Precision Ranching

What is Precision Ranching?

Precision ranching (PR) is the use of smart sensors for automated monitoring of livestock and other important components of ranching such as stock tanks and drinkers, rainfall, and forage growth. Precision systems are fairly common in intensive animal agriculture but their use in extensive ranching operations is still in its infancy. However, sensor technology and wireless data transmission networks as well as sophisticated data analytics tools are becoming ubiquitous and less expensive. Consequently, new and exciting opportunities to develop robust and relatively low cost PR systems are rapidly emerging.

What are the benefits?

A well calibrated user-friendly PR system could aid ranchers in making rapid decisions to address issues of animal health or forage shortage. Real time analysis of shifts in animal movement or activity patterns associated with declining forage, faulty water supply, parturition, or predation (and even cattle rustling!) can help a rancher intervene rapidly and prevent losses that would otherwise go unnoticed. A PR system could also help reduce the financial and environmental costs of ranching and increase the efficiency of rangeland cow-calf systems. For example, rough calculations for the USDA-ARS Jornada Experimental Range, a 300-section ranch in southern New Mexico, suggest that wireless sensors monitoring water levels in troughs could save up to 480 hours of driving time and up to 960 gallons of fuel per year – which would translate into cost savings of approximately $10,000 annually (not including vehicle wear and tear and maintenance). Water sensors in this case could not only make this ranching operation more environment-friendly by avoiding approximately 8.5 metric tons of CO_2 emissions per year, but would also free up valuable time that a rancher could use to pursue other endeavors.

Sustainable Southwest Beef

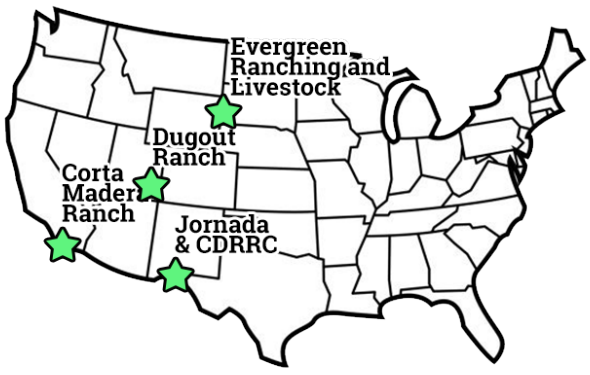
knowledge and tools for ranch and rangeland resilience

What are the potential tradeoffs?

Investments in setting up a PR system, including the purchase of hardware, installation, maintenance, and time spent learning to use the technology, can represent significant initial costs in terms of time and money. Other considerations include ease of use of sensor dashboards, as well as additional costs associated with data storage and data privacy.

SW Beef CAP Precision Ranching System

The Southwestern Beef Coordinated Agriculture Project, a large USDA-NIFA funded effort, will develop and test a precision ranching system able to log, transmit, and analyze animal, weather, and drinker sensor data in close-to-real time using a Long Range Wide Area (LoRa Wan) network (technical details provided below). This system will be installed at five participating cow-calf ranches. Costs and savings from this technology will be assessed via enterprise budgets and rancher surveys to determine the pros and cons of implementing a PR system on commercial ranches. With this understanding of cost savings and feedback from participating ranchers, a market-ready product is expected to be available by 2026.



Five SW Beef CAP participating ranches where the precision ranching system will be tested. Preliminary tests have begun at Chihuahuan Desert Rangeland Research Center (CDRRC) in southern New Mexico where the system is currently being calibrated.

LoRa WAN antenna and gateway

Abeeway™ LoRa-enabled GPS tracker in Pelican water-tight box

Cow with Abeeway™ LoRa-enabled GPS tracker collar

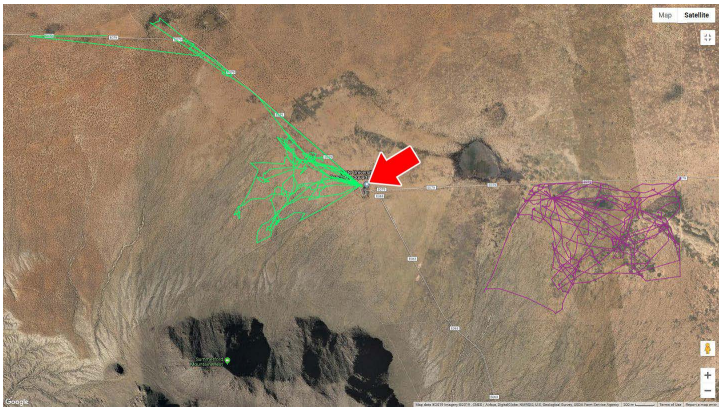
LoRa-enabled DecentLab™ real-time water level sensor

LoRa WAN antenna, Abeeway™ tracker collar, DecentLab™ water level sensor and LoRa WAN real-time tracking of cattle via GPS, a component of the USDA, NIFA CAP precision ranching system.

The nuts and bolts of the system

A PR system typically consists of sensors that log and transmit data to a network, network antennas and gateways, cloud data storage and analysis, and a graphical interphase or dashboard that summarizes sensor data trends and that can be used to configure the sensors. The SW beef CAP plans to develop a PR system based on LoRA WAN, a low power wireless platform that is being used increasingly to connect devices in the Internet of Things (IoT). The technology is well suited for rangelands since it can transmit small packets of data over distances of up to 10 km. It is currently being used in extensive pastoral systems of the Scottish Highlands by scientists at Scotland's Rural College (https://www.sruc.ac.uk/kirkton) who are collaborating on the SW Beef CAP. The PR system being developed will provide close-to-real-time information on weather, water levels, and animal position. An example of the components of the PR system being developed by the SW Beef CAP team is provided above.

Real-time GPS locations of one cow (blue polygons above) grazing a small pasture at the NMSU Campus Farm during preliminary tests in April 2019. Data are available via the ThingParkTM dashboard online. The system recorded over 99% of GPS fixes (5 min intervals). The antenna and gateway (red arrow) were located <100 m from the pasture.



Real-time GPS locations of two cows (green and purple polygons above) grazing large desert pastures at the NMSU Chihuahuan Desert Livestock Research Center during preliminary tests in June 2019. Data are available via the AbeewayTM dashboard online. The system recorded approximately 77% of GPS fixes (10 min intervals). The antenna and gateway (red arrow) were located about 4 km from the farthest GPS point recorded.

Partnering Institutions

ars · Asombro Institute for Science Education · The Jornada Rangeland Research Programs · ltar

Kansas State University · NCBA · NIFA · West Texas A&M University

NM State University · SRUC · Texas A&M AgriLife Research · Texas A&M University

FVET Facultad de Veterinaria Universidad de la República Uruguay · INTA Instituto Nacional de Tecnología Agropecuaria · Universidad Autónoma de Chihuahua Facultad de Zootecnia y Ecología

The Nature Conservancy · USDA Climate Hubs U.S. Department of Agriculture

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