

Nutrient Management Opportunities for Crops and Forages— Fall 2003



Fall Fertilization with Phosphorus and Potassium—Boost Forage Yields and Improve Stands

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FALL FERTILIZATION should be an important part of this year's crop management. By getting phosphorus (P) and potassium (K) applied this fall, you leave more time to take care of essential operations when planting season approaches. Plus, you keep forages in top shape to maximize yield. There are many good reasons to fertilize forages with P and K in the fall.

Since forages typically have an extensive root system, they can effectively use water and nutrients in the soil when they are present. However, harvesting large amounts of forage can deplete the nutrients from the soil more quickly than other crops. Virtually all of the top growth of forage is removed from the field, along with large amounts of nutrients. Since forage harvest leaves almost no crop residue in the field, there is little nutrient recycling that occurs. This situation is different from many annual crops where much of the vegetation remains in the field after harvest.

Table 1 gives examples of nutrient removal in various perennial forages. As an example, an alfalfa crop of 8 t/A annually removes 120 lb P_2O_5 /A and 480 lb K_2O /A. If nutrients are not replaced at a rate that keeps up with crop harvest, the soil fertility will decline over time and productivity will drop. Fall is an excellent time to replace these nutrients wherever soil tests indicate a need.

Table 1. Estimated nutrient removal by perennial forages.

	-- lb/A removed, dry matter basis --				
	N	P_2O_5	K_2O	Mg	S
Alfalfa ¹	56	15	60	5	5
Bermudagrass	46	12	50	3	6
Bromegrass	36	13	59	4	4
Clover ¹ /grass	50	15	60	5	5
Fescue	38	18	52	4	4
Orchardgrass	50	17	62	4	4
Timothy	38	14	62	3	4

¹Legumes obtain most of their N from the atmosphere.

Surveys of soil test results continually demonstrate that nutrient depletion is a common problem limiting crop growth in many areas of the country. Forages in particular are frequently neglected and not managed as intensively as some other crops. This oversight can result in large reduction in yields and quality. Crop stands can also be negatively impacted, reducing the lifespan of the forage crop.

Root health and vigor are essential for stand longevity. It is not surprising that P and K play important roles in maintaining vigorous forage stands when their metabolic role in the plant is considered.



Fertilization replaces the nutrients removed in forage harvest. Each ton of alfalfa removes 60 lb of K_2O and 15 lb of P_2O_5 .

Potassium: Potassium demand by high-yielding forages is quite large. The response to added K has become increasingly apparent in many areas—especially where high yields have been harvested for multiple years.

- An adequate K supply is essential in plants for proper enzyme function, photosynthesis, and nitrogen (N) fixation.
- Plants growing with adequate K have repeatedly been shown to have greater resistance to disease and pests.
- Water-related stress is frequently observed when K is lacking.
- Forage grasses have a high K requirement because of their high yields and their relatively high K concentrations.

Phosphorus: Soils that are medium or low in P frequently have slow growth, resulting from a stunted root system that cannot supply adequate water and nutrients to the growing plant. Phosphorus promotes energy transport, enhances photosynthesis, and allows vigorous growth to occur. Additionally, numerous studies have demonstrated the essential role of P in optimum N fixation.

Balanced fertilization of perennial forages makes an excellent long-term investment. Some of the documented benefits include:

- Stand decline is reduced due to winter injury and weed competition.
- Disease problems are minimized from nutrient shortage or imbalance.
- Enhanced stress tolerance resulting from temperature extremes, frequent harvests, or injury by pests or diseases.
- Prevention of early decline in both forage yield and quality.

A plan for nutrient management should be a key part of forage production—with a view towards high yields over an extended number of years. While pre-plant nutrient applications are critical for stand establishment and to maintain the early production, these initial applications frequently do not meet the constant nutrient demand over the lifetime of the stand. Remember that in each harvest, large amounts of nutrients are removed from the field (**Table 1**).

Fall application of P and K to forage makes good sense!

- Root vigor is boosted from fall fertilization before winter dormancy occurs.
- Cool-season forages enter their prime production season without nutrient limitations.
- The weather is often drier and more favorable in the fall for field operations compared with spring weather.
- Since P and K are relatively immobile nutrients, there is little concern with winter leaching losses prior to spring growth in all but the sandiest soils.
- The total annual nutrient requirement can be applied at this time or a portion of the annual rate can be added if heavy application rates are needed.

High yields of forages do not happen by accident...they require careful attention to avoid nutrient deficiency and protect your investment in a healthy plant stand. This process begins by considering the removal of nutrients in the crop and replacement of sufficient nutrients to maintain high soil fertility levels. **Fall is a great time to get it done.** ■

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