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Use of mob grazing to improve calf production, enhance legume establishment, and increase carbon sequestration in Iowa pastures

Abstract: Mob grazing is a variation on rotational grazing that has been proposed to have promise as one of the tactics graziers can use to improve cattle performance and environmental quality. This project looked at whether and how mob grazing could benefit livestock and producer management of their pastures and soil resources.

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$39,578 for year one
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Q Are there advantages to season-long mob grazing in animal performance, pasture botanical and nutritional composition, and/or soil physical properties over other forms of rotational grazing?

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A Results of the project demonstrated that at least over a two-year period, there are no advantages of season-long mob grazing over rotational or strip grazing at an equal forage allowance in animal performance, legume establishment persistence, forage nutritional quality, or soil carbon content and water infiltration that would merit the added labor, fencing and water system costs.

Background

Previous research has shown that rotational grazing will increase animal productivity and legume persistence compared to continuous grazing in cool season pastures. More recently, because of a high degree of defoliation and hoof action resulting from grazing at a high stocking density followed by extended rest periods, mob grazing has been proposed as a method to increase forage productivity, legume establishment, and soil water infiltration and organic matter content in pastures. However, there is little research supporting these claims in the Midwest.

The objective of this project was to identify the most effective grazing system to optimize the performance of grazing cattle, forage mass and quality, legume establishment and the physical quality of soils in Midwestern pastures.

Approach and methods

The team's plan was to compare grazing at a high stocking density using mob grazing, to the effects of grazing at an equal daily forage allowance at lower stocker densities using strip- or rotational grazing. The project involved August-calving cows, and also looked at cattle production, forage mass and botanical composition, and soil physical properties and carbon content. In spring 2010, six 10-acre tall fescue-orchard grass pastures at the Iowa State University Beef Nutrition Farm near Ames were broadcast-seeded with red clover at 8 lb/acre and divided into ten 1-acre paddocks. In 2010 and 2011, ten August-calving Angus cows were placed in each pasture and grazed from May through September by rotational, strip or mob grazing at live forage allowances of 4.0 and 3.2 percent of the cows' body weights, respectively.

Cows in the rotationally stocked pastures were stocked at an initial density of 14,000 lb body weight/acre and moved to a new paddock daily for two rotations. This was followed by movement when 50 percent of the forage was removed in subsequent

rotations. Cows in strip-grazed pastures were stocked at an initial density of 71,000 lb body weight/acre and moved daily to a new strip containing the daily forage allowance with no back fence. Cows in the mob-grazed pastures were stocked at an initial density of 356,000 lb body weight/acre and moved four times per day to a new strip containing one-fourth of the daily forage allowance with a back fence. The average stocking densities of the rotational, strip- and mob-stocked pastures were 14,000, 71,000, and 312,000 lb cow body weight/acre over the grazing seasons.

Results and discussion

In spite of the differences in stocking density, there were no differences among grazing treatments in cow body weight or body condition score, calf birth weight, daily gain or survival to termination of grazing. Calf birth weights and survival declined somewhat across treatments. This was apparently a result of heat stress from high temperatures immediately before and during the calving season and the lack of shade in each pasture for the black Angus cows. Cows in mob-grazed pastures may be even more susceptible to heat stress because of the density of cattle and the maturity of the tall fescue as a result of the long period before the initiation of grazing of some strips. There were no differences in the average forage mass, botanical composition, or crude protein and digestible dry matter concentrations among grazing treatments. However, mean total and live forage masses were lower and the percentage of legumes was greater in 2011 than 2010 across treatments. The lower forage mass in the second year may have resulted from the lower forage allowance in 2011 or from climatic conditions. Precipitation over the grazing seasons ranged from 16.9 inches above normal in 2010 to 4.2 inches below normal in 2011, a situation that may be repeated as climate variability increases.

The long period prior to initiation of grazing of some paddocks followed by short rest periods resulting from slow regrowth from mob-grazed strips seemed detrimental to legume establishment when mob grazing over an entire season. In spite of the differences in stocking density, grazing treatments also did not affect soil bulk density, penetration resistance, water infiltration, or carbon content over the two years of this project. Unlike soil characteristics, legume establishment can be seen a year after a change in grazing management has been made. The researchers have observed that in an on-going project at the McNay Farm. The response seems related to soil seed bank and soil moisture.

Conclusions

Summary: Mob grazing, as shown in the two years of this project, may be used more effectively as a strategic short-term management tool to improve the productivity and botanical composition, soil physical properties, and wildlife habitat of grasslands than as a season-long grazing management system.

- Increasing stocking density and rotation frequency of grazing cows through season-long mob grazing of cool-season, grass-legume pastures does not significantly improve cow or calf performance, forage botanical composition or mass, or soil physical properties over strip or rotational stocking at an equal forage allowance in the first two years of implementation.

- Adequate rest periods between grazing events (rest periods allowing forage regrowth and legume establishment) can be achieved through less frequent and intense stocking systems than mob grazing. This would reduce the costs for labor, fencing, and watering systems associated with mob grazing.
- The long period prior to the grazing of the last strips in a pasture, followed by the slow regrowth after grazing and trampling in the mob-grazed strips may impede forage productivity and legume establishment.
- In a season-long mob-grazing system, the grazier would need to increase the total number of acres in the system or decrease the stocking rate to accommodate long rest periods needed.
- The concentration of animals, maturity of tall fescue and challenges of providing cool water and shade in a mob-grazing system may increase the risk of mid-summer heat stress in cattle.

Because strategic short-term use of mob grazing seems to have potential for improving the composition and ecological services from Midwestern grasslands, studies evaluating this management approach should be continued. There is a need for work to determine the optimal pasture and climatic conditions for use of mob grazing and how mob grazing should be modified if conditions will not enhance pasture plant and soil conditions. While alterations in animal production or botanical composition from pastures can occur over relatively short periods of time, changes in soil physical properties may take much longer. Thus, it would be best to conduct studies for longer than two years.

The black Angus cows and calves in this project appeared to experience mid-summer heat stress. It would be valuable to evaluate management approaches to reduce this risk, particularly in systems which control the distribution of grazing cattle. In the past, some graziers did not provide shade to grazing cattle because it was believed to reduce grazing time, impair grazing uniformity, and cause loss of vegetation and accumulation of manure in shaded areas. However, some studies in the southern United States have shown improved body weight gains in cows and calves grazing in shaded tall fescue pastures. As ambient temperatures continue to increase, there is a need to determine if providing shade to cattle grazing in different stocking systems improves animal performance and pasture characteristics and, if shade has value, what are the most effective approaches for providing shade to cattle under varying conditions.

Impact of results

Season-long mob grazing in this two-year experiment did not improve cow or calf production, forage mass, the proportion of legumes in the live forage mass, or soil physical properties over strip or rotational grazing over two years. While this project was conducted under conditions of excess rainfall (year 1) followed by deficient precipitation (year 2), these kinds of extreme conditions are forecast to be more common in an increasing variable climate. Results indicate that the economic return on the investments in labor, fence and watering systems would improve if producers implemented a less intensive system. Possibilities are strip or rotational grazing, particularly under conditions with high soil moisture on highly fertile soils.

However, these results don't mean that mob-grazing has no role in Iowa pasture management. On the contrary, short-term strategic use of mob grazing to achieve specific goals such as increased plant species diversity or organic matter, or improved wildlife habitat in grasslands seems to be effective. Thus, a producer may mob graze a portion of a pasture or grassland in the spring to improve the botanical composition or sward structure and either graze the remainder of the pasture or leave the remainder of the grassland ungrazed for bird habitat for the rest of the growing season. The most appropriate uses will depend on the specific goal for utilizing mob grazing and the existing soil and climatic conditions.

Education and outreach

Publications stemming from this project included a refereed journal article in preparation for *Rangeland Ecology Management*, two abstracts in forage and animal science publications, and two Extension publications (ISU Animal Industry Reports for 2011 and 2012). Members of the team gave presentations on the project work at the ISU Beef Nutrition Field Day in May 2011, the Land O' Lakes beef feed sales staff workshop in June 2012, the ISU McNay Research Farm Field Day in September 2012 and the University of Kentucky Grazing Management seminar.

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No additional external funds were leveraged by this grant.

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