

TIMELY INFORMATION

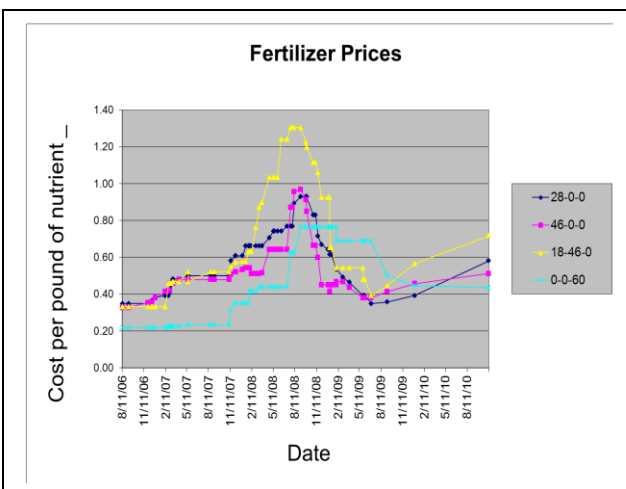
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Alternative Fertilizers for Pastures and Hayfields

Farmers are aware of the huge increase in fertilizer prices that occurred in 2008. In 2009, prices dropped almost as fast as they had increased but since then, there has been a gradual increase in all prices and there is no indication that this trend will end (Fig. 1). Most manufactured N fertilizer are made from fossil fuels. We are aware of the gradual increase in gasoline prices so why would we not expect a similar trend in urea, ammonium nitrate, UAN solutions, etc. ? There



has also been a lot of speculation about phosphate prices increasing because of declining resources and increased world demand. All phosphate fertilizers come from limited rock deposits in Florida, North Carolina, North Africa, and a few other spots around the globe. All of the high quality, easy-to-get-to phosphate rock has already been mined. Almost all of our potash is now mined and imported from western Canada. We compete with China, Brazil, and the rest of the world for these supplies and it takes fuel to transport this potash from Saskatchewan to Alabama. Thus, we see potash prices rising as well.

What is an Alabama cattleman to do? We depend on forages to support our cow-calf and stocker operations. Without fertilizers, we'd have to go back to running cattle in the piney woods of South Alabama like settlers did in the 1800s and early 1900s. Fortunately, there are alternatives. None are cheap. Each producer will have to look at his/her resources and level of grazing management to decide which alternative works best on his/her farm.

Regardless of nutrient sources, here are some facts to keep in mind.

- 1) A dry ton of grass forage contains about **50-10-40 pounds** N-P₂O₅-K₂O. These nutrients must come from the soil either as residual nutrients or direct fertilization. Because our soils are typically low in soil organic matter, we must provide almost all the N needed by the crop.
- 2) We can grow a little grass without fertilization because Mother Nature usually gives us around 20-30 pounds N per acre per year in rainfall.
- 3) Legumes can provide up to 150 pounds N per acre, enough to produce up to 3 tons of dry matter per acre.
- 4) Soils high in organic matter are more productive. They hold moisture, drain better, and provide mineralized N to the growing grass crop. The University of Missouri soil testing lab recognizes this by crediting between 5 and 40 pounds N per acre per percent soil organic matter depending upon the soil texture and the season of the year (Table 1). In Alabama, we only have a few soils with a CEC above 10 cmol/kg (Limestone Valleys and Black Belt) and most have SOM less than 1 percent.

- 5) How much a producer fertilizes usually depends upon how much forage he needs and how much he can afford to spend. Fertilizer costs are a major out-of-pocket expenditure for all Alabama farmers.
- 6) Grazing livestock recycle nutrients. They don't remove much from the land. Therefore good grazing management is important to get as much out of applied nutrients as possible.
- 7) Removing hay removes a lot of nutrients (see #1 above).

Table 1. Nitrogen credits for soil organic matter (SOM) used by the University of Missouri Soil Testing Laboratory (Buchholz, 1983; Mitchell and Everest, 1995).

Soil texture	Soil cation exchange capacity (cmol/kg)	Nitrogen rate adjustment formula	
		Cool-season crops	Warm-season crops
Sands- sandy loams	<10	20 * %SOM	40 * %SOM
Silt loams-loams	10-18	10 * %SOM	20 * %SOM
Clay loams-clays	>18	5 * %SOM	10 * %SOM

With the above facts in minds, one or more of the following alternatives will help Alabama producers get the most out of their fertilizer budget.

#1. Soil Test

Applying fertilizer without having taken a soil test amounts to guessing how much fertilizer is needed. Applying too much fertilizer is a waste of money; applying too little will result in less-than-optimum forage production. Auburn University's soil test recommendations assume a high level of management and production and are based on the assumption that the forage produced can and will be used. Be sure to follow liming recommendations on soil tests. More than half the soil samples for forage tested at the laboratory at Auburn University have a pH too acid for best production and need agricultural limestone to correct this. Fertilizer nutrients are less available when the soil pH is low.

If you can only afford lime or fertilizer but not both, apply the lime. Phosphorus and potassium will build up in all our soils. If the soil tests "High" in one of these, then research has shown that applying more as fertilizer is a waste of money.

#2. Use Legumes

The single most beneficial technique for lowering N fertilizer costs is to grow forage legumes. Some legumes are grown in a pure stand, e.g. alfalfa or sericea lespedeza, but many species of clovers work best in a mixture with forage grasses.

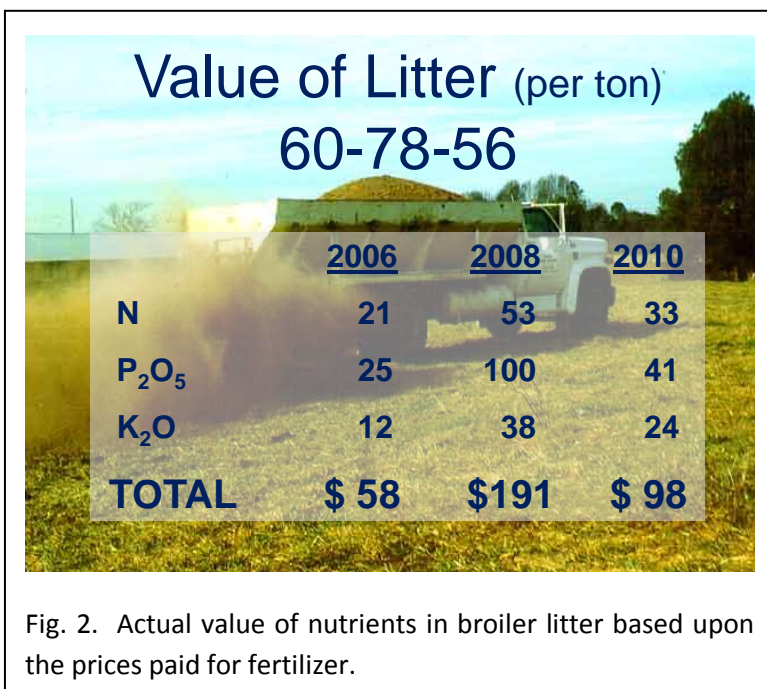
In association with Rhizobium bacteria, clovers and other legumes obtain N from the atmosphere. Specific strains of this type of bacteria live on the roots of particular legumes. The bacteria obtain N from air in the soil and "fix" it in a form usable by plants. Bacteria accumulate in small nodules on the legume roots but most of the N is in the form of protein in the leaves.

The amount of N fixed varies due to legume species, temperature, strains of bacteria present, the extent of sunlight versus shading, soil pH, soil nutrient availability, and extent of defoliation. However, as Table 2 indicates, the amount and value of N fixed by a good stand of clovers (the type of forage legume most commonly-used in pastures) can be substantial.

In addition to providing biological N, legumes offer other potentially important advantages. In some cases a legume/grass mixture may produce more dry matter per acre than grass alone, particularly as compared to grass receiving little or no N fertilizer. The distribution of forage growth in pastures may also be more favorable, thus helping reduce the need for stored feed. However, the single most valuable advantage forage legumes offer is better forage quality on average than grasses, which usually sharply increases animal gains and may enhance livestock reproductive rates.

Species	N fixed	N value (\$/acre) @		
	--lb/acre/yr--	\$0.45/lb	\$0.65/lb	\$0.85/lb
Red clover	75-200	34-90	49-130	64-170
White clover	75-150	34-68	49-98	64-128
Annual clovers	50-150	23-68	32-98	42-128

#3. Use Broiler Litter or Other Organic Materials



Alabama produces more total nutrients annually in broiler wastes than are in all the fertilizers sold in the state. Many producers are taking advantage of this relatively abundant source of organic fertilizer. On the average, a ton of fresh broiler litter will contain at least 60-60-40 pounds N-P₂O₅-K₂O. In other words, it is at least a 3-3-2 grade fertilizer. If one had to purchase these nutrients as commercial fertilizers, they would be worth around \$98 at today's prices (Fig. 2). Even if you just used the N in the litter, it would be valued at \$33 per ton. A consistent problem is being able to find the litter when you need it and have it delivered and spread, especially if your farm is outside of the poultry-growing regions of the state. If you need to find a Certified Animal Waste Vendor in your area, go to the

Fig. 2. Actual value of nutrients in broiler litter based upon the prices paid for fertilizer.

following web site and contact them by phone. If a local vendor does not have litter available, he/she may know someone who does.

<http://www.aces.edu/dept/aawm/County.php>

Broiler has been undervalued in the past, is rather bulky, and requires special handling that is different from commercial fertilizers. For these and other reasons, cattlemen near poultry producing areas have over-applied and often misapplied broiler litter to forages. Realistically, it should be treated just as any other fertilizer. In fact, Alabama's 1999 AFO/CAFO Rules require that it be treated as a fertilizer. This assures getting the maximum value out of the litter. Some practices include:

- Apply only to actively growing crops e.g. don't apply to bermudagrass in winter.
- Apply within 30 days of planting an annual crop.
- Apply based on soil tests (at least every 3 years) at agronomic rates.
- Know what you are applying e.g. have it tested or demand an analysis from your vendor.
- Assume that at least 2/3 of the N and all of the P and K will be available during the year it is applied.
- Litter may be stored safely for several months in a dry stack facility or under cover on a well drained, grassy site near the edge of a field.
- Broiler litter is especially valuable on sites that are low in P. Phosphorus will build up rapidly if broiler litter is used mainly as a source of N.

There are other municipal, industrial, and agricultural organic wastes that may be available to producers. The feasibility of using organic waste materials depends on two factors. First, is the value of the nutrients in the material high enough to justify the cost of obtaining and applying it? To answer this question requires knowing the level of nutrients in the material as well as how much will actually become available to plants. The second factor is whether the material contains any pathogens, heavy metals, or other undesirable components that could be harmful to animals, humans, or to the soil. If neither of these factors is a problem, then using a waste material as a soil amendment may be quite justifiable. Municipal biosolids have been applied safely and with good agronomic results in many areas of Alabama. The US-EPA strictly controls biosolid application and the vendor or municipality spreading it should provide the landowner with information about the by-product. A contract may be required between the landowner and the vendor spreading the biosolids.

Paper mill lime and boiler wood ash are also popular in some areas. Both have been successfully used as an inexpensive alternative to ground limestone.

#4. Try Urea-based fertilizers where possible

Urea (45-0-0) is less expensive compared to ammonium nitrate (34-0-0), ammonium sulfate (21-0-0-24S) and other sources of N because it is easier to manufacture. On the other hand, it is also more volatile and thus more likely to be lost during warm weather.

Can you afford to use a urea source of N fertilizer during warm weather? The answer is that you probably can in most situations if urea is substantially cheaper than other N sources. While the potential losses of urea by volatilization during warm weather can be significant (up to 30%), recent research by Auburn University scientists demonstrate that

losses in pasture situations were rarely greater than 10 to 20%. Losses are lower when urea is applied to bare soil with a soil pH less than 7.0. The worst case for applying urea would be surface applied during a drought in the summer on a summer grass pasture on a high pH (7.0+) soil in the Black Belt. In cool, wet weather or if a rain or irrigation is expected within 3 days, no N loss is expected.

Liquid N is usually a mixture of urea and ammonium nitrate, but only the urea component is vulnerable to volatilization loss. Considering the total cost of urea, a producer may be able to apply a little extra to compensate for potential N loss from volatilization. This is not a problem in cool, wet weather. Another alternative is to purchase fertilizer treated with Agrotain®, a commercial product that claims to greatly reduce volatilization losses from urea and urea-ammonium nitrate solutions.

#5 Compare Costs of New Technology Products with Conventional Sources

There are several new technology products on the market designed to reduce the potential volatilization of urea based fertilizers or to control the release of N from fertilizers. Controlled-release fertilizers are usually coated with a polymer. There is also an encapsulated phosphorus fertilizer to prevent fertilizer P from being tied up by soil minerals e.g. Avail®. All these products are promoted and sold based upon their product name. Examples of some of these products include Agrotain® mentioned above, Nitamin Nfusion® (22% liquid N manufactured by Georgia Pacific), Nutrisphere N® and Avail® (SFP, Leawood, KS). We have evaluated several of these new technology products with cotton and corn but not in forage production. All seem to do what they claim. However, we did not look at the cost of these materials compared to more conventional sources of N. Yields were about the same regardless of material used.

#6. Prioritize Fertilizer Application

Not every acre of pasture is equal, because some areas have a much higher yield potential than others. For example, a rich, deep, and relatively level bottomland pasture may be much more productive than an eroded hillside pasture. The reasons are that on the hillside water runs off quickly, the soil may not hold nutrients well, and roots may only have a few inches of good soil in which to grow. In the bottom there will probably be better moisture and nutrient availability during most of the growing season and roots can penetrate deeply. The point is that the first priority should be on providing nutrients in areas that have the potential to be most productive.

#7. Time Fertilizer Applications

If a producer has limited funds to invest in fertilizer, it makes sense to time the applications such that pasture forage will be available when it is most valuable. For example, on a farm in north Alabama that is not heavily stocked, there may be excess forage available in spring. In such a situation, fertilizer dollars would result in more valuable forage production if used to apply fertilizer in autumn to stimulate autumn grazing or to stockpile fescue forage to help reduce hay requirements.

#8. Practice Better Grazing Management

Utilization of pasture forage is greatly affected by grazing method. In fact, research has shown that in many poorly managed continuous grazing situations, less than half the forage produced in a pasture ends up being consumed by livestock. On the other hand, with controlled grazing management the percent of utilization of the forage produced may be 20 to 30% higher. This is the same result that would occur if 20 to 30% more fertilizer was applied. Remember that

you don't remove many nutrients when you sell cattle. Those nutrients should be recycled on the pasture when you practice good grazing management.

Conclusion

There is no single answer to the problem of higher fertilizer costs. Different livestock producers will need to take different approaches based upon their location, resources available, and type of operation. In fact, a given producer may need to take different approaches at different times or in different fields including using soil testing, legumes, organic wastes, alternative sources of fertilizer N such as urea, timing of fertilizer application, and improved grazing management.

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