Fine Tuning Fertilization Programs in Tough Economic Times

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Times are tough in the cattle business—again. So we don't want to spend any money that we don't have to—again. Should we ever, even in good times? Let's look at pasture fertilization and see how we can make wise nutrient management decisions—in tough times and better ones.

Waste of resources doesn't make sense. A good manager will use resources such as land and capital in ways that produce benefits for the operation as well as the society in general. Most fertilizer materials are natural resources, and most are non-renewable. Mining a mineral and spreading it out on the land is a one-time operation. About the only way we get a chance to use that mineral again is when we return waste products such as manure, food processing wastes, biosolids, and nutrient-containing water to the land. That's where a waste material in one sector of our society can be a resource in another—and its beneficial use can reduce overall resource consumption.

As a way of illustrating how to make the most out of your fertilizer budget (even if you think it's zero this year), let's look at three imaginary ranch situations: a large commercial ranch, a homestead ranch, and a hobby ranch. Each situation will have lessons for any cattle operation.

Large Commercial Ranch

Albert DeGator is manager of a large commercial ranch that has about 3,000 acres of mostly bahiagrass pasture. Representatives of the county's wastewater treatment plant have offered to sell him treated biosolids (formerly called sewage sludge) for what seems to be a pretty reasonable price. Albert has questions.

- Is the material safe and legal for land application?
- Will there be restrictions on grazing the land?
- Will there be long-term effects like soil contamination with heavy metals?
- How much is it worth to him as fertilizer?
- Shouldn't they be paying *him* to take the waste off their hands?

First, is it safe? Biosolids come from sewage treatment plants that are regulated by state and federal laws. The plants are monitored for compliance and are ultimately responsible for the product delivered to a farm or ranch. Treatment at the plants kills organisms that are hazardous to human health. Biosolids that received advanced treatment (e.g., composting, alkaline stabilization, or heat treatment) are subject to fewer application restrictions than those that received only secondary wastewater treatment. The material supplier must provide the land owner with reports and test results and is ultimately responsible for the material's appropriateness for land application. Albert should have no problem determining that the material is safe and legal for land application.

Any human pathogens that may have escaped the treatment plant are quickly killed by soil microorganisms. As an extra precaution against possible spread of disease, cattle are not allowed to graze treated pastures for 30 days after application when less-treated biosolids are applied. There are no grazing restrictions for advanced-treated biosolids such as those that have been composted, alkaline treated, or dried by artificial heat. However, advanced treatment involves added cost and those

products are less often offered to ranches—they go to markets that will pay more for the product.

The popular concern about heavy metals such as cadmium, lead, and mercury in sewage sludge is a relic of the days when all kinds of industrial wastes were being flushed into the sewer systems. That practice has been eliminated in the past 30 years or so, and the level of those contaminants is so low that they seldom present a problem in land application. EPA issued new regulations in 1993 promoting beneficial use of biosolids (c.f., EPA, 1994). The "503 regulations," as they are often called, were based on extensive review and evaluation of the scientific literature and take a well-reasoned approach to the environmental pollution potential represented by biosolids use. Furthermore, Florida biosolids are particularly low in metals since there is little industry here with that kind of pollution potential. That's another reason to favor using our own home-grown biosolids rather than those imported from industrial cities of the north.

What is the fertilizer value of this material? The most common way of estimating the value of a waste product is to look at its nitrogen (N) content. Nitrogen is the nutrient that is almost always deficient in plant production because plants need a lot of N—and it gets lost through leaching and denitrification. So, the N content of a material provides an index of its fertilizer value. Waste materials have varying amounts of plant nutrients, but concentration of nutrients is almost always low, making hauling costs a major factor in waste product use. You have to apply relatively large amounts to get significant nutrient application. For example, a ton of sludge that has 5% solids, with 3% of the solids consisting of N, has only 3 lb total N. Assuming half of that N will be plant available during the growing season, we can only count on 1.5 lb N per ton. So it would take 40 tons of sludge to give 60 lb N to the forage plants, the same as about 180 lb ammonium nitrate. There is certainly value to the material, but Albert must also consider negative aspects such as regular truck traffic onto his land, possible loss of grazing time, and potential soil compaction.

Shouldn't they be happy to *give* it to me for taking it off their hands? Albert wonders. Some treatment plants may be willing to haul and spread the material on your land as a means of safely and legally disposing of their treated waste. However, most are also trying to reduce their costs, and sale of the product is one way to do that. Some have hired marketing firms to do the promoting and selling. Albert will have to evaluate the situation and decide how hard to negotiate. Hauling distance, ease of access to the pastures, and disposal alternatives available to the supplier are major considerations.

So, Mr. DeGator should seriously consider the offer. He has the possibility of getting some plant nutrients at a good price, maybe even at no cash cost. The materials should be safe and cause no problems. As usual, he will have to be a vigilant manager to assure that application is done properly and that the supplier keeps him informed about the material.

Homestead Ranch

Helen Sabida is the owner of a 250-acre family homestead ranch. Most of the pasture land is bahiagrass, but she has 40 acres of bermudagrass that she uses for grazing in the spring, before taking the cattle off and making hay. This year she can spend about $2,000 on fertilizer. She can get floor sweepings from the fertilizer dealer at an attractive price per ton. What fertilizer should she buy, and where should she apply it?

Helen learned at the 1996 Beef Cattle Short Course that buying fertilizer floor sweepings is like buying somebody's cull bull without having seen it or knowing anything about it. Not a smart way to invest money. She decided to buy nutrients that she knew she needed—and apply them in quantities

that she knew would give her a return on her investment. She will buy plant nutrients, not "fertilizer."

The bermudagrass should get the fertilizer rather than the bahia. It's a higher quality forage and will give a better return on the fertilizer dollar. In addition, it's being cut for hay, which exports nutrients from the land when it's harvested. A ton of hay with 10% protein takes with it about 30 lb N, 9 lb P_2O_5, and 25 lb K_2O. One calf leaving the ranch removes only about 15 lb N, 6 lb P_2O_5, and 1 lb K_2O per acre (Pate, et al., 1980). She should apply 80 lb N per acre, and P and K according to soil test in early spring. If she still has some fertilizer budget left, she should apply another 80 lb N and 40 lb K_2O, per acre, when she moves the cattle and lets the hay grow.

Hobby Ranch

Jill and Jack Hill have their home on 30 acres of land. They both work at jobs in the nearby town and enjoy having a few cows on the pastured land surrounding their home. They want their children to learn responsibility by sharing in the basic care of the animals. While the animals are a hobby and not a means of livelihood, they would prefer to make rather than lose money on their cattle. One of the kids took soil samples in the bahiagrass pasture and had the soil tested by two labs as part of a high school class project. The soil test results of the two labs were quite similar; pH was 5.1 and extractable P and K were rated as low. However, XXX Lab recommended a ton of lime, 120 lb N, 80 lb P_2O_5, and 80 lb K_2O per acre. YYY Lab recommended no lime and had P and K recommendations that depended on the rate of N fertilization. Which recommendation should they follow?

Since recommendations are based on different fertilization philosophies, it's common to have different recommendations. We expect people to give us different recommendations about which car to buy or which restaurant to eat at; fertilization recommendations are no different. XXX Lab is making the assumption that the Hills don't want fertility to limit grass production. The lab is leaving economic considerations to the Hills. YYY Lab makes their recommendation dependent on the Hill's decision of how much they can spend on fertilizer (e.g., Kidder et al., 1991). Since the Hills want to fertilize only to produce forage their cattle can utilize and are not interested in optimum production, they should follow the recommendation of YYY Lab.

There is another major difference—the lime recommendation. XXX Lab is still using old guidelines by liming soil above 6.0 for just about all crops, including pasture grasses. YYY Lab is utilizing research which has shown no yield benefits to liming for bahiagrass above pH 5.0. The result is a significant difference in the cost and resources spent on the pasture—for the same forage.

So, the Hills should learn with their kids that recommendations come from people, not a test tube. As users of soil tests, they need to know something about how the lab personnel make recommendations, including what approach they have toward fertilization and liming. Since they are not interested in just complaining (or bragging?) to the neighbors about the cost of fertilization, they should follow the recommendations of YYY Lab. They will thus be using fertilizer as it was meant to be used—to get better plant growth.

Summary

It always makes good sense to fine tune fertilization and liming, but it is *critical* to do so during hard economic times. Some of the main points to remember:

- Use organic waste materials as forage fertilizers when they are economical.
- Buy plant nutrients, not "fertilizer."
- Give hay priority over pastures when fertilizing.

- Fertilize only to produce forage you will utilize.
- Liming is seldom needed on bahiagrass pastures.

References

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Appendix I: Text of the Brochure

Table 1. IFAS recommendations for grazed bahiagrass pastures. (Note that P and K recommendations depend on the level of N applied; they represent three ranges of cost and energy inputs.)

Nitrogen Option	Nitrogen, lb/acre	Approximate Cost, per acre[a]	P_2O_5 and K_2O Recommendations
Low	0 – 70	$ 0 – 21	Do not apply P or K fertilizer. (Use this recommendation only for grazed pasture; *do not use if making hay*.)
Medium	70 – 140	$ 21 – 42	Apply 25 pounds of P_2O_5 if soil test P is *low*; none if test is *medium to high*. Apply 50 pounds of K_2O if soil test K is *low*; none if test is *medium to high*.
High	140 – 180	$ 42 – 54	Apply according to soil-test-based recommendations.

[a] Assume cost of N = $0.30/lb.

This brochure and the subject video were made possible by a grant from the Florida Energy Extension Service. The video is available in many locations for loan to individuals or groups for private viewing. Contact your county Cooperative Extension livestock or agricultural agent for information about local availability.

Also available from county Cooperative Extension offices is the related publication, Circular 916, Fertilization of Established Bahiagrass Pasture in Florida.

Save Energy, Resources, and Money with IFAS Bahiagrass Pasture Fertilization Recommendations

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There are about 2.5 million acres of bahiagrass pasture in Florida. Bahia responds well to fertilization, but fertilizer costs money. In fact, it's the biggest single expense item in the pasture-production budget and *represents more energy resources* than any other single production practice in beef and(or) forage operations.

IFAS (Institute of Food and Agricultural Sciences) of the University of Florida, with a grant from the Florida Energy Extension Service, has produced a short video to explain current IFAS recommendations for grazed bahiagrass pastures. We feel it's important that you know about and understand these recommendations.

Saving resources—especially energy—while getting the most out of what you spend on fertilizing grazed bahiagrass pastures is the subject of this program. Maximizing energy-use efficiency has many positive environmental and economic effects.

In the 1980s, Florida beef cattle producers were applying to grazed bahiagrass pastures an average of

- 53 lb N
- 24 lb P_2O_5
- 32 lb K_2O per acre, per year.

The old, basic "law of the minimum" tells us that the factor in shortest supply, relative to plant needs, sets the growth limit—no matter what quantities of other factors are present. In the 50 lb N per acre range, no meaningful response to the application of other nutrients is expected (Table 1).

Nitrogen is the "gas" for our grass. It's the nutrient that can be counted on to be limiting almost all of the time. If you can only afford to spend a limited amount of money on pasture fertilizer, then spend it on the nutrient that is most limiting. Even with the large amount of energy used to manufacture nitrogen fertilizers, their proper use increases the energy-use efficiency of you fertilizer.

Take These Steps:

- Decide how much you can spend on fertilization.
- Calculate how much N that will buy.
- If N rate is < 70 lb, don't apply P or K.
- If N rate is > 70 lb, soil test for P and K.
- Apply only nutrients that will give more grass.

Here s What Ranchers Are Saying:

> "It allowed us to reduce the P and K we were using and saved us about $7 per acre. We have not seen any reduction in forage yields. Also, we quit fertilizing bahia in the fall and use that money to fertilize limpograss, which gives us better fall forage. It's been a very positive thing for us, economically."
>
> *— Paul Genho, Deseret Ranches*

> "For the same amount of dollars, I can fertilize twice the acreage. I like the fact that I can put it all on in the spring while these calves are on the grass and growing."
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> *Dan Sumner, Elsberry Farms*