



Soil Health Is the Foundation

Avoid getting lost in the weeds by understanding the fundamentals of pasture management.

by **Troy Smith**

Some Nebraskans refer to their state's southwestern cluster of counties as the "banana belt," claiming its winters are mild compared to other parts of the state. While maybe true, natives of the region believe they receive their fair share of cold temperatures, snow and wind — perhaps more than their share of wind. The winters are bad enough many cow-calf producers typically plan on feeding plenty of hay or other harvested feed.

Hitchcock County rancher Jacob Miller is atypical because he seldom hauls feed to his cows. Miller, whose family's 7M Ranch is located near the village of Culbertson, plans to

have cows grazing standing forage throughout the year, even during the winter. With 365-day grazing, the goal is that the land produces large volumes of forage. This requires healthy soils which Miller promotes through savvy grazing management.

A healthy base

"Soil health really is the foundation of civilizations — and the fall. Civilizations have failed when their soils became degraded," says United States Department of Agriculture (USDA) Agricultural Research Service soil scientist Virginia Jin, citing the collapse of ancient Egyptian and Grecian societies as examples.

But what is soil health? According to Jin, soil health and soil quality are often used interchangeably to describe soil's ability to function as a living system. Indicators of soil health fit within three major categories:

- 1) physical properties such as bulk density and texture
- 2) chemical properties including relative acidity/alkalinity (pH) and nutrient availability
- 3) biological properties that include soil microbial biomass, soil respiration and enzyme activities

"Almost every soil health aspect falls under the overarching influence of soil organic matter," Jin says. "Management practices aimed at enhancing soil organic matter often benefit overall soil physical, chemical and biological aspects."

Considerable research involving many different types of plant

communities shows species diversity promotes soil health, increased fertility and greater productivity. Plant communities consisting of rich mixtures of perennial grasses, tap-rooted forbs, nitrogen-fixing legumes and shrubs contribute a wide variety of residues to the soil, which feed microorganisms responsible for residue decomposition. Along with providing nutrients to growing plants, the decomposing residues provide stable organic matter that contributes to soil structure and water-holding capacity. In contrast, pastures dominated by a single species — monoculture — either by seeding or by invasion of a weedy species like cheatgrass tend to have more shallow soils with less biological activity and lower productivity.

Miller's ranching experience illustrates how grazing management has a regenerative effect on soil health, forage production and the resilience of the range. It started with a shift from more traditional season-long grazing of rangeland pastures to intensively managed rotational grazing with high-stock density.

"We started cross-fencing and adding water infrastructure to allow for a rotational system," Miller explains. "We went from eight pastures to 32 paddocks. It'll soon be 38, with the addition of some land coming out of CRP [Conservation Reserve Program]."

Miller employed high-stock density, grazing a relatively high number of cattle but rotating them through the system of paddocks in relatively rapid succession. High-stock density has afforded more

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uniform grazing of available forage and beneficial animal impact. The animals deposit manure and urine and their hoof action tramples plant residues, hastening decomposition.

Following its short exposure to grazing, each paddock then receives a long period of rest and recovery — at least 75 days but sometimes up to 100 days of rest during the growing season. “It depends,” says Miller, explaining how weather conditions — especially precipitation - and plant regrowth influence such decisions but rest periods are always long.

As a result of changed range management, the range has gained greater diversity of plant life and a particularly desirable increase in the presence of native, deep-rooted perennial grass species capable of competing with “weedy” annuals. And instead of a more traditional five to 5½-month summer grazing season, the Miller's cow herd's typical time on the range increased to about eight months, from early April through the end of November.

Cover crop advantage

Historically, the ranch also produced cash crops, including wheat, corn and soybeans, but those changed, too. No cash crops are produced, but every acre grows some kind of forage that cattle harvest by grazing. Spring-planted mixtures of cover crops include species such as oats, peas, barley, rapeseed, yellow clover and alfalfa.

Summer mixtures combining brown midrib forage sorghum, sunn hemp, cowpeas, sunflowers, turnips and radishes are stockpiled for winter grazing. And a fall-planted mixture of rye and hairy vetch has provided grazing in the very early spring.

“But, it's the winter stockpile of forages that are the heart of 365-day grazing,” states Miller. “Not only do we rarely feed hay, having fairly high-quality grazing in the winter has allowed us to reduce protein supplementation of the cows.”

The cover crops aren't utilized solely by the cow herd. Miller emphasizes that moving to year-round grazing required a systems approach, so some other changes were required. Calving season was moved to late spring to reduce nutrient requirements of cows during the winter and to have them on green forage before and during calving. Cow numbers were reduced from 600 to 375 head, and instead of marketing in the fall, calves are now held over as yearlings that will summer-graze cover crops.

“Our calves aren't as heavy at weaning. Winter gains are modest, but they do grow,” says Miller. “And then we get cheap compensatory gain in the spring and summer, all from grazing.”

Miller says growing cover crops benefits soil health on the crop ground by maintaining ground cover, promoting water infiltration

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Incorporating cover crops, such as annual ryegrass, into crop rotations helps control weeds and pests, mitigates tillage harm and provides high-quality forage.

and reducing erosion. Having living roots in the soil throughout much of the year fosters increased biological activity. Grazing cover crop forage with cattle affords the same soil building benefits seen on the range by adding nutrients in animal waste and trampling plant litter.

Like Miller, Jerry and Cindy Glaser are more than a little interested in soil health. The Glasers consider the flora and fauna living within the soil to be just as important as any plants and animals they can see above ground. They also rely on permanent pasture managed under a rotational system that allows for short periods of grazing followed by long periods of rest. Their grazing management has improved soil health, made the range more resilient and improved forage production and utilization.

But, the Glaser operation, near Spalding, Neb., is quite different from Miller's ranch because the Glasers raise organically grown food crops including popcorn, yellow corn and edible beans, as well as grass-finished beef. They also raise cover crops and grass-legume mixtures on their irrigated cropland as part of a planned crop rotation. Jerry Glaser also cites erosion control, better soil structure, increased organic matter and improved water infiltration as benefits that are further enhanced when cover crop acreage is grazed by cattle.

However, while Miller can use no-till methods, Glaser says organically grown crops require tillage instead of herbicide for weed control. Crop rotations incorporating cover crops also help control weeds and plant pests, as well as to mitigate the negative effects tillage has on soil. They also serve as high-quality forage for Glaser cattle. Cattle harvest some of it, extending the grazing season, but some is harvested for winter feed.

Doubling up

Cover crops also provide an opportunity for harvesting two crops from the same field during the same year. As an example, Glaser explains how a cover crop mixture, such as forage turnips and annual ryegrass, can be interseeded into a standing cash crop of popcorn. After harvesting the popcorn, cattle are allowed to graze the residue along with the cover crop.

Another example of double-cropping involves spring planting a mixture of oats and peas, which can be hayed or grazed prior to the time black beans are planted for a summer cash crop. So, the appropriate cover crop mixtures can be used to provide grazing resources at either end of the traditional grazing season, thus extending the total time cattle spend grazing.

The Glasers do not graze year-round. However, harvested feeds are needed for the cow herd during

the dead of winter, and finishing cattle without grain requires a high-quality forage source be available during months when green, growing forage is unavailable. These needs are satisfied with round bale silage made from a legume-grass hay crop that is windrowed, baled at 40 to 60% moisture content and ensiled by wrapping each bale in a plastic covering.

The main benefit is, usually, hay can be cut one day, then baled and wrapped the next day. Occasionally, if conditions are just right, hay can be cut, baled and wrapped on the same day. Either way, this harvesting method eliminates much of the frustration experienced when weather isn't conducive to cutting, curing and baling hay in the traditional way.

"Ensiling bales gets hay off the field faster and maintains nutrient value," Glaser says. "We typically take two or three cuttings in this way, with cattle brought in to graze the last cutting."

"Bales are stored at the edge of the field until cattle are brought back to graze that field's standing forage and the bales," Glaser says. "Feeding bales on the same field where that hay was grown puts nutrients right back into the soil."

When feeding bales in the field, they are placed on a flat end so plastic wraps can be cut and easily removed. Electric fence is used to limit cattle's access to just part of the bales, much like strip grazing, and the fence is moved as needed. Typically, bales are placed in areas of a field that will benefit most when whatever amount of hay gets trampled is incorporated into the soil with cattle waste, putting nutrients into the ground, Glaser adds.

"The microbes living in the soil are the most important livestock we raise," insists Glaser. "They unlock minerals and break down other nutrients in the soil and make them available to plants. We've got to feed the soil microbes to have healthy soils. And without healthy soils, we couldn't survive." **HW**