# Snapshot of rancher perspectives on creative cattle management options

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## On the Ground

- We assessed rancher perceptions of three creative management strategies (heritage genetics, precision ranching, and alternate supply chain options) at the 2020 Southwest Beef Symposium.
- Nearly all cattle producers (n = 36), mostly from Texas and New Mexico, currently monitor rainfall and more than half are interested in additional rainfall information.
- Some producers would consider using animal tracking sensors (31%), rainfall sensors (42%), and water level sensors (50%).
- Most producers surveyed raise British breeds (72%), but some (11%) are interested in learning about Spanish Heritage breeds.
- Nearly all (33 of 36) respondents self-identified as ranchers, with nearly half (16 of 33) knowing where their cattle are finished at least some of the time. Eight of 36 survey respondents indicated that grass-finishing and other supply chain options was the topic most immediately applicable to their operation.
- Please see the project website (https://southwestbeef.org/) for newsletters, on-ranch demonstrations, and research updates.

**Keywords**: Beef production, Heritage cattle, Precision livestock farming, Supply chain, Climate change, Precipitation

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## Introduction

Although animal agriculture in the western United States is inherently resilient, coping with the extremely variable weather that dramatically affects forage availability remains a challenge to successful livestock management in the western United States.[1] Temperatures have already increased across the western United States and will continue to do so, creating an even more challenging environmental conditions for future cattle production in the semiarid and arid west.[2]

The Sustainable Southwest Beef project is a new Coordinated Agricultural Project led by New Mexico State University poised to identify viable options for arid lands ranchers and the US beef industry as environmental challenges continue. A diverse team of nearly 30 research, education, and extension specialists is focusing on three creative management strategies: precision ranching, heritage breeds, and alternative supply chain options. A group of ranchers from the western United States advises the team (Fig. 1). The Sustainable Southwest Beef team introduced the project to attendees of the 2020 Southwest Beef Symposium in Amarillo, Texas. Roughly 125 ranchers, feedlot operators, and others connected to the beef cattle industry attended the symposium, and 36 volunteered to share initial rancher perceptions of the three creative management strategies. Here, we share perceptions of those 36 producers.

Cattle producers (n = 36) from 26 counties across seven states completed a baseline survey developed by members of the project's extension team and external evaluators at the Office of Educational Innovation and Evaluation at Kansas State University. Nearly all survey respondents self-identified as ranchers (n = 33) and most (73%) were from Texas and New Mexico. Ranchers had been raising cattle for an average of 38 years, but responses ranged from <1 to 65 years. Respondents' operation size varied widely with 28% raising fewer than 100 animalsnearly half (44%) raising 101 to 500 animals and 25% raising more than 500 cattle (Fig. 2).

## Precision ranching

Precision ranching (PR) is a proposed specialization of Precision Livestock Farming that includes the use of sensors for automated monitoring of vital components of ranching such as livestock location and activity, stock tank and drinker water levels, rainfall, and forage growth. Although precision agriculture is common in cropping systems and intensive animal agriculture, use in extensive ranching operations is less common. As sensor technology, wireless data transmission networks, and advanced data analytics become ubiquitous and less expensive, opportunities to develop robust and low-cost

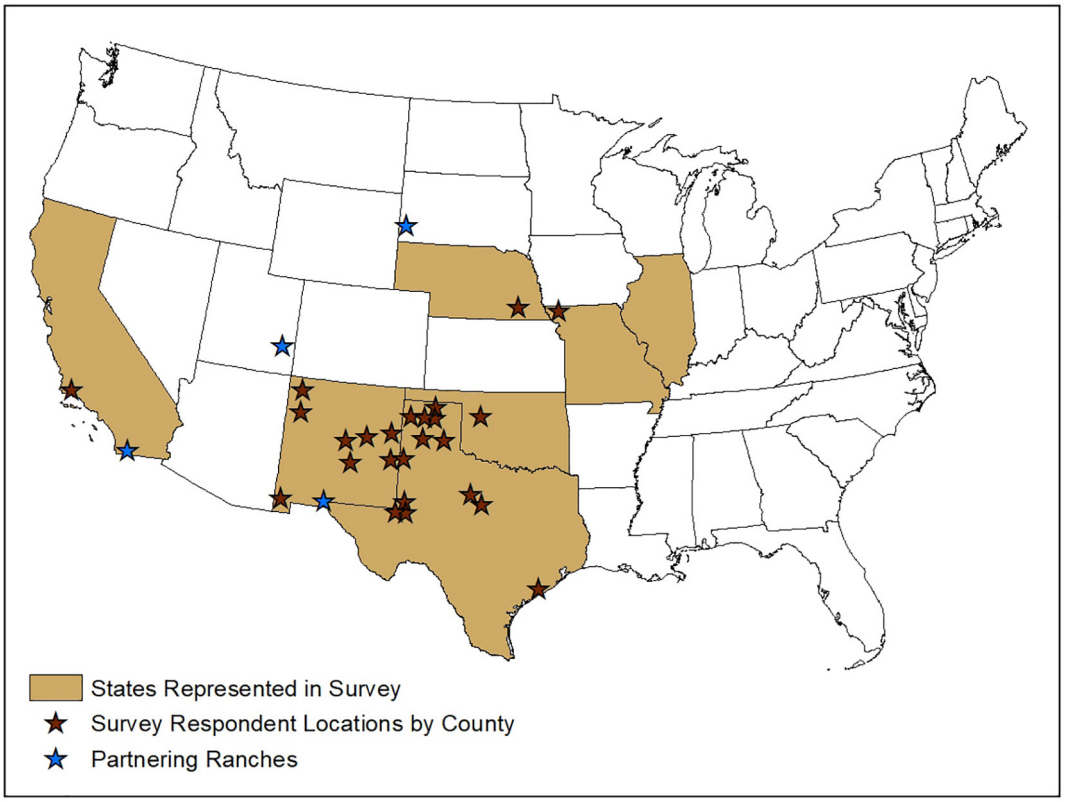


**Fig. 1.** Sustainable Southwest Beef partnering ranch and survey respondent locations.

PR systems are emerging. Real-time information about animal health and forage shortage can aid in rapid decision-making on rangeland systems. Shifts in animal movement or activity patterns related to declining forage, faulty water supply, parturition, or predation could alert ranchers to rapidly intervene and prevent losses, reducing the financial and environmental costs of ranching while increasing animal well-being and efficiency of rangeland cow-calf systems.

For example, rough calculations for the Jornada Experimental Range, a 777-km$^2$ (19,201 acres) ranch in southern New Mexico, show wireless sensors to facilitate monitoring of trough water levels could save up to 480 hours of driving time and up to 3,534 L (960 gallons) of fuel per year, which equates to a cost savings of approximately 10,000 annually. Investments in establishing a PR system, including the purchase of hardware, installation, maintenance, and time spent learning to use the technology, can represent significant initial costs. A rough estimate of the cost of a typical PR system including a LoRa WAN (Long Range Wide Area Network) radio frequency network that enables long-range transmissions, with enabled animal sensor deployed on every cow in the herd, two to four water level sensors, and two rain gauge sensors ranges from approximately 73 to 90 per cow per year for a small herd of 150 cows or approximately 50 to 57 per cow per year for a large herd of 500 cows. These calculations are based on a pilot system being tested at the Chihuahuan Desert Rangeland Research Center. Our estimate involves assumptions about the life span of sensors and network gateways, as well as terrain configuration and number of water tanks and rain gauges needed, which may vary considerably from ranch to ranch. Over the coming 5 years, we plan to determine the actual cost of deploying precision systems at five cattle ranches in the western United States. Monetary and time costs and savings from this technology will be assessed via enterprise budgets and rancher surveys, and a market-ready product which integrates results of these assessments is expected by 2026.

Nearly all survey respondents (33 of 36) use rainfall information and 75% (27 of 36) use nonautomated personal range gauges (Fig. 3). Nearly half of respondents rely on free, on-line weather service (17 of 36). More than half (21 of 36) use more than one source of rainfall information. Three respondents (all located in Texas and New Mexico), all with >50 years of experience raising and feeding cattle, indicated that instead of relying on rainfall measurements, they evaluated forage quantity and quality directly.

More than half the respondents (21 of 36) would like more rainfall information. Although it may be intuitive that ranchers in drier counties might want more rainfall monitoring, that was not reflected in the survey responses. We evaluated

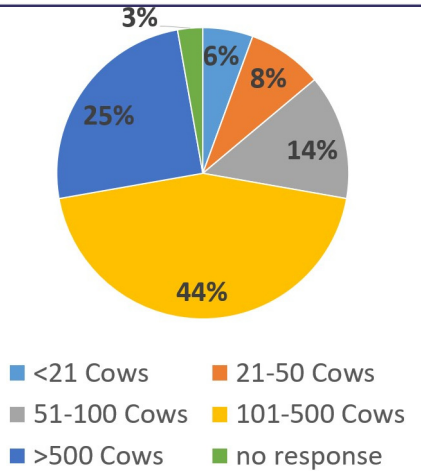


**Fig. 2.** Herd size reported by respondents to the survey completed at the 2020 Southwest Beef Symposium (n = 36).

historic precipitation normals at the county-level from the PRISM Climate Group based on the desire for more rainfall information for the 27 respondents who supplied their county.[3,4] The county-level annual average rainfall of respondents ranged from 258 to 1,188 mm (10.2–46.8 inches) with a mean of 507 mm (20.0 inches). Producers desiring additional rainfall information had nearly identical median (439 vs. 438 mm [17.3 vs. 17.2 inches]) and mean (495 vs. 511 mm [19.5 vs. 20.1 inches]) annual rainfall as producers uninterested in additional rainfall information, suggesting that wanting additional precipitation information is not related to average annual precipitation. We also evaluated the desire for rainfall information by herd size and found that the smallest operators (<21 animals) do not want more rainfall information, whereas larger operations are more equally divided. The biggest barrier to collecting more rainfall information was time to purchase, install, and monitor new technology (55%), followed by travel distance (22.5%) and cost (22.5%).

Most producers do not currently use sensor technology in ranch management, but some reported interest. Only one rancher currently uses water level sensors, 18 indicated they would consider using them, even though nearly all respondents travel < 30 miles to check their water tanks (29 of 34). Although only 8% of respondents currently use automated rainfall sensors, nearly half (42%) indicated they would consider using automated rainfall sensors (Table 1). None of the ranchers surveyed currently use animal sensors, however 11

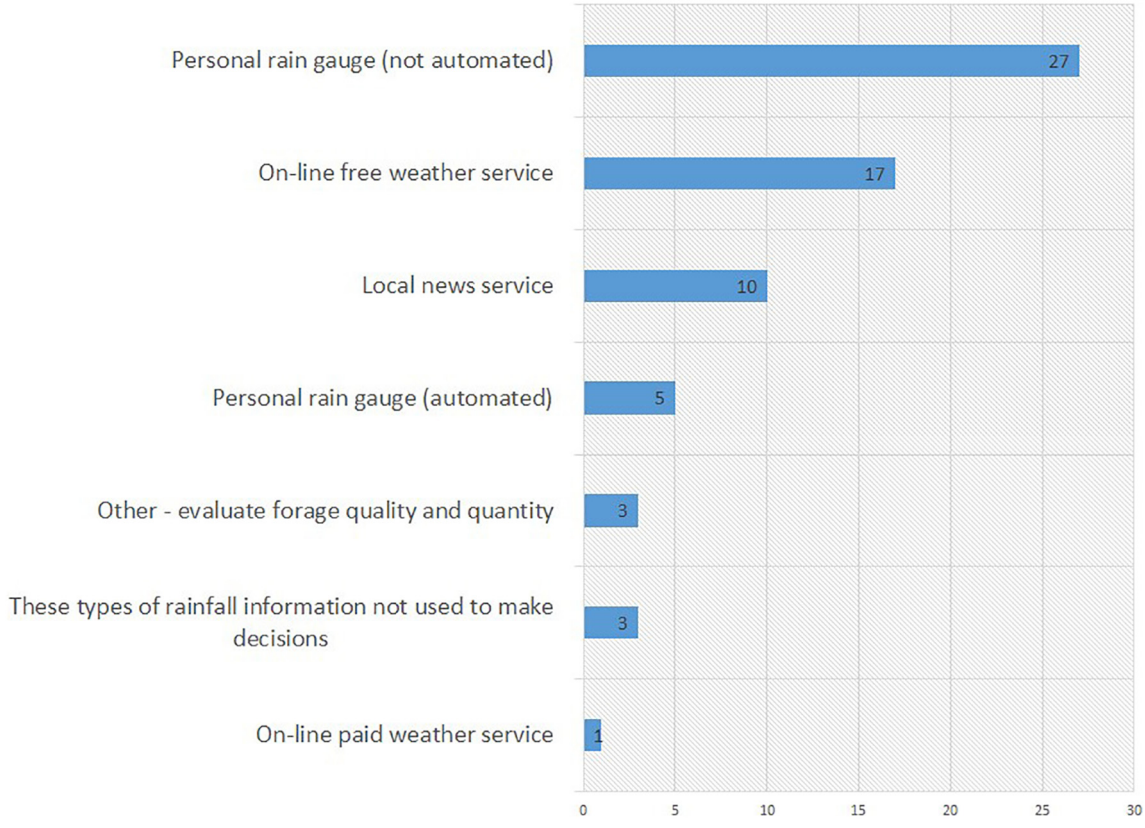


**Fig. 3.** Sources of rainfall information used by cattle producers (n = 36) (note: some use more than one source of rainfall information).

ranchers (31%) indicated they would consider using them. Animal sensors can supply location information, allowing managers to find animals easily, thereby reducing driving time, fuel use, and $CO_2$ emissions.[5] Sensors also provide movement information that can be linked with weather-related environmental conditions, such as declining forage and inadequate water supply.

An open-ended question about factors that might limit adoption of PR technologies showed cost (40%), time and effort (13%), small operation size (13%), and uninterested in the information provided by these data (13%) as the largest barriers to adoption. Two ranchers, both in New Mexico, also listed cellular service as a limitation.

## Heritage breeds

In the semiarid western United States, heritage breeds, such as Raramuri Criollo show promise for profitable and sustainable production.[6] Compared with other common breeds, preliminary research suggests Raramuri Criollo travel farther from water, spend more time traveling, and appear to have less heat stress while continuing to maintain weight and body condition. Previous research shows that added grazing capacity from broader livestock distribution may be a major benefit of Raramuri Criollo cattle production.[7] The project continues to analyze landscape use, behavior, and production economics of Raramuri Criollo at participating ranches. To better understand product quality and marketability, cattle will be fed finishing diets, weighed at 28-day intervals, and carcass qualities will be measured at harvest.

The majority of producers surveyed raise and/or feed British breeds (72%), however some raise Continental (14%) and/or British X Continental breeds (17%). A small percentage (8%; three people) indicated they currently raise/feed Criollo or other Spanish heritage breeds, but one of these three people is part of this project. Some producers indicated they raise/feed Japanese Wagyu cattle (11%). Eleven percent of survey respondents were interested in learning more about Spanish heritage breeds, such as Raramuri Criollo, as an option for southwestern rangelands.

## Supply chain options

US beef production systems are striving to meet global demand while sustaining local profitability and environmental quality. These opportunities and challenges are evident in four regions of the United States connected ecologically and socially through beef production: the Southwest, Ogallala Aquifer region, Northern Plains, and Upper Midwest. Most calves raised on the arid pastures of the Southwest are exported to the Ogallala Aquifer region for finishing on grains grown locally or imported from the Upper Midwest.[8] Alternative supply chains for calves weaned on Southwestern ranches include grass-finishing locally in the Southwest, or grass-finishing in the productive grasslands of the Northern Plains. However, factors that can affect the long-term sustainability of these regionally connected supply chains include changes in aquifer storage, climate, vegetation, and human demographics. The Sustainable Southwest Beef project is using the Integrated Farm System Model to evaluate how beef production connects these four regions and how various scenarios may affect their sustainability.[9]

We asked survey respondents about their role in the greater US supply chain. Nearly all (33 of 36) respondents self-identified as ranchers, with nearly half (16 of 33) knowing where their cattle are finished at least some of the time. Eleven producers (of 36) self-identified as backgrounders and/or feedlot operators with nearly 75% of those knowing where their cattle come from "most of the time" and the remaining three knowing where their cattle come from "sometimes."

Eight out of 36 (22%) survey respondents indicated that grass-finishing and other supply chain options was the topic most immediately applicable to their operation. Geographic location of the respondents varied widely, with five respondents from New Mexico, one from Oklahoma, one from Missouri, and one from Nebraska. Cattle operation size among these respondents varied widely, ranging from 21 to 50 to >500 cattle, with half managing 101 to 500 per year.

## Next steps

Producers indicated the most immediately applicable aspects of our project for their operations were (percentage of survey respondents shown):

- Integrated research, education, and extension of the Sustainable Southwest Beef CAP – 28%
- PR technology (i.e., animal movement, water level, or precipitation measurement sensors) – 25%
- Range finishing on Southwestern rangelands and other supply chain options – 22%
- Spanish/heritage breed cattle (e.g., Raramuri Criollo) – 11%
- None or other – 6%

**Table 1. Sensor technology use by ranchers/feeders (n = 36) surveyed at the 2020 Southwest Beef Symposium.**

| Sensor technology | Currently used? | Would you consider using? |
|---|---|---|
| Animal sensors | 0% | 31% |
| Water level sensors | 3% | 50% |
| Rainfall sensors | 8% | 42% |

Over the next 5 years, research will culminate in a decision dashboard designed to assess tradeoffs among the economic, environmental, and social outcomes and help producers and consumers make informed decisions (https://southwestbeef.org/).

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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