard application. This is the same set-up needed for any or all of the sensors described in this information sheet and one system can support all three simultaneously.

## How many receiver stations would I need?

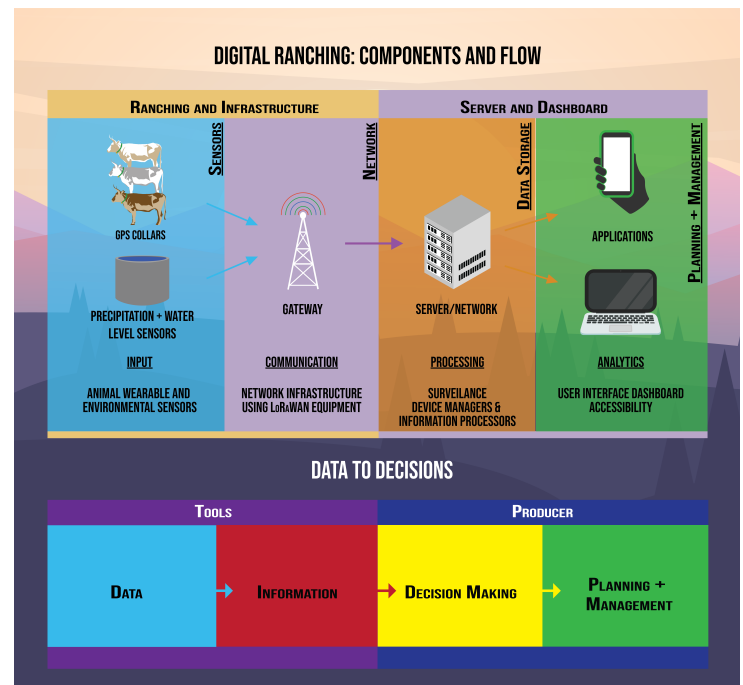
It really depends on the ranch size and terrain. Generally, somewhere in the neighborhood of 3-5 strategically placed stations. Current receiver station designs being tested include a trailer mounted design and a tripod mounted design. Both allow the receivers to be moved around to find the best coverage for your specific needs.

## How much does it cost?

As with any new technology, costs are changing all the time as the market grows. At the current\* time, each solar-powered portable receiver station is about \$2,600 to \$5,000 depending on the setup. Data storage and processing subscription is one payment of \$2,300 for up to 7 receiver stations and 200 sensors, plus an annual fee of \$290 per receiver station. GPS tracking collars run \$77 each; water level sensors: \$670/unit; rain gauges: \$1,143/unit.

\* At the time of preparation: August 2022.

Photos/diagrams of typical receiver stations (also called gateways). Left is trailer mounted, right is tripod mounted:



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[swbeef.org](http://swbeef.org)