Livestock Numbers by Weather and Climate

PEGGY GREB (D2135-1)

In the semi-arid Great Plains, a good forecast of forage growth can guide the rancher in planning the right herd size for the coming season. Here, soil scientist Gale Dunn checks the validity of model-forecasted forage growth against actual growth in late summer.

Ranchers in the central Great Plains may soon be using some of their winter downtime to rehearse the growing season, all from the warmth of their homes.

Ranchers would use a computer model known as "GPFARM-Range" to see which stocking rates are sustainable on their rangelands. The scenarios include forage yields and weight gains of beef cattle and calves and other livestock under various stocking rates and weather conditions.

Looking at National Weather Service seasonal weather predictions, ranchers would judge whether precipitation in the coming season would likely be normal or above or below normal. The ranchers would then choose a stocking rate based on this.

"The high variability of precipitation in the semi-arid Great Plains makes it difficult for ranchers to choose a stocking rate that is the best balance between economic and rangeland sustainability," says Sam Adiku, a visiting soil scientist from Colorado State University who is working in the Agricultural Research Service's Agricultural Systems Research Unit at Fort Collins, Colorado.

Throughout the season, ranchers would keep an eye on changing weather conditions to see if adjustments in the stocking rate would be wise. GPFARM-Range is one of a few range models that can also factor in the effects of climate change on stocking rates. "We can predict the response of forage plants to increased CO_2 and higher temperatures," Adiku says.

GPFARM-Range was originally developed by ARS and tested on rangeland at Cheyenne, Wyoming, in 2003. The acronym stands for "Great Plains Framework for Agricultural Resource Management."

Adiku works with ARS soil scientist Gale Dunn and research leader Laj Ahuja to test GPFARM-Range in enough locations to make the model fully usable throughout the central Great Plains. They recently tested GPFARM-Range on sheep pastures in Miles City, Montana, and beef cattle pastures at Fort Supply, Oklahoma.

At Fort Supply, Adiku and colleagues recalibrated and enhanced the model to simulate the effects of soil compaction on native sand bluestem grass. Soil compaction increases as the number of cattle per acre goes up.

With this adjustment, the model accurately predicted forage yields as stocking rates increased. Previously, the model was overestimating forage yields with high stocking rates, because it wasn't accounting for soil compaction.

GPFARM-Range guides researchers as well as ranchers by pinpointing areas requiring further research and development. "This is an evolutionary process that ties research and technology transfer closely together," Ahuja says. "It brings scientists together with farmers, ranchers, consultants, and land managers in a joint search for solutions."—By **Don Comis,** ARS.

This research is part of Agricultural System Competitiveness and Sustainability, an ARS national program (#216) described at www.nps.ars.usda.gov.

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GPFARM, the range model's parent, can be downloaded at **www.tinyurl.com/farmrange**.

A CD is available on request by e-mailing **GPSR_Email@ars.usda.gov**.

GPFARM-Range is not yet online, but a CD is available from Gale Dunn, **gale.dunn@ars.usda.gov**.

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