# Management Approaches to Control Fertilizer Cost

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At current prices, fertilizer costs constitute up to 85% of the total variable costs in the production of pasture, up to 75% of the variable costs in hay production, and over 65% of the variable costs in silage production. It is entirely logical to look for ways to reduce fertilizer costs in the production of forage. However, if the reduction in fertilizer costs results in reduced yield (i.e., less fertilizer often equals lower yields), then the cost of the forage per ton (or pound) can actually go up! The reason for this can be seen in the following equation that is used to calculate the unit cost of forage production:

$$\text{Cost of Forage (\$/ton)} = \frac{\text{Total Cost (\$/Acre)}}{\text{Forage Yield (tons/Acre)}}$$

Consider Table 1. Let's assume in this example that the field we are dealing with has a yield potential of 6 tons/acre for hybrid bermudagrass hay. Based on current prices, the average cost of production for hybrid bermudagrass hayfields is approximately $750/acre (or $125/ton). If production costs are reduced and yields essentially remain the same, the unit cost ($/ton) decreases (green cells). However, it is likely that substantial reductions in costs in forage production will come from fertilizer expenditures (because fertilization constitutes such a big part of the total variable costs). Indiscriminant reductions in fertilizer use will likely lead to reductions in yield. This may very well result in an increase in the unit cost ($/ton) of the forage (red cells). **Thus, it is critical to remember that cutting costs in forage production should be done in a way that has a minimal impact on the forage yield.**

**Table 1.** The unit cost of forage produced under different levels of cost (relative to the current average for hybrid bermudagrass hay) at different levels of forage yield.

| | Cost of Production Compared to Average | | | | | |
|---|---|---|---|---|---|---|
| Yield | 60% | 75% | 90% | 100% | 110% | 125% |
| (tons/ac) | ------------- Unit Cost of the Forage ($/ton) ------------- | | | | | |
| 8 | $56 | $71 | $85 | $94 | $103 | $118 |
| 7 | $64 | $80 | $96 | $107 | $118 | $134 |
| 6 | $75 | $94 | $113 | $125* | $138 | $156 |
| 5 | $90 | $113 | $135 | $150 | $165 | $188 |
| 4 | $113 | $141 | $169 | $188 | $207 | $235 |
| 3 | $150 | $188 | $225 | $250 | $275 | $313 |

* The average cost of production for a hybrid bermudagrass hayfield is approximately $750/acre. If the yield goal is 6 tons/acre, the unit cost of the forage is $125/ton.

### *Management Tips*

So, how does one reduce forage production expenses without compromising yield? The following tips can help reduce fertilizer expenses or at least make the investment in fertilizer more efficient.

1. **Soil Test and Follow Fertility Recommendations.** If one does not soil sample and apply fertilizer and/or lime based on the results of those tests, it is likely that they are either 1) not putting on enough fertilizer/lime and therefore the forage yield is below its potential, or 2) putting on more fertilizer than is required to meet your yield goals and therefore you are wasting money. Few other practices in the forage enterprise can improve the profitability of the cattle operation more than soil testing and following UGA fertility recommendations.

2. **Do NOT Cut Back on Lime.** Keeping an optimum soil pH will ensure that soil tilth is maintained, root development is encouraged, and (most importantly) the nutrients in the soil are freely available to the plants. If the soil pH drifts much below 6.0, the availability of some nutrients in the soil will decrease and, in some cases, other nutrients can reach toxic levels. The availability of nitrogen (N), phosphorus (P), and potassium (K) is severely reduced as the soil pH declines (Figure 1). This can translate to a major waste of one's "fertilizer dollar." For example, a pH difference of 5.6 vs. 6.2 can (in one growing season) effectively reduce the value of the N, P, and K fertilizer that is applied by as much or more than the value of the lime that is applied (Table 2). Of course, lime applications should rectify soil pH problems for several years.

3. **Focus Your Resources.** Apply fertilizer to pastures or fields where soil test P and K values indicate an economic response to the addition of the fertilizer AND the soil pH is in the optimum range. If the soil pH is inadequate, attempts to raise P and K levels in soils that have a low soil pH will result in a lack of return on the fertilizer investment. Instead focus on raising the soil pH value in those fields.

**Table 2.** The decrease in the relative availability of N, P, and K fertility can dramatically reduce nutrient use efficiency. In this case, the annual value in the decrease in fertilizer efficiency is compared between a soil pH of 5.6 and 6.2. This uses a moderate to low amount of fertilizer.

| Nutrient | Amt. Used Annually | Unit Price | Dec. in Efficiency | Value of Decrease |
|---|---|---|---|---|
| | *(lbs/acre)* | *($/lb)* | | *($/acre)* |
| N | 200 | $0.60 | 35% | -$42 |
| $P_2O_5$ | 50 | $0.30 | 50% | -$ 8 |
| $K_2O$ | 150 | $0.67 | 10% | -$10 |
| | | | Total | -$60 |

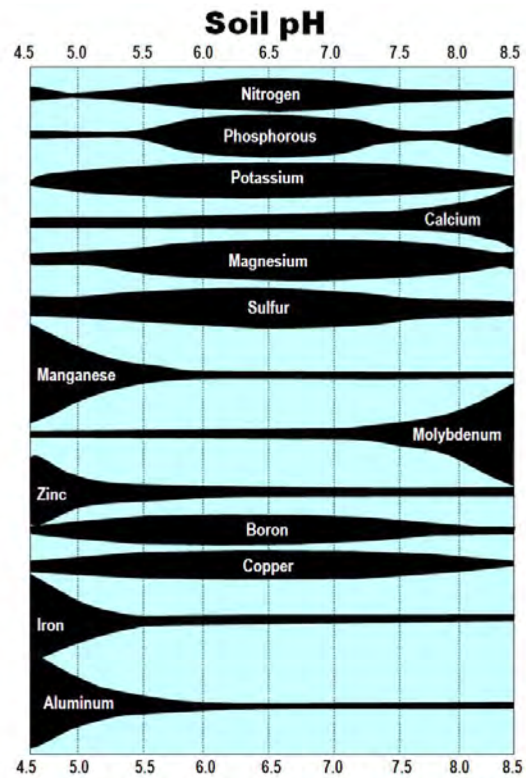


**Figure 1.** The relation between soil pH and the relative availability of plant nutrients in mineral soils. The wider the bar, the greater the availability.

**Table 3.** A comparison of three common strategies for fertilizing hybrid bermudagrass hayfields.*

| Fertilizer Strategy | Product Used | Amount | Product Price |
|---|---|---|---|
| | | (lbs/ac) | ($/ac) |
| Standard Blend | 17-17-17 | 1471 | $367.65 |
| | | Total: | $367.65 |
| Mixed Fertilizer | Urea (46-0-0) | 488 | $85.43 |
| | DAP (18-46-0) | 141 | $28.26 |
| | Potash (0-0-60) | 375 | $150.00 |
| | | Total: | $263.69 |
| Animal Manures | 3-3-2 | 8000 | $120.00 |
| | Potash (0-0-60) | 110 | $44.00 |
| | | Total: | $164.00 |

* Based on a target fertilizer rate of 250-65-225 (i.e., assumes medium soil test level P & K).

4. **Avoid the Use of Standardized Blends.** Standardized blends (e.g., 10-10-10, 17-17-17, etc.) of homogenized (uniform particle size) fertilizer products are commonly sold. Unfortunately, these blends are usually more expensive than custom mixed fertilizer products that have been tailored to the needs of the producer (Table 3). Using current prices, one can see that the use of a custom mixed fertilizer can save over $100/acre as compared to a standardized blend when fertilizing a bermudagrass hay field.

5. **Use Animal Manures When Available, but be Strategic.** Continuing the scenario that is posited in Table 3, note that the use of animal manure (and supplementing to provide enough K) can reduce fertilizer costs by almost another $100/acre. Certainly, animal manure can be a cost-effective and beneficial fertilizer source. After many years of manure applications, however, nutrients can accumulate to very high levels in these soils. Note from Table 3 that if soil test P and K levels are sufficient and only N is needed, then the total cost of fertilization would be $85.43/acre (i.e., the cost of urea fertilizer, in this instance). If the animal manure is produced on the farm, the recommended strategy would be to sell the manure and purchase N fertilizer.

6. **Split Your Nitrogen Applications.** Fertilizer recommendations are given as totals for the season. For some nutrients, the entire amount can be applied with little economic or environmental risk. However, high rates of N application at the beginning of the growing season can result in unnecessary risk. This can be especially risky when conditions for leaching, volatilization, late frosts, or drought occur. Split applications of N also reduce the risk of nitrate toxicity. Further, long-term research has shown that yields can be increased by 5-10% and N use efficiency can be as much as 25-30% higher when N fertilizer applications are evenly split among 3-4 applications (or more) during the season.

7. **Maintain Good Potassium Levels.** When K is deficient, bermudagrass stand decline is inevitable. Symptoms of stand decline is poor stress tolerance, increased incidence of leafspot diseases, poor vigor, poor winter hardiness, and the death of large, irregularly-shaped patches. When K is readily available, bermudagrass stands are more vigorous, more dense, and high yielding.