

## Research shows protein on U.S. native grasslands in decline

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Manure samples arrive at the Grazing Animal Nutrition Lab at the Texas A&M AgriLife Research and Extension Center in Temple. The manure samples are analyzed to show producers the nutrient quality of their forages. Thousands of samples collected over the past 20 years have shown long-term declines in

nutritional value in native forages on America's grasslands. Credit: Texas A&M AgriLife Extension Service photo by Adam Russell

There is an alarming trend on America's rangelands due to grazing and changing climate, and it's already costing producers almost \$2 billion annually, according to recently published work by a Texas A&M AgriLife Research scientist in Temple.

Dr. Jay Angerer, an AgriLife Research rangeland ecologist at the Texas A&M AgriLife Research and Extension Center in Temple, recently co-published "Long-term declines in dietary nutritional quality for North American cattle" in *Environmental Research Letters* with Dr. Joseph Craine, of Jonah Ventures, Manhattan, Kansas, and Dr. Andrew Elmore, University of Maryland Center for Environmental Science, Frostburg, Maryland. Their research outlines the falling dietary value of forages on unimproved native rangelands in the U.S. over the past two decades due to nutrient losses associated with grazing and changing climate.

The researchers suggested in the publication increased prevalence of drought, rising atmospheric carbon dioxide concentrations and sustained nutrient loss from grazing "all have the potential to reduce cattle performance by reducing the nutritional quality of forage."

Angerer said the downward trend in nutritional value on rangelands poses a measurable concern for producers and consumers in the future. The publication notes grazing livestock such as sheep, goats, cattle and buffalo, provide 15 percent of the global human protein supply.

The reduction in forage quality creates what Angerer and the other researchers labeled a "protein debt." The contributing factors have led to cattle "becoming increasingly stressed for protein over the past two

decades, likely reducing cattle weight gain."

The research estimates it costs producers an additional \$1.9 billion annually to meet the U.S. cattle herd's protein needs with supplemental feed.

"There are financial implications for producers and eventually the consumer," he said. "Producers already have enough to worry about, and if their supplemental feed costs go up, their margin shrinks, and that may lead to a decision on whether to stay in the business or get out."

The Grazing Animal Nutrition Lab at the Temple center collected 36,000 manure samples from cattle in the U.S. that were measured for dietary quality between 1994 and 2015.

The GAN Lab's short-term goal is to estimate a producer's forage quality, especially crude protein and total digestible nutrients, using manure samples to help them optimize supplemental feeding regimens, Angerer said. The lab receives and tests samples from various livestock producers from all over the U.S. including sheep, donkeys, cattle and wildlife such as white-tailed deer.

Over the years, researchers have dialed in equations and parameters to determine forage quality based on manure samples, the animal, the breed and other factors that help the lab give producers or consultants the information to provide the correct amount and type of supplemental feed throughout the year.

"If producers are looking for optimization, it's better to look at a number and not a range of numbers," Angerer said.

But the long-term look at information provided by the manure samples showed that digestible organic matter and crude protein quality were

declining. Over 20 years, available crude protein decreased 1 percent which amounts to an average 10-pound loss per head without supplemental feed.

The U.S. had 86 million cattle that were not on feed, including 27 million calves, in July 2015, according to the study.

Angerer said potential losses depend on the rangeland, the animal's production stage, growth, lactation, gestation, the season, temperatures and other factors that could increase the amount of supplemental feed to make up for the crude protein losses.

Enriching native grasslands with nitrogen is discussed in the study, but fertilizing millions of acres would be counterproductive, Angerer said, so producers face higher [supplemental feed](#) costs or the cost of establishing improved pastures for grazing.

"These aren't large differences after 20 years, but if that trend continues for 60 years it might get into something that makes a large difference for production capacity," Angerer said.

The study concluded the protein debt is likely to grow "if the drivers of the reduction of [protein](#) in plants cannot be identified and reversed, or adaptation strategies enacted" and could lead to net losses in [cattle](#) production.

In 2010, the U.S. Department of Agriculture's Natural Resources Conservation Service ramped up its conservation stewardship program that provides incentives to producers who participate in the studies.

Angerer said participation in the NRCS program is picking up. Last year, producers turned in 19,000 samples for analyzation. Most samples originate from the Great Plains area. Most participating producers send

in six samples per year.

The samples will continue to be analyzed to assist producers' supplemental feeding programs, added to the long-term [forage quality](#) study and held in storage for future research.

**More information:** Joseph M Craine et al. Long-term declines in dietary nutritional quality for North American cattle, *Environmental Research Letters* (2017). [DOI: 10.1088/1748-9326/aa67a4](https://doi.org/10.1088/1748-9326/aa67a4)

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