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Value of Spring Fertilization of Bahiagrass[1]

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The fertilization program suggested by the University of Florida for grazed bahiagrass in central and south Florida is 50 pounds of Nitrogen per acre applied each spring. This is an important practice to improve the amount and quality of grazing at a critical time of year. For cows coming off winter pastures and onto bahiagrass from March to May (a 90-day breeding season), it helps provide needed nutrition to get lactating cows into a weight-gaining condition to increase their chances of rebreeding. For cows bred from December to February, it provides nutrition to improve lactating ability of cows and, hence, bigger calves. Whatever the situation, the results of spring fertilization of bahiagrass are dependent on rainfall, which is often very little at this time. Day length and temperature are not the limiting factors that they are in winter.

The years 2000 and 2001 were record years for low rainfall, and there is little doubt that cattlemen have not received the full benefit of spring fertilization in years such as these. However, even in the driest years, there is some benefit from spring fertilization. The period of interest in this discussion is from March 15 to June 15, which is a critical time when grazeable forage is often limited in pastures.

Rainfall and Yield

Cattlemen tend to associate spring with drought because there is little rainfall from April to early June. Rainfall during the March 15 to June 15 period has averaged (for 59 years) 11.44 inches at the Range Cattle Research and Education Center (REC), but in 2000 and 2001, rainfall during this period totaled 4.5 and 8.5 inches, respectively. Effective rainfall in the March to June 2001 period was much less than 8.5 inches because 4.6 inches of the 8.5 inches of rainfall were received in one day at the beginning of the period (March 30, 2001), which was the first large rainfall after a 12-month, 59-year record low rainfall period at the Range Cattle REC. Because of the limited rainfall in spring 2000 and 2001, bahiagrass production is of interest in these years. At the Range Cattle REC, yield, crude protein, and digestibility were measured on three, 28-day intervals in a grazed pasture containing a fertilizer experiment with treatments that included 50 pounds of Nitrogen per acre (applied on March 15, 2000 and 2001) and an unfertilized check.

There was no significant increase in yield in any month as a result of the Nitrogen application during these dry years (Table 1). Grass production declined from April to June in both treatments because water

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became more limiting. Total yield was marginally improved by 270 pounds per acre due to Nitrogen fertilization.

Recent experience usually has a strong influence on what we perceive to be true, but 2000 and 2001 are not representative of long-term conditions in central Florida. Over the past 59 years, there have been only three years (five percent of the time) when rainfall from March 15 to June 15 was less than six inches; 15 years when rainfall was less than eight inches (25 percent); and 27 years when rainfall was less than 10 inches (46 percent). Years with severely deficient rainfall are rare.

Typically, dry matter production from bahiagrass fertilized with Nitrogen in March should total 2,500 to 3,500 pounds per acre during the April to June period. This amounted to a 980 pound per acre increase (three-year average) in forage production over unfertilized bahiagrass during this three-month period on nine ranches in central Florida (Table 2). Rainfall at the nine ranches was not measured, but if records for April to June rainfall at the Range Cattle REC are used, there is some association in each year between rainfall and bahiagrass yield. When rainfall is closer to the long-term average (12 inches) as in 1988, fertilization resulted in an increase of 1,350 pounds per acre over unfertilized grass. As rainfall decreased (1987 and 1989), the response to spring fertilization decreased.

Nutritive Value of Bahiagrass in Spring

Crude protein in Nitrogen-fertilized bahiagrass in April is two to three percentage units greater than that found in unfertilized grass (12 to 15 percent for fertilized versus nine to 12 percent for unfertilized grass). The lower the rainfall, the higher the crude protein concentration in leaves because yields are lower and protein is more concentrated. By June the difference in crude protein concentration between fertilized and unfertilized grass is minimal (both will be eight to 10 percent). Across the April-to-June period, crude protein in the total mass of grass produced during this period averages one to two percentage units greater with Nitrogen fertilization. Total digestible nutrients (TDN) in bahiagrass will be increased by Nitrogen fertilizer applied in March, but only by one to two percentage units.

Economic Value

More than at any other time, late March through May is when available forage is most critical and when the demand for good nutrition is high. On most ranches, cattle inventories are probably not low enough to allow unfertilized grass to produce sufficient forage to maintain satisfactory cow condition. Each year, cattlemen need to determine the number of acres they need to fertilize. Fertilizing bahiagrass with Nitrogen in spring is a business decision that should be based upon the economic return of the input. The economic value of Nitrogen fertilization in spring lies in a composite of the replacement value of the extra grass produced and the impact of that forage on cattle performance. Because of the complexity and variation among ranching operations, there is no single value. Our objective is to show you a process you could use to make your own decisions.

To approach the decision based on replacement value, some assumptions need to be made. Assume the rancher fertilized one acre for each cow and applied 50 pounds of Nitrogen per acre. At today's prices, 50 pounds of Nitrogen per acre costs $15.30, with ammonium nitrate at $205 per ton. Bahiagrass yield is increased by 1,000 pounds of dry matter (DM) per acre, and its nutritive value is increased to 12 percent crude protein and 55 percent TDN.

If the cattlemen did not fertilize, replacement of the extra grass could take two forms. First, it could be replaced with lower quality, less expensive hay at $80 per ton and supplemented with a 16 percent crude protein molasses-urea mixture ($128.40 per ton) fed at five pounds per head, per day. At 15 percent moisture, the cost of 1,000 pounds of DM would be $47, plus $0.32 per day for the molasses. If the 1,000 pounds of hay were fed over a 60-day period, the replacement cost could be $66.20 per cow. Assuming 10 percent crude protein hay and 16 percent crude protein molasses, this option provides a ration containing slightly more than 11 percent crude protein, which is comparable to the bahiagrass. A second replacement option, although it may not be practical, is 1,000 pounds of premium-quality hay, having 12 percent crude protein and 55 percent TDN. The value of the additional premium quality hay purchased to replace 1,000 pounds of spring-fertilized bahiagrass is $83 per cow, assuming a market price of $140 per ton at 15 percent moisture content.

The impact that 1,000 pounds of high quality bahiagrass has on cow performance is less straight-forward in its determination than the replacement value. The value of spring fertilization of bahiagrass for cattlemen with an early breeding season (December to February) will not be as great as that for cattlemen with a traditional spring (March to May) breeding season. In both cases, the added forage is needed to maintain cow condition and sustain a higher level of milk production, which increases weaning weights. With a spring breeding season, conception rates can be included as a direct result of fertilizer use in the spring. Poor cow nutrition lowers conception rates and return to estrus, which directly affects calf-weaning weights. One skipped 21-day estrus cycle translates into calves that are approximately 42 pounds lighter at weaning, or $42 per cow annually (with $100 per hundredweight calves). A five percent increase in calving percentage will translate into $23 per cow annually, given 450 pounds weaning weights and $100 per hundredweight calves.

Determining the economic value of spring nitrogen application is complex. The bottom-line value lies in a composite of the economic value of the forage itself, the impact of that forage on cattle performance, and the influence on profitability, which includes both costs and benefits. The most direct approach is to first examine three possible scenarios:

1. No spring nitrogen fertilizer application.
2. Nitrogen fertilizer applied in March.
3. Purchases of replacement forage or forage plus supplements.

In the first, or baseline, scenario, the absence of quality forage results in a loss of performance valued at $65 per cow, but requires no increase in the cost of production. In the second scenario, increased bahiagrass yield results in performance increases of $65 per cow. Given the $15 cost of fertilizer, this scenario results in a net profit gain of $50. The third scenario also yields performance improvements valued at $65 per cow, but at an expense of $66 and $83, respectively. This scenario results in reduced profit opportunities because the cost of purchasing additional feedstuffs is greater than the value of improved performance. This does not take into account any residual effects or benefits of N fertilizer application on bahiagrass.

Even though the added bahiagrass and both replacement options yield the same level of increase in cattle performance, the replacement options require the purchase of additional feedstuffs, whereas the extra bahiagrass grown requires only the economic expense of the added nitrogen. Utilizing this approach, we can view the response to spring N fertilizer application as having two components: cost savings from not having to purchase additional feedstuffs and the value of increased performance. Overall, the response to N fertilizer applied to bahiagrass ranges in value from $66 to $83 per acre (cow) if feed cost savings alone is considered. If both feed cost savings and increased performance are included, the value ranges from $131 to $148 per acre (cow).

Table 1. Mean dry matter yield of Pensacola bahiagrass.†

Treatment	Month			
	April	May	June	Total
	(pounds per acre)			
No Nitrogen	680	400	310	1,390
50 Pounds Per Acre	780	530	350	1,660
Difference	100	130	40	270
Probability	N/S	N/S	N/S	0.07

† Mean (two-year) dry matter yields of Pensacola bahiagrass and differences with and without 50 pounds of Nitrogen per acre at three 28-day periods at the Range Cattle REC. Nitrogen was applied on March 15, 2000 and 2001.

Table 2. Increase in dry matter yield of Pensacola bahiagrass.†

Year	Rain*	Month			
		April	May	June	Total
	(inches)	---(*pounds per acre*)---			
1987	9.6	180	120	330	630
1988	11.4	550	550	250	1,350
1989	6.9	350	350	250	950
Average	9.3	360	340	280	980

* Rain from Range Cattle REC records.
† Sumner, et al., 1991. Circular 916. University of Florida, Gainesville, FL. Increase in dry matter yield of Pensacola bahiagrass as a result of 60 pounds of Nitrogen per acre applied in March. (These values are yields resulting from application of 60 pounds of Nitrogen per acre in March minus yield with no Nitrogen. Mean yield over nine ranches in central Florida.)