Financial Analysis of Cow-Calf Grazing:

Why Shifting to Managed Rotational Grazing Can Make Sense for Your Profits & Improve Soil Health

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For more fact sheets in the series, see https://landstewardshipproject.org/lspsoilbuilders.

When it comes to making a profit with a cow-calf or other ruminant enterprise, **well-managed pasture** can play a very important role. Such management can produce better forage throughout the year, which can result in healthier, more productive animals.

Managed Rotational Grazing

Managed rotational grazing (MRG) is an approach that increases the stocking density of livestock by shortening the grazing time and lengthening the rest period for pasture forages. MRG is an umbrella term that can include a wide range in rotation timing and animal numbers. On one end of the spectrum is basic rotational grazing with just a few paddocks and longer grazing periods. MIG (management intensive grazing), utilizes a higher stocking density and frequent moves from paddock-to-paddock. On the other end of the spectrum is MOB (mob grazing), which involves high numbers of animals that are moved more frequently. Farmers or ranchers adapt their management to pasture growth using portable electric fence, low-impedance energizers and modern watering systems to create multiple paddocks. Cattle—this fact sheet is focused on beef cow-calf systems—can be moved every one- to-three days, or as often as every half-day or less with high stocking density. The animals are not returned to that same paddock until the plants have recovered.

Moving animals at least every three days helps to maintain plant vigor through adequate recovery of leaves and roots after grazing, which enhances profitability and regenerates soil health. Using annuals or warm season pastures to offset slow, early spring growth and summer slumps in cool season pastures, or to extend the fall grazing season, increases soil health and profitability. Such a system can improve animal health, reducing veterinary bills.

Adapting managed rotational grazing can increase your net profitability

The Land Stewardship Project (LSP) developed an analysis to show how costs per cow-calf unit and per-acre might decrease, and stocking density increase, on a hypothetical Minnesota farm of 300 acres, with 100 acres in pasture. The data and calculations are derived primarily from the Minnesota Farm Business Management system database, the Pasture Project beef calculator, and LSP's Cropping Systems Calculator. The costs and returns shown are based on five years of sales and production costs for a cow-calf enterprise. Feed is primarily from pastures managed with varying grazing intensities, farm-grown mixed hay, and 20 to 40 days on cover crops and/or corn stalks with higher stocking densities. Comparisons are shown for corn on owned fields and soybeans on cash rent.

Grazing Financial Analysis

	Row Crops		*Continuous Grazing*	**Managed Rotational Grazing (Grazing days per paddock)**		
	Corn on Owned Land	Soybeans Cash Rental	90 days in 1 pasture	Basic: 6 days	MIG: 1 day	MOB: 1/2 day
Production Costs						
Number of cow-calf units			28	46	108	127
Cost of pasture on owned land			$ 1,415	$ 2,675	$ 14,433	$ 14,680
Cost of farm grown hay on owned land	$ 66,481	$ 29,389	$ 8,075	$ 8,373	$ 13,119	$ 14,464
Cost of annuals or cover crops			$ -	$ -	$ 192	$ 3,546
Feed purchased and other costs			$ 3,300	$ 5,500	$ 12,963	$ 15,278
Other direct and indirect beef enterprise			$ 8,262	$ 15,979	$ 27,604	$ 27,014
Total Cost of Production			**$ 21,052**	**$ 32,527**	**$ 68,311**	**$ 74,982**
Cost of 550 lb. calf sold			$ 761	$ 695	$ 616	$ 547
Cost /lb. of calf produced			*$ 1.55*	*$ 1.43*	*$ 1.28*	*$ 1.19*
Returns						
Sales	$ 66,527	$ 30,947	$ 23,958	$ 39,930	$ 94,111	$ 110,917
Government payments & crop insurance	$ 7,161	$ 2,114	$ 632	$ 700	$ 2,965	$ 3,092
Return to labor and management	**$ 7,207**	**$ 3,672**	**$ 3,538**	**$ 8,103**	**$ 28,765**	**$ 39,027**
Return per acre	*$ 72*	*$ 56*	*$ 26*	*$ 58*	*$ 120*	*$ 140*
Return to labor and mgmt. on 300 acres			$ 14,417	$ 18,746	$ 37,276	$ 47,096
Grazing System Intensity						
Number of paddocks			1	8	28	100
Average days of rest before re-grazing			0	36	27	49.5
Dry matter from pasture			1.49	2.97	5.00	5.50
Animal unit/acre of pasture			*0.28*	*0.46*	*1.08*	*1.27*
Acres of alfalfa hay for stored feed Acres			35	39	76	84
grazed corn stalks plus cover crops			0	0	64	95
Stocking density in lbs./acre in paddock			**330**	**3,850**	**36,296**	**152,778**
Acres of row crops	100	65	165	161	124	116

Notes

- MIG is management intensive grazing and MOB is higher stocking density grazing. All managed rotational grazing systems are over 180 days.

- *Beef cow-calf:* Calf weaning rate 90 percent; cow replacement rate 20 percent at $.90/lb.; average weight per cow-calf of 1,200 lbs. eating 3 percent of body weight/day.

- Fencing: This assumes no changes in fencing for continuous grazing. Basic grazing assumes replacing 1/3 of fence posts and new polywire and posts for strip grazing fences. MIG and MOB grazing include more interior polywire and portable watering systems to create the requisite number of paddocks. Costs per acre were spread over 15 years.

- *Cost of production for cow/calf-with spring calving, pasture and crops:* Five-year average costs for MN cow-calf production were from the Farm Business Management Association, including owned pasture and hay acres, purchased feed and other costs for continuous grazing. Managed rotational systems costs were derived from 2017 Beef Cow-Calf Benchmark report (Basic grazing at 60 percent, MIG at 70 percent and MOB at 80 percent). The latter assumed average intensive pasture costs from 2017, along with costs from the Pasture Project calculator.

- *Sales:* 5-year average prices from the Farm Business Management Association were $3.57/bushel corn at 184 bushel/acre yield on owned fields, $9.74/bushel soybeans at 48.4 bushel/acre yield on cash rent and $176/hundredweight calves sold at 594 pounds. Government payments and crop insurance payments were from crop reports.

- *Pasture condition on 100 acres:* Poor condition grass/red clover was assumed for continuous grazing. Basic grazing was assumed to be orchard grass and legume in good condition, and MIG or MOB were mixed legume grass pastures in excellent condition. High levels of dry matter were based on Mike and Jennifer Rupprecht's (see sidebar) production and calculations using the APSim model. Grazing utilization was assumed to be 30 percentile for continuous grazing, and 50 percentile, 70 percentile and 75 percentile for basic, MIG and MOB grazing, respectively, from the University of Missouri's Wesley Tucker.

Moving from continuous to higher stocking density with managed rotational grazing could improve profitability and would be more profitable than corn on owned land or soybeans on cash rental, this analysis shows. When animals are grouped in smaller paddocks, it saves money because they do more of the work of harvesting feed and distributing manure. Pasture production increases due to healthier soils and plants that actively photosynthesize throughout the growing season. Stored feed costs go down because a greater proportion of annual feed required is harvested by the animals.

Crunching the Numbers

- Expenses for continuous grazing were $761 for a 594-pound calf, and decreased to $547 in the higher density system, despite higher costs for intensively-managed pasture.
- Total farm returns on 300 acres increased from $14,417 with continuous grazing to $47,096 with the highest stocking density.
- Average total direct and overhead expenses for Minnesota cow-calf systems from 2017-2013 were $751 per cow-calf unit for a 594-pound calf that was sold. For a 550-pound calf that was sold, the Pasture Project calculator baseline was $735/cow-calf and Iowa State University's baseline was $781.42.
- LSP's Farm Transitions Toolkit showed that it could cost $192.5 per-acre to establish the permanent electric fencing and water systems needed to conduct a managed rotational grazing enterprise. That may seem high, but pales in comparison to the per-acre cost of putting in an annual corn crop—seed, fertilizer, fuel, machinery depreciation, etc. Moreover, fencing and watering systems can last for up to two decades. In addition, numerous farmers interested in grazing have taken advantage of USDA initiatives like the Environmental Quality Incentives Program (EQIP), which provides cost-share funds for establishing rotational grazing fencing and watering systems.
- However, current commodity prices are lower than the five-year averages. The Farm Business Management Association average data for sales in 2017 shows $148 per hundredweight for calf sales. At that price, only the two higher intensity grazing systems would show higher returns. By contrast, corn and soybeans show only slight returns at $3.14 per bushel, and $9.18 per bushel, respectively. Continuous grazing would lose money, and basic rotational grazing would have a return of $1,751.

Pasture Resiliency = Pasture Profits

Over 30 years of managed rotational grazing and pasture improvement have helped Mike and Jennifer Rupprecht control costs on owned pasture and hay fields. And marketing grass-finished beef has kept their southeast Minnesota farm profitable through the ups and downs of the livestock market.

The Rupprechts farm crops and livestock on just over 260 acres in a rugged, erosion-prone area of the state. Through observation, the Rupprechts have found that the presence of earthworms, other biological activity in their soil, plant diversity and healthy livestock are indicators of their farm's profitability and environmental sustainability, as well as the family's quality-of-life. On average, they have 90 acres in organic corn, soybean or small grains, and about 60 to 70 acres in mixed hay following the small grains. There are about 105 acres of mixed pasture. Their grass-finished cattle operation includes a cow-calf component and finishing of yearling steers, which are sold direct and through a branded grass-fed program.

The farm utilizes a managed rotational grazing system with 1.5 to 2-acre paddocks, moving animals every one to two days, on average. The Rupprechts feel it is crucial to move animals before the pasture plants start to regrow and to allow adequate time for the plants to recover. This recovery period is usually about 32 to 40 days.

The Rupprechts run about 170 animals on pasture for about 180 days. An additional 30 acres of corn stalks are grazed from mid-October to January, supplemented with some farm-grown hay. Corn stalks provide the equivalent of about one month of feed for their cow-calf herd. Yearlings are fed hay when not on pasture. They sometimes graze mixed hay acres in lieu of a fourth cutting of hay. All grazing is managed with polywire interior fences and electrified perimeter fencing on pastures. The Rupprechts run about 1.4 animal units per pasture acre; their pastures produce about 5 tons of dry matter per acre. They estimate that grazing utilizes

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Soil Health Contributes to Profitability

Managed rotational grazing helps spread manure evenly and introduces microorganisms to the soil, which improves biological activity and over time helps raise organic matter. By stocking cattle in high numbers on pastures as well as cocktail mixes of cover crops that have been planted between cash-crop growing seasons, North Dakota farmer Gabe Brown has raised his organic matter on depleted fields from 1.7 percent to almost 6 percent. He produces five to seven tons of dry matter per acre. Research by grassland/grazing scientist Richard Teague and ecologist Steven Apfelbaum found that carbon sequestration occurs at rates several times higher than previously thought when measurements are taken to a one-meter depth. Pasture fertility increases with the inclusion of legumes in the pasture mix.

With uniform reduction of the grass competition, pasture species' longevity increases, along with volunteer establishment from the latent seed bank, according to grazing expert Allen Williams. With good rotational grazing management, grazing efficiency—the portion of utilized forage ingested by the animal after the rest is trampled or otherwise lost—improves from 30 percent to as much as 75 percent on pastureland, according to Wesley Tucker. Some farmers like Jennifer and Mike Rupprecht (see Pasture Resiliency = Pasture Profits sidebar) utilize up to 75 percent of total forage production and still maintain healthy pastures. Improving a poor stand can double or triple pasture dry matter production. Investing in fencing and watering, lime, fertilizer or other improvements may help lead to further increases in dry matter production.

Fears About More Intense Grazing

Overgrazing is less about the number of animals. It has more to do with the amount of time plants are exposed to the animals and if the plants are properly rested before follow-up grazing. Teague and Apfelbaum noted that one cow grazing on 10 acres all season can kill thousands of plants. But, a lot of cows—100, for example—grazing the same acre for one day will not kill a single plant.

Management Strategies

Continuous grazing has low labor and management requirements. However, as shown by the financial analysis chart, limited production and soil health depletion can eat into profits. The following principles, operating actions and options for observing can get you started on making changes in pasture management. Resources are listed at the end of this fact sheet.

Pasture Resiliency = Pasture Profits

(CONTINUED FROM PAGE 3)

about 75 percent of available dry matter in a paddock. Their costs of production for the cattle enterprise, including hay and pasture acres and all other direct and overhead costs attributed to the cattle enterprise, are about $.94 per pound sold.

This system is not only financially viable, but creates a soil system that is much more resilient.

"When it rains, everything soaks into my pastures," says Mike. "This past summer we had five weeks of flash drought during which my pastures kept growing and the animals on them were healthy. Other pastures in the area didn't look so good during this time. My pastureland is steeper and has poorer soils than my cropped fields. With a well-managed grazing system, I am producing income on land that should never be tilled."

"We have seen the impact of human involved climate change on our farm," says Jennifer. "A couple of major examples are huge rainfall events, the biggest being August 18 and 19, 2007, when we had 17 inches of rain in 24 hours. In the bigger picture, what we are doing on our farm is climate change mitigation."

"I'm convinced most ranchers give their cattle highest priority, followed by grass; little thought is given to soil. I suggest that is backwards. We should think soil first, as all life springs from the soil."

— Burke Teichert, *Beef Magazine*

Management Strategies

MANAGEMENT PRINCIPLE	OPERATING ACTION	OBSERVING/MEASURING
Establish as many paddocks as possible: Eight paddocks provide rest 87 percent of the time. Any increase shows a benefit, but more paddocks make greater stocking density possible as soil health improves.	Electric fencing that includes low-impedance energizers and single polywire with temporary step-in posts works for internal divisions and can work externally as well for short-term grazing on corn stalks or annuals. Semi-permanent fencing is less costly than perimeter fencing with wood posts.	Various measures of soil health include organic matter, aggregate stability and the Haney Soil Health Test.
Increase stocking density to at least 10,000 lbs./acre. Significant improvements come as stocking density increases above 250,000 lbs./acre, according to grazing expert Allen Williams of the Pasture Project.	Temporary paddocks achieve the desired stocking density that utilizes available grass, while leaving enough residual material to promote recovery. Portable watering systems placed near a paddock enable cattle to drink individually and avoid erosion and compaction. An NRCS grazing stick can help you estimate the forage available per acre to determine paddock sizes at a given time of year.	Observe changes in stand species composition and density (poor, good or excellent) over time. "I know I have the density right when cattle enter a new paddock and immediately put their heads down and eat instead of walking the perimeter," says western Minnesota beef grazier Terry VanDerPol.
Shorten grazing time. The grazing period should end before regrowth begins for a given pasture mix. Moving cattle at least every four days is beneficial.	Keep a minimum height of 3-5 inches for cool season grasses and legumes, or 6-8 inches for warm season pastures. Defoliating more than 80 percent of leaf area stops root growth. Experienced graziers can set up paddocks in a few hours. Most moves take only a few minutes once cattle are trained.	Observe leaf area. Leaving more leaf area enables the plant to continue to produce enough carbohydrates to start re-growing and keep roots growing.
Allow adequate rest for pasture plants. Allowing pasture plants to recover for as long as needed is crucial.	The rest period depends on soils, heat, rainfall and growth rates of forage species. Rest periods are longer for cool season pastures when temperatures are highest in late summer. Rest periods are longer for warm season pastures when it is cool earlier in the summer and again in autumn.	Look for growing points. The period also depends on the active leaf area remaining following the last grazing period.

Managed Rotational Grazing Continuum

Managed rotational grazing systems depend on how tightly packed the animals are in terms of stocking density (pounds of animals per acre) and how often cattle are moved, as shown in the continuum chart. Where you want to be on the continuum depends on your goals, management constraints and resources.

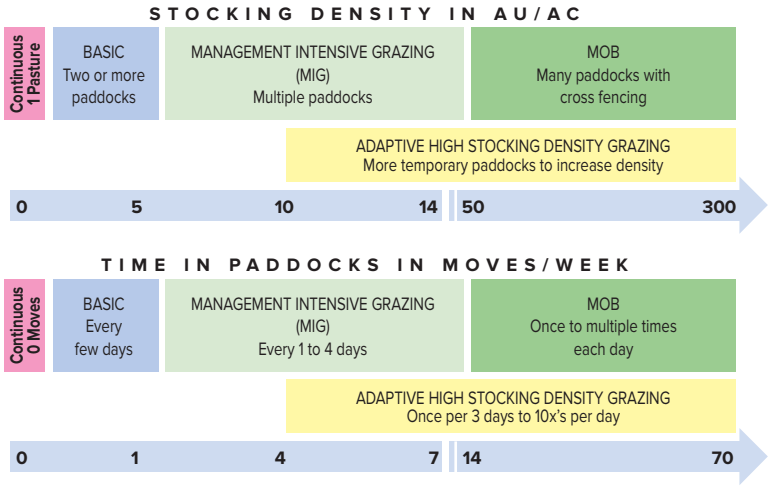
Allen Williams writes: "Stock densities and animal movement frequency can be altered throughout the annual grazing cycle to adjust to changes in climate, forage dry matter production, animal performance and soil health objectives." Achieving ultra-high stock densities of at least 250,000 pounds per acre at least once per year helps improve soil health, he writes. The longer rest period that necessarily follows high stocking density allows plants to restore leaf area and root reserves, as well as increase forage mass, which in turn increases dry matter production on a seasonal and annual basis.

The Bottom Line

If you have livestock and pasture and are using continuous grazing management, you can double your returns by adopting basic rotational grazing, or increase your returns up to 10 times by adopting managed rotational grazing techniques that involve higher stocking densities. With current commodity prices, managed rotational grazing can help you make more than the return from corn on owned ground or soybeans on cash rent. If you don't have cattle, the advent of portable electric fence and watering options makes it possible to contract with nearby livestock farmers to reintegrate cattle into your row-cropping operation.

> The Pasture Project, working with partners such as the Land Stewardship Project, found that, **"...cattle grazing on winter cover crops can provide significant soil health and on-farm economic benefits, particularly when cover crop mixes are diverse and combined with adaptive high-stock density grazing practices."**
> See Allen Williams et al.

Managed Rotational Grazing Continuum



Adapted from **"Making sense of the many systems of rotational grazing,"** Pasture Project. http://pastureproject.org/pasture-management/rotational-grazing-systems/

Grazing Summer Annuals & Cover Crops Rests Pastures

Olaf Haugen, who produces milk near Canton in southeastern Minnesota, likes to graze his herd on a few acres of annuals, such as grazing corn, to lengthen the late summer rotation. He cuts his permanent pasture grazing acres by ½ during the summer slump when hot, dry weather can send cool season grasses into dormancy. Late season annuals include oats and turnips that he grazes after a killing frost for a few hours a day, supplemented with stored hay. Corn grazed after frost is also a pasture replacement. Seventy percent of Haugen's 180-cow herd's diet comes from grazing. Stored feeds can be twice as expensive as feeds derived from grazing, he says.

(*Graze Magazine*, Aug-Sept 2018, p. 5)

Resources

Grazing Resources

Land Stewardship Project Bridge to Soil Health: Bryan Simon for technical questions on grazing planning and more resources. Shona Snater, Alex Romano, Liana Nichols and Robin Moore for soil health resources. See a list of additional grazing publications:
https://landstewardshipproject.org/lspsoilbuilders

Green Lands Blue Waters Midwest Perennial Forage and Grazing Working Group:
http://greenlandsbluewaters.net/Perennial_Forage/

Graze Magazine: http://www.grazeonline.com/

Pasture Project: Making Sense of the Many Systems of Rotational Grazing:
http://pastureproject.org/pasture-management/rotational-grazing-systems/

Practical Farmers of Iowa:
https://practicalfarmers.org/topic/livestock/

Stockman Grass Farmer: *https://www.stockmangrassfarmer.com/index.php*

Sustainable Farming Association, Kent Solberg and Wayne Monsen: *https://www.sfa-mn.org/soil/*

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- Beef Cow-Calf in MN average per cow 2017-2013 (564 farms)
- Beef Cow-Calf Per Cow 2017 Benchmark Report (113 enterprises)

Crop Enterprise Analysis:

- Pasture on Owned Land 2017-2013 (332 farms)
- Pasture, Intensive on Owned Land 2017-2013 (29 farms)
- Hay-Alfalfa Hay on Owned Land 2017-2013 (1,273 farms)
- Soybeans on Cash Rent 2017-2013 (63,653 farms)
- Corn for Grain on Owned Land 2017-2013 (5,301 farms)

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