FERTILIZING PASTURES FOR PROFIT

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It has been known for centuries that providing certain nutrients to plants is critical for high productivity. The nutrient source and manner in which it is applied may vary, but the desired outcome is the same: high crop yield and quality. Fertilization is the most practical means that producers have to ensure that crops receive the nutrients they need. While increasing fertilizer application and managing pH by liming can lead to increase forage production, your investment should be measured against the potential return. Also, over application of nutrients can potentially cause environmental problems.

The missing link in forage production is often soil fertility management because enough attention is not paid to soil testing, tissue testing, and fertilizer and/or manure application. Since the growth and productivity of plants are directly linked to soil fertility every effort should be made to provide the necessary nutrients for plants. The equation is a simple one: **Feed the forages so they can feed the livestock!** To determine the fertility needs of pasture or hayfield soil testing is required. Even so, only approximately 21% of the forage land in the South is soil tested and of that amount over half (52%) had a pH below 6.0, and nearly half (46%) of the land was low in phosphorus and potassium (Ball et. al., 2002). This means we still have a lot of producers fertilizing forages without the benefit of a soil test. They may be wasting their money and valuable fertilizer in the process.

Unfortunately, producers are more likely to apply fertilizer to hayfields and not to pastures. This is often because they do not see the immediate economic impact of a pasture in the same way they would see money received for selling hay. Pasture is just as valuable though. Its economic impact is seen in the pounds of meat of milk produced by grazing animals.

To show that we really need to replenish the soil by applying fertilizer, one only needs to look at the numbers in Table 1 that indicate the amount of various nutrients removed from the soil when certain forages are harvested as hay.

Table 1. Approximate pounds of nutrients removed by various forage crops at specified yield levels when harvested as hay.					
	Species and assumed hay yield, tons/A				
	Alfalfa 5	Tall Fescue 3.5	Sorghum-sudangrass 4	Orchardgrass 3	Bermudagrass 6
	Amount of nutrient removed (Lb/A)				
Nitrogen	280	135	160	150	258
Phosphorus	75	65	61	50	60
Potash	300	185	233	185	288

Adapted from Ball et al. Southern Forages, 3rd Ed.

The availability of nutrients in the soil is affected by the soil pH. Therefore it is important to make sure that we do soil tests to determine if we need to adjust the pH of our pastures and hayfields. The amount of lime that may need to be applied will vary depending on your soil test, but Table 2 provides some general suggestions.

Table 2. Generalized lime recommendation for cool-season grasses.	
Soil pH	Tons of Ag Lime/A
Above 6.4	0
5.8 - 6.4	0 - 2
5.2 - 5.8	2 - 4
Below 5.8	4

AGR-103 Fertilization of cool-season grasses. Issued: 11-82. K.L. Wells, L.W. Murdock and C.T. Dougherty.

Fertilizer options for forage crops:

There are several options you can choose from for a source of nutrients for your forage crops. The two main sources of nutrients are: inorganic fertilizer and organic fertilizers (manures, crops residue, compost etc.). As the price of inorganic fertilizer and broiler production increases, the use of organic fertilizers (especially swine or cattle manure and chicken litter) has increase dramatically.

When a producer decides to use inorganic fertilizer, the nutrient content of the fertilizer they apply is known and application rates may be adjusted accordingly. This same principle should be followed for organic fertilizers; they need to be analyzed to determine their nutrient content. The nutrient content of the manures will vary widely and it is recommended that you sample and analyze manures before making application rate decisions. Over-applying manures (or any fertilizer) can lead to pollution as well as plant and animal health problems. For more information on manure sampling and testing, and the potential use of broiler litter as a nutrient source see Extension Publications ID-123 and AGR-168.

The importance of taking soil samples and determining the soil nutrient status **BEFORE** applying fertilizer cannot be overstated. If your soil test report indicated that your field is high in potash or phosphorus, it would not make good economic sense to apply a fertilizer with those nutrients. Many fertilizer suppliers are able to custom blend fertilizers to meet your need.

In research conducted at Western Kentucky University Agricultural Research and Education Complex and other locations, it has become evident that producers may be able to apply smaller amounts of poultry litter and supplement with inorganic nitrogen to produce forage of comparable yield and quality (and lower cost) to that produced with inorganic fertilizer or very high rates of poultry (Litter at the N rate). An additional benefit to applying less poultry is the reduction of the rate of buildup of soil nutrients such as copper, zinc, and phosphorus. Tables 3 and 4 show the nutrient content of an alfalfa-orchardgrass and a sorghum-sudangrass hayfield fertilized with litter or inorganic fertilizer in various combinations (Sleugh et al. 2002).

Table 3. Crude protein, nutrient concentration and yield of sudangrass fertilized with poultry litter and/or inorganic fertilizer.

Treatment	Crude protein	P	Cu	Zn	Fe	Yield
	------% Dry matter-------		----------PPM----------			T/acre
Litter at N rate (N)	11.15b[a]	.41a	14.75a	55.33a	101.83a	1.66ab[b]
Inorganic fert. (I)	12.10a	.32c	14.91a	55.16a	107.08a	1.77a
Litter at P rate + supplemental N (NP)	11.34b	.37b	14.75a	53.91a	101.42a	1.25b
Litter at P rate	9.00c	.40ab	13.83a	39.08b	124.42a	.73c

[a]Means in each column followed by the same letter are not significantly different at the 5% level.

[b]Average yield at each of the 3 harvests in 2001.

Table 4. Crude protein, nutrient concentration and yield of orchardgrass fertilized with poultry litter and/or inorganic fertilizer.

Treatment	Crude protein	P	Cu	Zn	Fe	Yield
	------% Dry matter------		----------PPM----------			T/acre
Litter at N rate (N)	18.47a[a]	.53a	15.53a	35.61a	174.94ab	1.48a[b]
Inorganic fert. (I)	18.58a	.50a	12.56b	31.82b	168.38ab	1.26ab
Litter at P rate + supplemental N (NP)	19.17a	.47b	14.88a	33.52ab	223.69a	1.28ab
Litter at P rate	17.6a	.49ab	15.4a	31.91b	153.81b	1.05b

[a]Means in each column followed by the same letter are not significantly different at the 5% level.

[b]Average yield at each of the 4 harvests in 2001.

The soil test information from these plots indicate a buildup of soil phosphorus, copper and zinc in the plots that received high amounts of litter (litter at the N rate)

Most producers are very aware of the importance of nitrogen fertility in their fields. Some overlook the importance of P, K, and the other nutrients. It is just as important to provide enough magnesium as it is to provide enough nitrogen or else the nutrient you do apply will not have maximum effect. Phosphorus and potassium are particularly important because they improve root development and winter survival, respectively.

Table 5. Dry matter yields of fescue-clover vs. fescue-nitrogen, Lexington, KY, 1978, 2 year average.	
Treatment	Yields, lb/A
Fescue-Red clover (6 lb seed/A)	11,100
Fescue + Nitrogen	
0 lb/A	3,900
90 lb/A	6,700
180 lb/A	9,900

Taylor, T.H., et al. University of Kentucky

In Kentucky (Table 5), research has shown that a tall fescue-red clover stand (6 lb/acre red clover) can produced yields greater than tall fescue grown alone and fertilized with up to 180 lb/N/acre. Using the data from Table 5, if you planted 6 seed lb/A at a cost of $2.00/lb you would have spent $12 for seed. Even with the cost planting the seed included it would still be more cost effective and provide more of a return than applying the lowest amount of nitrogen (90 lb/A) even if nitrogen is $0.31/lb. This information shows that management decisions such as inclusion of forage legumes in grass pastures and hayfields can help lower the cost of fertilizer over the long run.

Overall, it is important to know the nutrient requirement of your forage crop, know the nutrients available from the soil (soil test) and supply that nutrient in the appropriate manner from inorganic or organic sources. Making the right fertilizer decisions can improve your forage yield and nutrient content and thus the performance of your livestock.