Dealing with High Fertilizer Prices

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Commercial fertilizer is a key component in forage production, but the all-time high prices is limiting rancher's ability to fertilize pastures. According to USDA, fertilizer prices started to increase in 2021 in response to rising prices of natural gas and still remain high for over a year. This trend is expected to continue in the near future; thus, it is critical that fertilizers are used efficiently so the investment return can be maximized. The purpose of this document is to provide information about factors that may affect fertilizer efficiency and can also help in decision making regarding fertilizer application.

Soil Testing - Soil testing is still the best management tool to monitor soil fertility levels. Routine soil tests can help identify nutrient deficiencies and inadequate soil pH. Soil tests also provide information about nutrients are present at adequate levels so fertilizer can be omitted. In addition to the cost savings by only applying the required fertilizers, losses and associated environmental problems can be minimized. Based on soil test results, cost-effective fertilization programs can be developed to meet forage nutrient requirements while minimizing production costs.

Adequate soil pH - Maintenance of adequate soil pH is an extremely important step in soil fertility programs for forage crops. Soil pH is a measure of the acidity or alkalinity of soil and is one of the most important soil properties that controls nutrient availability to plants, root development and fertilizer efficiency. Since soil pH is measured using a logarithmic scale, relatively small changes in pH can have important consequences for forage production and fertilizer use efficiency. For instance, nitrogen fertilization efficiency increases 2.5 times by increasing soil pH from 4.5 to 5.5.

Forage crops require different soil fertility conditions and target pH varies according to the forage species. In general, warm-season grasses are more tolerant to soil acidity than legumes. Liming frequency as well as application rates will depend on the soil's characteristics and management practices. Nitrogen fertilization and decomposition of organic materials contribute to soil acidity. It is important to closely monitor pH and soil fertility status by testing the soil regularly. Routine soil testing provides the soil pH levels as well as the recommended lime application rates.

Choosing the most adequate fertilizer source – Several commercial fertilizer sources are available to supply nitrogen, phosphorus, and potassium, and micronutrients to forage crops. Ammonium nitrate and ammonium sulfate are the major nitrogen sources used on pastures in Florida. Organic sources such as biosolids and animal manure also represent important sources of nutrients that can be used in pastures. When choosing the right fertilizer source, it is important to consider important factors, such as price, fertilizer effectiveness, method, and rate of application.

Cost of fertilizer should be calculated in terms of dollars per pound of nutrient. In addition, it is also important to consider the acidity potential of each fertilizer source. Nitrogen fertilization often reduces soil pH. However, some nitrogen sources can cause a reduction in soil pH more rapidly than others. Thus, when choosing a nitrogen source, it is also important to account for additional costs associated with lime application. For instance, ammonium nitrate requires 0.61 lb of lime per lb of fertilizer, while ammonium sulfate and urea require 1.10 and 0.81 lb of lb of lime per lb of fertilizer to maintain soil pH.

Commercial fertilizer mix often provides multiple nutrients, which can be most economical in some situations. However, the N:P:K ratio of the fertilizer formula should coincide with the soil test recommendations to avoid unnecessary nutrient application.

Organic fertilizer sources such as animal manure and biosolids are usually as effective as commercial fertilizer at providing crops with nutrients and organic matter. When properly applied, these organic sources can be beneficial to agriculture with no negative impacts on the environment.

Timing and rate of fertilizer application - Fertilizer should be applied when the forage is actively growing. For most warm-season grasses commonly used in Florida such as bahiagrass, growing season does not start until night temperatures reach 60^{o}F, which typically occurs in early spring. For establishment of new plantings, fertilizer should not be applied until plants have emerged. Nitrogen and potassium should be split-applied into two applications: after emergence and 30 to 50 days later. For hayfields, nitrogen and potassium should be applied after each cutting.

Unlike phosphorus and potassium recommendations, nitrogen application is not based on soil test results, but rather it is estimated based on expected yields. From an economic perspective, it is important to consider realistic yield expectations when calculating the amount of nitrogen that a pasture will receive. Improved grasses such as bermudagrass and stargrass usually require higher fertilizer application rates than bahiagrass pastures. Beside the forage species, another important aspect that should be considered is how much grass is needed. Do not fertilize pastures if forage production will not be consumed by grazing animals and/or harvested for hay. In other words, although nitrogen fertilization increases forage production and nutritive value, these benefits may not be economical if not converted into animal product. Adequate stocking rate is another important variable that should be considered when choosing nitrogen rates.

Utilization of forage nitrogen-fixing forage legumes - Nitrogen-fixing legumes have the ability to convert atmospheric nitrogen into compounds that plants can use. Symbiotic fixation of nitrogen is achieved by the association of bacteria and the roots of legumes species. Legumes are only able to fix nitrogen from the air if specific strains of bacteria are present in nodules on their roots. In addition, soil fertility (i.e., pH and cations) and environmental conditions also affect the efficiency of nitrogen fixation. The primary driving force in calculation of nitrogen fixation is legume yield. High yielding legumes fix more nitrogen.

Cool-season legumes make most of their growth in the spring when temperature and rainfall are favorable. Cool-season legumes are more widely used in North Florida because they more adapted to well drained soils and mild temperatures. Some clovers such as arrowleaf, ball, rose, and white clover produce a high percentage of hard seed which allows them to reseed if managed properly. Cool-season legumes are high in nutritive value and when grazed by beef cattle provide excellent animal performance. Annual clovers can contribute with about 75-100 lbs nitrogen/acre for the subsequent grass crop.

The most common warm-season legumes species adapted to Florida's conditions are perennial peanut (North-Central regions of the state), and aeschynomene (South region). Perennial peanut have been primarily used for hay production, while aeschynomene, an annual warm-season legume, is commonly used in beef cattle grazing systems.

The majority of the legume-nitrogen is transferred to the soil by unused plant material and/or animal excreta. Grazing animals can return more than 80% of the consumed nutrients to the soil through the feces and urine. If the legume crop is harvested and removed from the pasture as hay, haylage, or silage, the contribution of legume-nitrogen to the subsequent crop is reduced.

Grazing management - Because a large proportion of nutrients is returned to the soil via animal excreta, grazing management can have a major role in maximizing the benefits of nutrient recycling in grazing pastures and, consequently, reducing the dependence on commercial fertilizer. Stocking rate and grazing method (rotational versus continuous) are important factors that may affect nutrient redistribution. Rotational grazing often leads to a more homogeneous distribution of excreta. Research in Florida has shown that short grazing periods can increase the uniformity of excreta return as well as the efficiency of nutrient recycling compared to continuous grazing. Similarly, increasing stocking rate may also increase nutrient concentration and redistribution across the pasture but overstocked pastures can have detrimental impacts on forage and animal performance. Lastly, environmental factors such as daily temperature and animal type may also affect animal grazing behavior and, consequently, nutrient redistribution in pastures.

Conclusions:

- Soil testing remains the best tool for monitoring soil fertility levels and providing baseline information for management of sustainable pasture production.

- Maintaining an adequate soil pH should be the first step in soil-fertility programs for forage crops and sustainable pastures.

- The choice of fertilizer application rate and source should be based on the need to meet and/or satisfy production objectives for harvested forages and/or grazed pastures.

- Forage legumes can be a viable alternative to reduce or eliminate nitrogen fertilization. Similarly, nutrients added via excreta by grazing animal also represents an important pathway for nutrients to be recycled within the pasture system.

Questions, contact Dr. Silveira at mlas@ufl.edu or 863-735-1314 ext. 209.

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Upcoming Events

Visit our calendar online to view all our upcoming events and their registration links:

May 10, 11:00-11:45 a.m. – Ona Rangeland Wildlife and Ecosystems Program Highlight with Dr. Hance Ellington.

May 25 and 26, 6:00 – 8:15 p.m. - 5th Annual Nutrition for Beef Females. May 25 -- Bassinger Alton Chandler Civic Center, 20350 US hwy 98 N, Okeechobee or May 26 -- Exhibit Hall at the Turner Agri-Civic Center, 2250 NE Roan St., Arcadia. Register by 5/18 to attend this free program: https://rcrec-nbf-2022.eventbrite.com

June 30, 9:00 a.m. -2:30 p.m. - 13th Annual Youth Field Day – Registration opens May 1! See the flyer in this issue.

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UF/IFAS Range Cattle REC - 3401 Experiment Station Rd., Ona - http://rcrec-ona.ifas.ufl.edu/