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Boosting pasture production

Stephen K. Barnhart, Professor, Agronomy, Iowa State University

The majority of the 'pasture questions' that I receive as Extension Forage Specialist deal with the various aspects of pasture improvement, renovation, and establishing new pasture areas. A few of these kinds of questions are now coming from otherwise good pasture managers as well, who are planting more corn and soybeans and are looking for ways to maintain or increase the productivity of the remaining pasture acres. Some of the most practical ways to boost pasture production are fertilization, overseeding, and improved grazing management.

Pasture fertilization

Fertilizing pasture is often not a high priority for livestock producers. However, pasture fertilization may be one of the easiest and most economical solutions.

Do pastures respond to fertilizer and lime nutrients? Yes, particularly to nitrogen.

Grass-based pastures generally respond very efficiently to the first 40-50 lbs/A of nitrogen. Bluegrass will continue to respond to N applications up to 150 to 180 lbs/A annually, but at a decreasing rate of response. Tall cool-season grasses (bromegrass, orchardgrass, tall fescue) respond to N levels of 250 to over 300 lbs/A, but at a decreasing rate of response. N recommendations for grass-based pastures are greater than the minimal amounts, but are still modest, yet efficient, rates:

Table 1. Nitrogen recommendations for grass-based pastures.

Kentucky bluegrass	Early spring	60-80 lbs N/A
	Late spring (Optional)	additional 30-40 lbs N/A
	Late Summer (Optional)	additional 30-40 lbs N/A
Tall, Cool-Season Grasses	Early spring	80-120 lbs N/A
	Late spring (Optional)	additional 40-60 lbs N/A
	Late Summer (Optional)	additional 40-60 lbs N/A
Legume-Grass Mixed Pastures	If less than 1/3 legume	treat as a grass pasture
	If more than 1/3 legume	no nitrogen is recommended

Note for legume-grass mixed pastures

High or frequent applications of nitrogen (particularly spring nitrogen applications) will make the grass component of pastures more competitive and limit the amount of legumes in the mixture. To encourage a greater legume presence, use modest N rates and limit application to summer or fall and maintain optimum soil pH, P and K levels. Also; improve grazing management, and consider regular oversowing of legumes (by interseeding or frostseeding).

Yield responses to phosphorus (P) and potassium (K) are neither dramatic nor consistent. Forage plants will respond to added phosphorus (P) and potassium (K) when applied to soils with 'low' or 'very low' soil P and K test levels. Some yield response can be achieved by fertilizing to raise soil P and K test index from 'Low' or 'Very Low' to at least the 'Optimum' index. Grass responds

to nitrogen more efficiently when P & K levels are adequate. On long term pastures, there will be some concentration of fertility in the upper few inches of the plant root zone, but pasture plants draw nutrients from more than the upper few inches. Phosphorus and K recommendations from the ISU Soil Testing Lab for pasture are based on yield response research using 6-inch soil calibration samples.

Do pastures need regular lime applications? Legumes are more responsive to moderate to high levels of pH than are grasses. Soil testing will help guide liming decisions. For grass-based pastures, try to maintain pH of 6.0 to 6.5. To encourage and maintain legumes, try to maintain a pH of 6.5-7.0. Lime recommendations from the ISU Soil Testing Lab for pasture take into account the slow downward neutralizing rate of surface applied liming materials, and can give liming recommendations for soil samples taken at a 2- to 3-inch depth for existing pasture. Soil sampling depths of 6- to 8-inch are recommended where liming materials are to be incorporated with tillage in a more complete renovation effort.

Frostseeding and interseeding

Frostseeding and interseeding, sometimes called oversowing, are seeding methods used to add more productive or higher quality forages into an existing sod. Their contribution to stand productivity is much slower than that achieved from nitrogen fertilizer, so expect a gradual production increase. Frostseeding is typically done in February and early March in Iowa. Interseeding is done with a no-till drill and can be done in the spring (March and April) or in late summer (August to very early September) if soil moisture conditions are suitable. Both grasses and legumes can be added to existing pasture sods, but the success of these efforts are generally better when done on a thin or less competitive sod and when follow-up clipping and grazing management are directed at reducing competition from weeds and existing pasture species. When done successfully, added legumes can contribute to the nitrogen needs of the site, and lead to similar yield increases that would be seen from moderate nitrogen fertilizer rates. ISU Extension publications on frostseeding and interseeding provide more details on these improvement methods. [<http://www.extension.iastate.edu/Publications/PM856.pdf>
<http://www.extension.iastate.edu/Publications/PM1097.pdf>]

A word of caution! The benefits of frostseeding or interseeding may be short-lived, unless grazing management is used to allow for 'rest' and expression of the yield potential of the new pasture components. Continuous stocking at high stocking rates will erase any seeding gains within a few years.

New pastures and complete renovation of existing pastures

Wholesale changes in pasture composition or planning for a new or first-time pasture provides both an opportunity (to create the pasture composition that you want) and some risks (low forage production during establishment, an elevated risk of soil erosion and, the risk of damaging the new stand before seedlings become well established). A few ISU Extension publications may be useful when planning for a new pasture or for a major renovation. For information about selecting species (traits, competitiveness of seedlings and other concerns etc) see ISU Bulletin Selecting Forage Species [<http://www.extension.iastate.edu/Publications/PM1792.pdf>]. The bulletin titled

Guide to Year-Round Forage Supply [<http://www.extension.iastate.edu/Publications/PM1771.pdf>] provides an overview of the seasonal productivity of several common forage types; and a 'pencil and paper' worksheet system that may help to identify the kinds of changes that you might need to make to 'fill out the summer forage balance'. If you are planning a new or completely renovated pasture, the bulletin titled Establishing and Maintaining a Legume-Grass Pasture [<http://www.extension.iastate.edu/Publications/PM1008.pdf>] provides details on some important steps to follow.

Improved grazing management

Better management of the pastures that you have can lead to some very practical gains in forage and livestock productivity on the same site. For forage plants to express their yield potential, some level of rotation grazing or the use of appropriate stocking rates on continuously stocked pastures should be practiced that will provide for 'rest' and recovery of the plants following grazing. Division of an existing pasture into 3 to 5 smaller paddocks and thoughtful rotation and 'rest' can lead to productivity increases in the range of 10 to 15%. Division and management of 6 to 10 paddocks can often lead to an additional 5 to 10%. Some of this increase from rotational stocking will be evident within a few months, but will realistically take 2 to 3 years to reach its full benefits. The specific recommendations needed to implement these kinds of management changes are beyond the scope of this article. A more detailed, multi-chapter ISU publication on these topics, titled Pasture Management Guide, is available from ISU Extension Offices and publications outlets.

Summary

For livestock producers looking for ways to maintain or increase the productivity of limited pasture acres, there are several practical strategies. Nitrogen fertilizer will give the most immediate increases, but requires some common sense about rates and timing. Productivity and quality gains can be attained by introducing some new forage species into the existing sod, but the benefits will come more slowly and can be easily erased by improper or abusive follow-up grazing management. Longer term benefits often come with improved grazing management. Changing grazing management may require some added cost and learning some new skills, but is often quite positive. A combination of these pasture management practices often leads to faster and more sustained pasture production improvement.