

Precision Tools: Using Technology for Ranching

Sustainable Southwest Beef Project



The Sustainable Southwest Beef research project involves more than 40 scientists, ranchers, extension agents, and educators. The team is looking for solutions to challenges faced by ranchers, including increased demand for beef, increasing preference for beef produced in an environmentally friendly way, and changing climate in the southwest. The project focuses on three strategies that might increase the sustainability of ranching in the southwestern United States: Rarámuri Criollo, precision tools, and beef supply chain options.

What are Precision Tools?

Precision tools are smart sensors that allow automated monitoring of livestock, water tanks, rainfall, and more. Precision tools have been widely used in other areas of agriculture for many years. However, the use of precision tools in ranching is more recent. The Sustainable Southwest Beef Project is investigating several precision tools for use in the rangelands of the southwest, including animal sensors located on collars and environmental sensors for water. For both tools, the sensors log and transmit data which are stored and summarized through a dashboard accessed by ranchers and scientists. The hope is that a user-friendly precision tools system could help ranchers make rapid decisions based on animal health and the quantity and quality of forage available on the ranch.

How Do Collars Work?

Animal sensors are placed inside a water-tight box attached to a collar around a cow's neck. Various sensors can be used to transmit close-to-real-time information on the cow's location, motion, and temperature. Data can be transmitted via several wireless network options that include cellular (4G/5G), Long Range Wide Area Network (LoRaWAN), satellite, and Wi-Fi. There are tradeoffs for each option, including availability on the ranch, ability to work in rough terrain, and the initial and ongoing costs for each network. The Sustainable Southwest Beef research team is also investigating a "virtual fencing" collar. The collar uses GPS technology to give the cow a signal when it approaches a fence boundary set by the researchers.

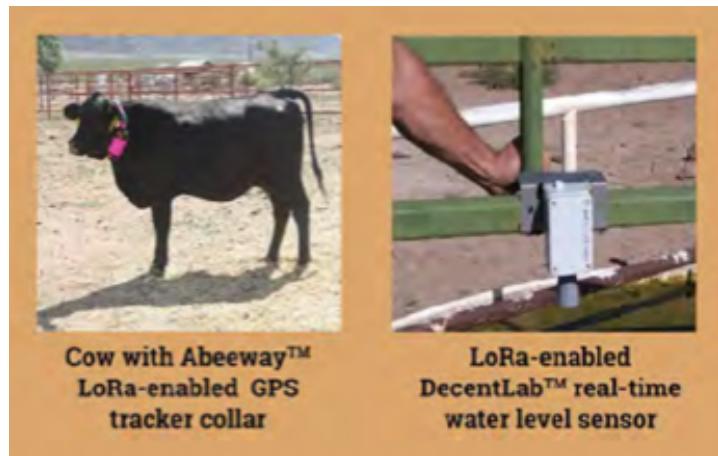


Figure 1. The Sustainable Southwest Beef Project is investigating two precision tools: GPS tracker collars with animal sensors (left) and water level sensors (right).

Cost is the largest potential barrier to the widespread use of animal sensor collars. While the cost will likely decrease over time, the current cost of the tracking collars being studied is approximately \$77 per collar (as of August 2022), plus \$2600 - \$5000 per solar-powered portable receiver station, and \$2,300 for a data storage and processing subscription that covers 7 receiver stations and 200 sensors. Ranchers should compare this cost to the saved labor costs with precision tools.

Durability and maintenance are also significant concerns with animal sensor collars. The collar and sensors need to be durable to withstand the wear and tear expected on a ranch. Some collars also have rechargeable or standard batteries that need to be recharged or replaced.

How Do Ultrasonic Water Sensors Work?

Water level sensors are placed on water troughs and tanks for livestock. They measure the distance from the sensor to the water; distance increases as the water level in the tank decreases. They use LoRaWAN to transmit data to receiver stations on the ranch, which then use Wi-Fi or cell service to transmit data to a dashboard on a rancher's phone or computer. Their use potentially saves ranchers large amounts of time and fuel. Commonly, ranchers drive across their large ranches to personally check each tank and note the ones that need to be refilled. Then, they return with a larger, slower vehicle carrying water to fill the tanks. A water sensor would significantly reduce this driving time and fuel cost. For example, a rough estimate of savings on the 193,000-acre Jornada Experimental Range in southern New Mexico shows that up to 480 hours of driving time and up to 960 gallons of fuel could be saved with sensors that monitor water levels in troughs. This would translate into a cost savings of approximately \$10,000 per year and a reduction of 8.5 metric tons of CO₂ emissions per year.

Cost, durability, and maintenance are also potential barriers to the widespread use of the water sensor tool. Water level sensors cost approximately \$670 (as of August 2022). They need to be equipped for long-term outdoor use under varying weather conditions. Most systems are battery-operated, so the time and cost of battery replacement need to be considered. Other systems run on solar panels, although the solar panels need to be durable to withstand potential damage from animals or the weather.

Sources

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<https://southwestbeef.org/resources/fact-sheets/>

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Career Corner: Lara Macon

Lara Macon is a Range Technician at the USDA-ARS Jornada Experimental Range in Las Cruces, New Mexico. She received a Bachelor's degree in Rangeland Ecology and Management from Montana State University.

Lara works with the Sustainable Southwest Beef Project (<https://southwestbeef.org>), contributing to research on precision tools and breed comparisons.

Her favorite part of her job is working outside in the beautiful Chihuahuan Desert and collaborating with other researchers and ranchers to find solutions to increase the sustainability of ranching in the west.

