Grazing your way to healthy pastures

FarmProgress

The latest science shows that putting livestock on the land is a critical element to its long-term health. But you can't simply pack the herd onto a single piece of land and allow them to graze it down to the dirt, and wear a single path between the pasture and the water source.

Managed grazing is a set of techniques and technologies that mimics the way the great herds of bison, elk and other large mammals moved over the vast grasslands of North America several hundred years ago. The animals would graze and then move. Hundreds of prairie plant species evolved over thousands of years to cater to this periodic stripping of vegetation and then regrowth. By subdividing pasture land into smaller lots through the use of modern, mobile fencing technology producers can rotate the herd through the landscape. Some producers invest in mobile water source technology and others use fencing, to assure that the herd doesn't wear a groove in the pasture that can become a massively eroding gully in the course of a single season.

Researchers have found that producers can use rotational grazing to increase profits while (temporarily) reducing herd numbers, all on the way to increasing the vitality of the land, and ultimately, upping its livestock carrying capacity.

Articles by Alan Newport

MORE PROFIT FROM FEWER COWS? HERE'S THE SECRET

A real-ranch experiment in Texas is showing higher profit potential from better grazing management and reduced wintering costs, even with 40% fewer cows.

On a ranch belonging to the USDA's Agricultural Research Service near Riesel, Texas, a tiny town just southeast of Waco, scientists and range management specialists in late 2011 began a 10-year study of conventional, set-stock grazing management vs. controlled, planned grazing together with multi-species cover cropping.

Working with existing managers, they split the ranch in half, and on the north 280 acres began changing management and measuring the outcomes of soil health, forage production, cattle production and profitability. They kept management the same as it had been for many years on the south 280 acres and measured the same things.

Jeff Goodwin, a former Natural Resources Conservation Service Texas state rangeland management specialist who now is a pasture and rangelands consultant with the Nobel Foundation in Ardmore, Okla., says the research team's plan is to decrease inputs at the same time it improves grazing distribution, grazing efficiency, forage and soil health, soil water-holding capacity, forage production, and ultimately, stocking rate and ranch profits.

In the three-and-one-half years so far, the average return for the north unit, where managed grazing was being practiced, was $1,170 per year. On the south unit, with all the gates open and traditional hay feeding throughout the winter, the operation lost $80 per year. This despite the fact the north unit team cut the number of cows from 50 to 30 so it could immediately eliminate nearly all supplemental hay (Figure 1).

Figure 1. Reisel ranch four-year returns

Four-year averages (2012-2015)			
North ranch (enhanced) costs		**South ranch (traditional) costs**	
Labor	$2,058	Labor	$3,972
Feed	$6,586	Feed	$12,780
Vet	$480	Vet.	$596
Misc.	$463	Misc.	$16
Sampling	$516	Sampling	$0
Capital	$3,022	Capital	$0
Buy cattle	$6,500	Buy cattle	$13,000
Mach./fuel	$3,382	Mach./fuel	$6,549
Seed	$5,182	Seed	$2,106
Fertilizer	$4,879	Fertilizer	$9,386
Chemical	$745	Chemical	$670
Total costs	$33,812	Total costs	$49,075
Revenue		**Revenue**	
Sell cattle	$34,983	Sell cattle	$48,995
Annual avg. net profit	$1,170	Annual avg. net profit	(–$80)
Annual avg. net profit/ac.	$4.16	Annual avg. net profit/ac.	(–28 cents)

The marginally higher profit on the northern managed-grazing unit was achieved despite a three-year amortization of $10,000 in water and electric fencing improvements which helped divide that property into 14 paddocks. With that out of the budget now, Goodwin says he's already projected a $140-per-cow profit for 2016 (Figure 2).

Figure 2. Reisel ranch projected profit

	North ranch (enhanced)	South ranch (traditional)
Head	30	50
Avg. net profit	$1,170	(–$80)
Avg. profit/head	$39	(–$1.60)
Projected 2016 net profit	$4,192	
Projected 2016 profit/head	$139.73	

In addition, Goodwin explains profits will improve as the north unit soil improves, and as that allows them to increase stocking rates.

"We should really begin to see some improvements in carrying capacity this year, since it takes about three years for cover-cropping and grazing management to really start making a noticeable difference in soil health," Goodwin says.

WHY COVER CROPS?

The north and south units both have a small amount of cropland, along with the majority pasture. For many years, the cropland was used for experiments on poultry litter and watershed nutrient movement. That work continues on separate acreage, and the north unit couldn't get rid of the crop ground. Goodwin says they would plant it to grass if that were an option, but since it is not, they have chosen to work with the cropland on both units.

The team has chosen to use multi-species cover cropping on the cropland and some of the bermudagrass pastures to create additional grazing days, and for soil health improvements.

Goodwin explains that in cropland or pasture, the diversity provided by multi-species cover crops builds soil life and therefore total plant production and water-holding capacity of the soil.

An example: On 5 north-unit acres of degraded bermudagrass pasture, the team planted a cool-season, multispecies cover crop that yielded 25 days of grazing with no fertilizer. That saved hay feeding and built the soil so that the bermudagrass stand rose about 50% the next summer.

The former oat fields on the north property are now in a two-season cover-crop rotation. The data shows this is building the soil, but also providing more total grazing days and more recovery time for the perennial-grass paddocks.

"We should really begin to see some improvements in carrying capacity this year, since it takes about three years for cover-cropping and grazing management to really start making a noticeable difference in soil health."

-Jeff Goodwin

FUTURE PLANS

Goodwin adds that the team used temporary electric fencing to further subdivide the 14 main paddocks at times, and will continue to shrink those down to get higher stock densities. This will result in better animal impact and distribution of urine and dung, helping jump-start soil biology faster.

Along the same lines, Goodwin adds, one of the management plans is to keep increasing stock density on the kleingrass paddocks via temporary fencing. In the past three years, the managers have subdivided the land it into 10-acre paddocks, and then last year, into 3-acre paddocks. That boosted stock density to 13,080 pounds total cattle weight per acre. This year the team plans to go to one-half-acre paddocks and about 80,000 pounds per acre.

To figure stock density, add up your total herd weight and divide it by the number of acres.

The research team's records show it producing and leaving behind more total forage on the north than on the continuously grazed pastures on the south side. This is important for soil building.

HERE IS PRIMER FOR MANAGED GRAZING, PART I

Since managed grazing is such a profit-maker, and such an enabler for management techniques that make more profit, this primer is intended to help newcomers with terminology and understanding basic principles.

Mob grazing, planned grazing, cell grazing, Savory grazing, MIG grazing, AMP grazing – All these terms and more have been coined to describe managed grazing. When we say managed grazing, it means cattle are being moved to fresh pasture often enough that the manager has some control over consumption level of the cattle, as well as the graze and recovery times for plants. It also implies the manager has a plan (planned grazing) for grazing that meets certain goals of both the soil-plant complex and the livestock.

MIG is management intensive grazing. AMP is adaptive multi-paddock grazing. Savory grazing was a colloquialism based on consultant Allan Savory's early advocacy for multi-paddock grazing in the U.S.

Cell grazing refers to the once-common label of a grazing unit as a "cell," with a grazing unit being the area where one herd is managed. This is less common terminology today. Mob grazing refers to very-high-stock-density grazing and has either Australian or South African origins.

Paddock -- is the term defining an enclosure where cattle are contained for a brief grazing period. This might be a week, or more, or less. It might be a few hours. It could be made with permanent, semi-permanent, or temporary fencing.

Stocking rate – Typically refers to the number of cattle that can be run on a ranch, or more specifically the total pounds of a livestock type and class that can be run year-around. It is typically based on the number of animals that can be grazed on one-half of one-half (or 25%) of the total forage grown in a year. Arguably, this carrying capacity would not include additional animals dependent on purchase of hay and other supplemental feeds. It can be a way to measure ranch productivity, but improvements in consumption, regrowth and soil health under well-managed grazing should improve stocking rate immediately and long-term.

Stock density – Stock density is a measurement of the amount of animals on a paddock at one time, usually expressed in pounds per acre. Using pounds per acre allows reasonable comparison across livestock species of the consumption and herd effects such as trampling, and urine and feces distribution.

WHY DOES STOCK DENSITY MATTER?

Stock density is inversely related to grazing time. The higher the stock density, the fewer pounds of forage will be available for each animal and therefore the shorter must be the grazing time. The longer you graze livestock in a paddock under any circumstances, the less residual forage you leave in the paddock and the more forage animals will consume. High stock density also increases trampling. Managing stock density also helps determine the evenness of grazing and of urine and feces distribution, and whether less-desirous plants will be grazed or left behind.

Further, high stock density is directly correlated to length of recovery time and to number of paddocks needed. Put another way, higher stock density requires more paddocks and increases length of forage recovery. In turn, that allows greater forage production and the chance to leave more forage behind, preferably much of it trampled onto the soil surface to make more available for consumption by soil life while still protecting the soil.

PRIMER FOR MANAGED GRAZING, PART II

In part I of this grazing primer we covered some names and principles for managed grazing, as well as stocking rate and stock density. Today we'll continue along those lines with more terms and definitions.

Recovery time – This is the amount of time allowed by the grazing manager for plants to regrow after a grazing event. It is sometimes erroneously called "rest," but this term doesn't remind the grazing manager that plants actually need time to regrow adequate leaf material for photosynthesis and fully recharge the energy stored in crowns, rebuild root systems, and reconnect with underground life such as bacterial and mycorrhizal fungi. This is even more important than once understood, since plants trade carbohydrates with underground life for nutrients they may not be able to mine from the soil with their own root systems. Allowing plants to fully recover builds soil life and

fertility, thereby increasing productivity. The most productive pasture plants also require the longest recovery time to thrive.

Graze period – This is vital information for grazing managers because the true definition of overgrazing, from the standpoint of plants, is being grazed or bitten off a second time or more before it can recover from the first grazing. This means grazing several times over several days is very damaging to individual plants, although repeated biting over a day or a few hours is not problematic.

Graze period also is inversely related to the number of paddocks used in a grazing operation. The higher the number of paddocks, the shorter the graze period.

AUDs, ADAs or cow days per acre – These are primarily measurements of the productivity of your resource. These measurements are a good way to track progress or regression over time, and is very important to help with grazing planning and management. This is very important to good managers who should be changing grazing patterns and herd makeup from year to year and season to season.

Animal Unit Days is based on an Animal Unit (AU), which the NRCS generally says is one mature cow of about 1,000 pounds and a calf as old as six months, or their equivalent. NRCS uses 30 pounds of air-dry forage per day as the standard forage demand for that animal unit. Animal Days per Acre is generally simpler in that the manager can choose his size of animal and simply track how many days and the number of animals were in a paddock. Cow days per acre is a variation of ADAs, based on a manager's particular cow size.

As an example how to use this, a herd of 100 dry cows weighing 1,400 pounds (140 AU equivalent) might stay in a one-acre paddock one day, producing 140 ADAs for that grazing. Two of the same grazings would produce 280 ADAs for the year. This tells the manager if rainfall and time of recovery and time of year are similar, that paddock should allow a herd of 233 600-pound steers should be able to graze one day on the same paddock (140ADA / .6 = 233).

This comparison can be weight-adjusted most simply, or more accurately adjusted by the consumption of a class of livestock and forage type. It should also be adjusted to include calves with cows according to their average weight.

Residual forage -- This is the forage left behind, usually expressed as a percentage of the forage present when cattle entered the paddock. Many managers aim to leave 50% under many circumstances. If forage is ample and animal production is more desired, leaving behind a higher percentage, such as 60-75% might be the goal, leaving a residual of 25-40%. If rationing out winter forage along with protein supplement, a consumption level of perhaps 80% with only 20% residual might be the goal.

If you really want to learn more about controlled grazing, consider taking a Ranching for Profit course or a Holistic Management course. You might also find and purchase a Holistic Management workbook. Read

a lot of books. Attend field days. Above all, make friends with some managed graziers who do a good job and learn all you can from them.

PRIMER FOR MANAGED GRAZING, PART III

In the first two stories of this series we covered some terms used in managed grazing, provided their definitions, and explained why the terminology and the ideas they represent matter.

In this third and final article of our managed grazing primer, we'll cover some important concepts that aren't based in terminology.

PLANTS: TALLER AND DEEPER IS BETTER

Early in the days of managed grazing there was a huge and largely mistaken emphasis on grazing plants in Phase II, or vegetative state.

Pushed to its logical end, this resulted in what then grazing consultant Burt Smith once commented about New Zealanders: "They're so afraid of Phase III growth they never let their plants get out of Phase I."

Young forage is high in nitrogen/protein and low in energy, while older forage is higher in energy and better balanced in a ratio of nitrogen/protein, although it has higher indigestible content.

This older attitude foiled the greatest advantages of managed grazing. It never let the plants work with soil life to build soil. It never let the grazier build much forage reserve for winter or for drought.

Last but not least, we were told for years the quality of taller, older forages was so poor that cattle could not perform on it. That is not necessarily true of properly managed, multi-species pasture where soil health is on an increasing plane and cattle are harvesting forage for themselves. It's all in the management.

BALANCE ANIMAL NEEDS WITH GRASS MANAGEMENT

One of the most important concepts to managing livestock well on forage is to recognize livestock production and nutritional needs and graze accordingly.

When your animals need quality for growth or lactation, you shouldn't demand they eat deep into the plant canopy, consuming older leaves and stems.

If you have dry cows or are dry wintering cattle, you might ask them to eat more of the plants.

Remember the highest quality in mature, fully recovered forage is near the top of the plants and the outer parts of newer or longer leaves

Again depending on livestock class and forage conditions, an affordable and well-designed supplement program can let you graze more severely, also.

ERRATIC GRAZING BREEDS SUCCESS

Nature is chaotic and constantly changing, so your grazing management needs to be also.

If you graze the same areas the same way and same time each year, you will develop plants you may not want because they will try to fill the voids you are creating and you may hurt plants you desire because they will become grazed down and weakened, perhaps at critical times.

If you move those grazing times and even change animal densities and, perhaps, also add other grazing species, you will create more diverse plant life and soil life.

Remember, too, that your livestock don't need to eat everything in the pasture to do a good job grazing.

CATTLE LEGS ARE FOR WALKING

Water is always a limiting factor for managed graziers, but the low-cost solution in many cases is to make cattle walk back to water.

Certainly you can eat up thousands of dollars of profit by installing excessive water systems and numerous permanent water points.

This can be overcome to some degree with temporary fencing back to water and using existing water sources.

NEW RESEARCH SAYS GRASS FINISHING CAN BUILD SOIL

A new study from Michigan has boosted the case for adaptive multi-paddock grazing with data showing less greenhouse gas (GHG) emissions from grass-finishing cattle than from feedlot finishing.

When the researchers included soil organic carbon (SOC) in the GHG footprint estimates, finishing emissions from the adaptive multi-paddock (AMP) system were net negative 6.65 kg CO2-enteric per kg of carcass weight, compared with feedlot (FL) emissions of 6.12 kg CO2-enteric kg, which was aggravated by soil erosion, the authors reported.

Perhaps just important, I believe, is the fact their data shows increased soil organic matter from AMP grazing. Researchers showed a four-year carbon (C) sequestration average of 3.59 Mg C ha/yr in AMP-grazed pastures. The feedlot system showed a potentially small net loss of soil carbon, as you might expect.

Researcher Jason Rowntree adds this paper may underestimate the amount of carbon sequestered by AMP grazing because of ongoing disagreements about the dynamic equilibrium theory of carbon sequestration. Compromises were made for the publishing of this paper, but he says plainly, “We are not measuring all the carbon being accrued.”

As we have described scores of times in Beef Producer, increased soil organic matter and soil life increase water capture and water-holding capacity, dramatically enhance fertility, provide better nutrient availability, and increase land and forage productivity.

Further, we showed in Richard Teague’s Texas A&M research that AMP grazing increases soil health over continuous grazing, including more soil carbon, and we showed from research led by Allen Williams in Mississippi that AMP grazing increases soil organic matter and soil health more rapidly than slower, less-intense “rotation” type grazing management.

This new research -- besides reiterating that the right kind of grazing management can improve soil health -- challenges the poor science which has been aimed at the beef industry from the outside, and more incomplete science aimed at grazing managers from inside the industry.

It has been claimed beef cattle are the largest livestock-sector contributor to greenhouse gas (GHG) emissions, and that grass finishing systems create more greenhouse gases than feedlot finishing systems. These authors make the point that soil organic carbon sequestration has never been included in those calculations, and they did so.

The researchers used on-farm data collected from the Michigan State University Lake City AgBioResearch Center for AMP grazing. Impact scope included GHG emissions from enteric methane, feed production and mineral supplement manufacture, manure, and on-farm energy use and transportation, as well as the potential carbon sink arising from SOC sequestration.

Paddock rotation frequency focused on preventing overgrazing and assuring forage recovery, allowing appropriate regrowth before being

grazed again, researchers said. Pastures were not fertilized, irrigated or treated for pests for more than seven years prior to this management implementation in 2010.

This new study is published in the journal Agricultural Systems under the title "Impacts of soil carbon sequestration on life cycle greenhouse gas emissions in Midwestern USA beef finishing systems."

SIX REASONS WE NEED GRAZING ANIMALS

Despite naysayer claims to the contrary, grazing livestock are a necessity to manage, heal and build the landscape.

There are myriad reasons, but here are six key components of the symbiotic animal-grassland relationship.

#1 First, grazing livestock are needed to cycle carbon and other nutrients essentially locked in above-ground vegetation and put it back on the ground in a more biologically active form to feed soil life and further vegetation growth.

#2 Second, they are vital for terminating cover crops, using low-quality forages and crop residues, again putting them into a more bio-available form that quickly feeds soil life. Put another way, grazing livestock are an important management tool.

#3 Third, livestock are also vital to produce a profit from enterprises that would otherwise be an expense. Cover crops are an example. They have many benefits that pay the crop farmer in the long run but cannot produce a profit in their own right without grazing livestock and good management to harvest them at correct levels that leave soil covered at the same time they produce beef or other meat products. As any fool should be able to understand, without profit for the operator there can be no one to manage the land.

#4 Fourth, they are the only affordable option to manage large acreage. Mowing is too expensive and total rest has proven a miserable failure.

#5 Fifth, different grazing and browsing species eat and provide control of different plant types. This is a case for us to use more than one type of livestock. The fossil record on all continents tells us the variety of species was extremely rich, but the complexity of that discussion must wait for another time. However, it is clear that cattle, sheep and goats provide better usage of a wide variety of plant species than does a single one of these species.

#6 Sixth -- and a point not yet proven but suspected true -- some producers believe the microflora in the gut of ruminants and hindgut fermenters are either some of the same species, or are certainly symbiotic with the myriad species of soil life. These folks talk about "inoculating the soil" with livestock presence. Again, the circumstantial evidence tells us when grazing is applied correctly, the relationship between gut life and soil life is true and good.

PEERING BACKWARD

A bit of history and paleontology also shows us the Creator used a wide variety of grazing and browsing animals to manage the environment, including extremely large herds of ruminants. Holistic management consultant Allan Savory was one of the first, perhaps the first, to note publicly that grazing animals and grasslands evolved together. If we consider the growing evidence that soil is built by modern livestock herds managed with a facsimile of the chaotic pulsing effect the giant herds would have had, we can see the sense in these claims. (See June 2017 issue of Beef Producer.)

Many people are led to believe the bison in North America is the ultimate example of this principle. Although their herding behavior appears typical of large-herd herbivory of the pattern we still see in remnant behavior in wildebeest in Africa and caribou in northern Canada and other uninhabited tundra, bison were not the original North American grassland symbiotes. In fact, the fossil record tells us that outside of Africa, human encroachment coincided with massive extinction of the so-called megafauna -- those animals large enough to provide ample food supply for skilled hunters. Depending on whose data you care to use, North America lost about 70% of its megafauna, Europe and Asia lost about 60% of its megafauna, and Australia lost more than 90% of its megafauna.

Two very good books on the topic of the wide variety of animals that once grazed in symbiosis with plains, savannahs and forests are Jim Howell's For the Love of Land and Tim Flannery's The Future Eaters. They describe in the early years of recorded human settlement huge herds of wildebeest, zebra and Thomson's gazelle in the Serengeti region of Africa, springbok in South Africa, caribou in the arctic tundra, saiga antelope in southern Russian and Kazahkstan, to name a few. For the record, settlers and travelers in the Great Basin of the US noted pronghorn in herds so large they could not count, but estimated at possibly 2 million head -- similar to springbok herds in southern Africa.

The American bison, although the fossil record says they came from Eurasia many thousands of years ago, grazed in herds so large they were said by travelers to have taken several days for a herd to pass by and leave almost no forage standing in their back-path. This is the same large-herd behavior we're discussing in other environments. It seems to have been common before disruption by large-scale hunting and habitat fragmentation by settlement.

Moreover, we've primarily discussed ruminants, which tended to be in large herds over perhaps long periods of the year. There are also descriptions of hind-gut fermenters, rhinoceros in Africa in particular, gathering into fairly extensive herds of at least thousands of animals at some times of the year.

PAST IS FUTURE

The salient point here is that large numbers of grazing animals tended to eat and trample forage plants on a massive scale, leaving so little behind they could not pass that way again before the plants fully recovered. This is the apparatus that appears to have built soils all over the world on the prairies and probably elsewhere. In turn it is the method modern humans can use to rebuild the prairies and make a profit at the same time.