

FOR IMMEDIATE RELEASE

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Costs of Nutrients in Hay

Hay is actually pretty cheap, but often the full cost of hay goes unrealized. Much of the value in hay remains in unaccounted soil nutrients that are removed from hay fields and are redistributed in over-wintering pastures or concentrated in lots. This becomes even more relevant during times of higher fertilizer prices. Seems like the wrap, fuel, and a little for labor and equipment are included in the cost, but the lost nutrients aren't factored in. This is easily seen in the red hay fields of broomsedge (also called poverty grass), which grows in acidic soils with low levels of phosphorus and potassium. It's not that broomsedge grows best in these soils; it's that the other grasses have such a low production that the broomsedge can outcompete. It often leads one to wonder: when these hayed fields are rented, purchased, or managed, is the someday cost of fertilizer fully realized?

Soil Nutrient Removal

Hay, of any type, is a nutrient intensive crop. Wendie Powell, Livestock Agent for K-State Extension Wildcat District, says, "When we look at fescue, Bermudagrass, or other non-native grasses, we can see a direct response of hay yield in comparison to the nitrogen application. But only applying nitrogen is not going to give you much if other nutrients in the soil are not present." Giving the importance of having a balance of all soil nutrients and pH, Wendie states, "A plant can only grow to the height of its most limited nutrient. If the soil phosphorus level dictates that a plant can only grow 6 inches, no amount of nitrogen is going to change its mind." Common hay crops of fescue, bermuda, alfalfa, and native have similar phosphorus (P) removal between 10 to 15 lbs P per dry ton, with 12 lbs P per dry ton being a frequently used average. Native grass tends to do well with lower phosphorus levels due to an expansive root system, but removal factors are fairly consistent across hay types and levels of production. Potassium levels, however, can vary. Average potassium (K) uptake for fescue and Bermuda is around 40 lbs K per dry ton, and 50 lbs K per dry ton for alfalfa. When hay yields are 4 tons or more, potassium removal is in the hundreds of pounds. Also, while phosphorus is only taken up on an "as needed" basis, potassium can be "luxury consumed" in quantities greater than plant needs.

Finding the nitrogen value in hay is less straightforward because not only is the quantity of nitrogen (N) changed based upon fertilization, but also because nitrogen can't be "stored" in the soil from season to season. The quantity of nitrogen can be estimated by crude protein percentage, which is both "true" protein and other nitrogen compounds combined. Calculated, there are 3.2 lbs of N for each 1% of crude protein in a dry ton of hay. Of course, this doesn't

account for nitrogen losses in the field. To account for this, we can use a simple approximation that in a fertilized field, it takes 50 lbs of N for each additional ton of hay.

Notice in Table 1 that unfertilized native bales can have up to \$10 of P and K, while a fertilized fescue bale in Table 2 is closer to \$34. The fertilized fescue has higher production and protein than the tame grasses like fescue, and Bermuda has its price, but remember this is the cost of the “extra” bales you get. An unfertilized fescue bale would be closer to \$12. So, if you get two bales an acre at \$12 unfertilized, and two more at \$34, the average nutrient cost is \$23. In the end, while urea is very expensive right now, adding 40 to 50 lbs of N (along with some P and K) is still going to be worth it in extra production and protein.

Accounting for Removal

To fully realize the value of element nutrients in hay, all hay crops should be considered a fertilizer loss to that field. Wendie Powell states “Undernourished hay meadows lead to low quality hay. For example, I often hear that native grass makes poor hay. Well, that’s because it’s all too common to see land turned to a hay field, and applying fertilizer at the correct rate has either been overlooked or not in the budget.”

There are many long-term hay fields that are effectively depleted of phosphorus and potassium, with P levels below 5 ppm and K levels below 80 ppm. The agronomic optimum, or a “full” nutrient profile, is P at 20 ppm and K at 130 ppm. Although grass hay crops can efficiently grow at lower values than the agronomic optimum, this gives a benchmark of standard. Using an approximation that takes 20 lbs of P and 12 lbs of K to move the respective nutrients 1 ppm in the soil, that depletion represents 350 lbs of P and 700 lbs of K. When adding in the cost of micronutrients and spreading, that value difference could be \$1,000 or more. Rightfully, this is something to consider when purchasing land or when rented ground is hayed, without compensating for nutrient loss.

There is no such thing as “free hay”, be it in a farmer’s own pasture or one that is rented. The value of forage is a sum of the labor and materials in baling, the land value or opportunity costs on the land on which it was grown, and finally, the soil nutrients contained within the bale itself.

If there are any questions about soil and pasture fertility, Wendie Powell and myself can be reached at any Wildcat District Extension office. Altamont’s office number is 620-784-5337 or email jcoover@ksu.edu.

Nutrients in 1,000 lbs dry hay	Value fertilizer per lb, \$	Total value of nutrient, \$
6 lbs P ₂ O ₅	\$0.62 /lb	\$3.72
15 lbs K ₂ O	\$0.40 /lb	\$6.00
	Total	\$9.72

Table 1. 1,200 lb bale of unfertilized native at 16% moisture ≈ 1000 lbs dry

Nutrients in 1,000 lbs dry hay	Value fertilizer per lb, \$	Total value of nutrient, \$
25 lbs N	\$0.90 /lb	\$22.50

6 lbs P ₂ O ₅	\$0.62 /lb	\$3.72
20 lbs K ₂ O	\$0.40 /lb	\$8.00
	Total	\$34.22

Table 2. 1,200 lb bale of fertilized fescue at 16% moisture ==~1000 lbs dry

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