Economic Implications of Fertilizer Management Decisions

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Introduction

The dependency that the beef cattle industry in Florida has on forage production is unquestioned. One of the largest expenses in forage production is fertilizer cost. Thus it makes sense to analyze the economic efficiency of fertilizer management decisions. Unfortunately, there is not a great deal of information on this subject.

Of the information available, most is on bahiagrass. While some may question this in light of the higher productivity of other forages, the fact remains that bahia is still the most widely grown forage in Florida. Most of this presentation will, therefore, be centered on bahiagrass fertilization.

Factors to Consider When Assessing Pasture Fertilization Programs

When assessing the economic implications of pasture fertilizer management decisions, a multitude of factors are involved, including the following:

Fertilizer cost is one of the first variables that comes to the mind of most managers. Since pastures are large and extensive croplands, even small increases in price per ton can have large effects on the total fertilizer bill on a beef cattle operation. Per ton costs of fertilizer have increased in recent months.

Increase in both forage quantity and quality is the desired response to fertilizer application. These increases can vary greatly, adding another variable that managers must consider. Variation in forage response to applied fertilizer may be caused by the quantity of plant nutrients applied. For instance, surveys have indicated that ranchers in Florida have applied nitrogen at rates varying from 50 to 150 pounds per acre per year in the 1980's. Obviously, this range of rates would cause variation in both growth response and cost per acre.

The timing of fertilizer application also has an effect on forage response. Timing the fertilizer application to coincide with the expected season of maximum growth response is the desired goal. Timing of application, though, must also be considered in terms of when the increase in forage quantity and quality is most beneficial to the cattle for which it is targeted. For instance, when dealing with warm season perennial grasses, there may very likely be a surplus of forage in mid-summer using nearly any management regime. While spring and fall seasons may bring about forage deficits under the same management.

Weather is a variable that, although out of the control of the manager, must be considered when making fertilizer application decisions. Too little or too much rainfall can limit productivity and forage response to fertilization. Low temperatures are a problem with warm season forages. Unseasonably high temperatures in the fall can be disastrous when growing cool season annuals. Although unpredictable, it can generally be assumed that critical dry periods will occur in the April–May time frame in spring and the October–November period of fall. If excessive rainfall is a potential problem, it is most likely in July, August or September.

Insect and disease incidence should be considered when making fertilizer application decisions. Armyworms and loopers are highly attracted to well fertilized forage in late summer and early fall. Spittlebugs and chinch bugs can attack some forages if heavily fertilized in summer, and crickets in bahia can be disastrous. Incidence of these pests can offset any benefit from fertilization if especially if thatch builds up. Mole

it is severe.

Price received for calves is another factor that must be considered when making decisions on pasture fertilization programs. It is much easier to justify a more aggressive fertilization program when returns are greater. Unfortunately, calf prices and fertilizer costs may be heading in different directions right now. As this trend develops, more pressure will be placed on managers to strongly analyze at what level fertilizer dollars can be maintained. Caution must be used here to ensure that pastures are not so run down from lack of fertilization that productivity is not up to par when calf prices do rebound.

Response of Bahiagrass to Differing Fertilizer Programs

In the late 1980's the South Florida Beef-Forage Agents Group, in collaboration with the Ona Research Center and the Soil Science and Agronomy Departments at the University of Florida, conducted a three year study to analyze forage response from bahiagrass to varying fertilization levels. There was a great deal of good information produced from that study. Some of the most dramatic was a 1760 lb. increase in forage production per acre with the application of 60 lb. of nitrogen per acre applied in March, compared with no fertilization. This 1760 lb. increase was a three year average collected at nine ranches over a nine county area. Currently it would cost about $25 per acre to buy and apply this rate of nitrogen. This works out to a cost of $28 per ton of additional forage produced. However, when 45 lb. per acre of P_2O_5 and K_2O were added, forage production per acre increased by only 400 lb. per acre. Adding 45 lb. of both P_2O_5 and K_2O increases fertilizer costs by $22 per acre and each additional ton of forage produced then costs $110.

An additional application of 60 lb. of nitrogen per acre in September resulted in only 480 lb. of additional forage, compared to the above mentioned 60 lb. application in March. Again, each additional ton of forage produced is much costlier than with the 60 lb. March-applied nitrogen. In fact, at current prices, each additional ton of forage from the September-applied nitrogen would cost $100 per ton. As you can see, both the amount of nutrients applied and the timing of application have some very distinct economic implications.

What About Skipping Fertilization for a Year or Two?

A sure-fire way to save on the fertilizer budget: Don't buy any. What happens to forage production level and the health of the stand? Work done by Blue (1973) indicated that it took two years of discontinuing fertilizer on bahia before it declined to the same production level as unfertilized bahia. We now know that about 1700 lb. of production per year is lost, or at least not gained, in the first year as shown in the South Florida Beef-Forage work. Also, Blue's forage yield on unfertilized bahia was critically low at only 1,370 lb. of forage per year. Forage distribution also plays a role in this scenario. It appears that most production loss comes in periods of stress from cool weather and dry weather. Usually, this coincides with the time when forage is most needed by lactating cows that are trying to re-breed in the fall, winter, or spring.

Some of the other forage species like hybrid bermudagrasses, stargrasses, hemarthrias, and rhodesgrass are another story completely. These grasses generally will not tolerate low fertility levels and stand loss would be expected from discontinuing fertilizer applications. Several of these may also benefit from fall fertilizer applications, unlike bahia.

Conclusion

There are a number of variables at work here, and several are totally out of the control of the manager. This makes for difficulty in forming fertilizer management decisions. There is no sure bet here, but it appears that the closest thing to one is a March application of 60 lb. nitrogen, which will produce an average of 1760 lb. per acre more forage than a non-fertilized bahia pasture. Each extra ton of

forage produced from the decision to apply the nitrogen will cost $28. This appears to be a good buy. When a good mineral supplement containing phosphorus and trace elements is available to cattle grazing a pasture using this type of fertilizer management, they perform well.

When dealing with some of the higher producing, higher maintenance forages, the ability to base a fertilization regime on economics alone becomes cloudy. The forage itself dictates to a large degree what the fertilizer application regime will be. If not managed from this standpoint, the risk of stand loss increases in addition to poor productivity. Due to higher establishment and maintenance costs on these forages, stand loss is probably not an affordable risk.

The most important thing that I have learned, and possibly what you will gain from this presentation, is that more work needs to go into this area. It would seem advisable to have IFAS faculty from several relevant departments collaborate on this topic.

In closing, I would like to borrow a quote from Dr. John Holt of the Food and Resource Economics Department. He made this statement in the *Proceedings* of the 1983 Beef Cattle Short Course, the most recent time this topic appears to have been tackled at the Short Course, "....ranchers are still asking how much fertilizer can I afford to use? Considering the complexity of the question, ranchers will still be asking it in 2083, and research will still be necessary to provide some of the information necessary to make an informed guess about answering it." If John's prediction is accurate, I doubt either he or I will make that 2083 Beef Cattle Short Course presentation. Whoever does, I wish them luck.

References

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Table 1. [60 lb. of N in March] vs. [No Fertilization]	
Increase in forage produced	1,760 lb.
Cost per additional ton of forage produced	$ 28

Table 2. [60 lb. N, 45 lb. $P_2 0_5$, 45 lb. K_2O in March] vs. [60 lb. N March]	
Increase in forage produced	400 lb.
Cost per additional ton of forage produced	$ 110

Table 3. [60 lb. N in March, 60 lb. N in September] vs. [60 lb. N in March]	
Increase in forage produced	480 lb.
Cost per additional ton of forage produced	$ 100