Determination of early summer pasture conditions to optimize forage and calf productivity and profitability

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Determination of early summer pasture conditions to optimize forage and calf productivity and profitability

Abstract
Forages can be valuable elements in a sustainable production system. The date when animals are first allowed to graze on pastures can impact the quality and amount of forages available. This study explored various factors that influence successful grazing.

Keywords
Animal Science, Agronomy, Animal management and forage, Farmer profitability, enterprise budgets

Disciplines
Agricultural Science | Agriculture | Agronomy and Crop Sciences | Animal Sciences

Lead Investigators

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Abstract: Forages can be valuable elements in a sustainable production system. The date when animals are first allowed to graze on pastures can impact the quality and amount of forages available. This study explored various factors that influence successful grazing.

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$35,093 for year one
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$21,240 for year three

Background

Forage crops help prevent erosion and require minimal inputs of pesticide and fertilizer, making them good choices for use in agricultural production systems. However, they also must display sufficient economic returns to compete with row crops. Previous research has shown that improved grazing management practices such as rotational stocking will significantly improve productivity and profitability of forage-based livestock production systems.

The recommendations for the pasture soil and forage conditions needed to initiate grazing have been developed in countries such as England and New Zealand, which have warmer, more temperate climates. Pasture conditions needed to enhance forage and animal productivity in the midwestern United States have not been identified.

Objectives of the project were to:

1. Measure the effects of environmental and soil properties, forage height, density, maturity, and stocking rate of summer pastures at the initiation of spring grazing on total forage yield, calf production, and cow reproduction throughout the summer;
2. Determine the environmental, soil, and forage conditions needed at the initiation of grazing of summer pastures to optimize the profitability of cow-calf production; and
3. Demonstrate the use of record programs to identify weaknesses in management of cow-calf enterprises to individual producers.

Approach and methods

Fifteen Iowa beef cow-calf producers (on locations from Williams to Clarinda) were selected to participate in the project. Producers were chosen based on their locality, level of management, historical date of grazing initiation, and desire to be part of the study. In 1997 and 1998, all producers kept records of production and economic data from their beef cow enterprises using the Integrated Resource Management-Standardized Performance Analysis (IRM-SPA) records program. All considerations in the grazing program were left to the producers, so that the project measured the effects of their management decisions.

At the start of grazing on each farm in 1997 and 1998, these factors were determined:
- date,
- degree days,
- cumulative precipitation,
- soil moisture,
- phosphorus,
potassium concentrations, pH, temperature, load-bearing capacity, forage mass, sward height, morphology, and dry matter concentration.

Over the grazing season, monthly measures for these items were taken outside and inside grazing enclosures: forage production, measured by cumulative mass and sward height, and forage in vitro digestible dry matter concentration and crude protein (CP) concentration. Regression analyses were used to determine the relationship of seasonal forage production and composition to initial and seasonal pasture characteristics.

Results and discussion

Cool season grasses were the primary species found in pastures on farms involved in this project comprising 76 percent of the live forage in 1996, with legumes (8.3 percent) and weeds (15.3 percent) far behind. The average number of paddocks was 4.1 per farm, reflecting a low intensity rotational stocking system. The average dates of grazing initiation were May 5 in 1997 and April 29 in 1998. Even though most producers initially claimed that they started grazing at an early date, the results from these two years showed a relatively late grazing start. Because the average soil moisture (23 percent) was relatively low both years, it seems that most producers waited until pastures were less muddy to begin grazing.

However, date, degree days, soil temperature and morphology index at grazing initiation were negatively related to seasonal forage production (measured as mass or sward height in 1997). The relationships imply that producers started grazing so late that forage production was adversely affected. Moreover, the concentrations of digestible dry matter at the initiation of and during the grazing season and the concentrations of crude protein during the grazing period were lower than desired for optimal animal performance. Delaying the start of grazing until pasture soils are dry limits the quality and quantity of pasture forage available.

In 1997, forage production and digestibility were positively related to the soil phosphorus concentration. Soil potassium concentration was related positively to forage digestibility in 1997 and forage production and crude protein concentration in 1998. Increasing the number of paddocks increased forage production, measured as sward height in 1997 and forage digestible dry matter concentration in 1998. Positive relationships existed between forage production or quality with pasture management variables other than grazing initiation. Increasing yields or the concentrations of digestible dry matter or crude protein of pasture forage reduced the costs of purchased feed per cow in this study.

Conclusions

Although some studies have shown that beginning grazing too early reduces seasonal forage production due to soil compaction and forage damage, seasonal forage production was not affected or decreased with the earlier date of grazing initiation chosen by farmers in this study. Unfortunately, one of the limitations of on-farm research is that there are no negative controls, that is an intentional treatment to test the effects of starting grazing under adverse environmental conditions. The difference in the results of this study and previous literature may have been caused by the differences in the environmental and soil conditions in the various locations.
Instead of she wing any adverse effects of early initiation of grazing, results of the present study showed that earlier grazing increased forage production in 1998 and increased mean forage crude protein concentrations in both years. The low mean IVDMD (in vitro dry matter disappearance) and crude protein concentrations of pasture forages in this experiment imply that while producers may limit the downside of grazing in muddy pastures by delaying the process, waiting too long may harm forage production and quality. Such low forage productivity and quality is associated with the high morphological index of the forage and likely limits productivity of the animals.

The significant relationships between forage productivity or composition with pasture management variables suggest that different management practices do impact forage production and quality. Increasing soil phosphorus and potassium may have positive effects on forage growth. Increasing the number of paddocks helped improve forages in 1997 and 1998, which may indicate that more intensively managed grazing offers advantages.

Impact of results

Forages are key to creating economically and environmentally sound agricultural production systems. However, results of this study suggest that producers delay initiation of grazing in the spring until soil moisture concentration decreases below 23 percent, and thus is moderately dry. Drier soil conditions help limit hoof damage to soil and plants. Unfortunately, by delaying initiation of grazing until soils are less muddy, forages are allowed to become excessively mature. The increased maturity of forages reduces forage productivity, digestibility, and protein concentration. In fact, digestibility and crude protein concentration of mid-season forage may be low enough to adversely affect animal growth and reproductive performance.

In order to maximize forage productivity and nutritional value, these results imply that producers should either initiate grazing at an earlier date or utilize management practices such as hay harvest to control excessive early season growth. Starting grazing 10 days earlier will increase seasonal forage production by 6 percent and increase forage protein concentration by 4 percent. Additional improvements in fertility and stocking management also will increase forage production and quality.

Education and outreach

Results were reported at the 1998 Animal Production Systems and Environment Conference in Des Moines, in the *Journal of Animal Science*, and in the 1999 Beef Research Report published by ISU Extension. The investigators plan to present a summary at the 2001 Management Intensive Grazing Conference.