Nutrient Management for Alfalfa

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Nutrient management for a perennial crop such as alfalfa is different from annual crops like corn and soybean. The management for alfalfa starts before the crop is seeded so producers must plan ahead to ensure the necessary nutrients for a good crop of alfalfa are available.

Alfalfa is a legume, so adequate nitrogen is typically not a problem. Because alfalfa fixes its own nitrogen via a relationship with the bacteria rhizobia, the soil needs to be at an optimum pH. If the pH is less than 6.0, lime application is needed. Because lime is slowly reactive in the soil, this application needs to be done before seeding and needs to be incorporated with the soil via tillage. Alfalfa is a big user of phosphorus and potassium, so there is a good chance these nutrients will be needed. Because phosphorus and potassium are immobile in the soil, it is best to apply them pre-plant and incorporate them thoroughly in the soil. In some situations sulfur and boron may need to be considered.

The best proactive way to determine what nutrients are needed for alfalfa is to soil test. Getting a representative soil sample is important. Most of the nutrient concerns for alfalfa require a soil sample taken at 6-8". At a minimum, the field that is to be sampled needs to be broken up into areas/zones of similar landscape position, drainage, or soil textures. These areas should not be greater than 20 acres in size. For a zone to work, the area should be sampled in a random pattern with at least 20 soil cores gathered to create a composite soil sample for the zone. The cores should be thoroughly mixed and subsampled to fill the soil sample bag. There are other methods of sampling fields more intensively - information can be obtained at http://www1.extension.umn.edu/agriculture/nutrient-management/docs/SF-990-1.pdf

If the pH is below 6.0, the use of a Sikora buffer pH will determine what amount of lime is needed. Information on the amount of lime to apply can be found in *Lime Needs in Minnesota* - http://www1.extension.umn.edu/agriculture/nutrient-management/nutrient-lime-guidelines/lime-needs-in-minnesota/docs/AG-FO-5956-B-1.pdf. Lime needs to be applied in a separate operation from phosphorus because the lime can react with the phosphorus fertilizer causing problems with availability of phosphorus to the plant. There are many materials that can be used as lime. The most common are dolomite and calcite; both are very good sources. Information on evaluating liming products can be found in *Liming Materials for Minnesota Soils* - http://www1.extension.umn.edu/agriculture/nutrient-management/nutrient-lime-guidelines/liming-materials-for-minnesota-soils/.

The amount of phosphorus and potassium needed are determined by a 6" sample. If the pH of the soil is greater than 7.4, the Olsen phosphorus soil test is used. If the pH is less than 7.4 the Bray phosphorus soil test should be used. Potassium needs are determined by the ammonium acetate soil test. Annual applications of phosphorus and potassium fertilizer, based on the results of a soil test, are suggested for the production of high-yielding alfalfa. In the year of establishment, the suggested rates of phosphate and/or potash should be broadcast and incorporated before seeding. For the first full year of production, repeat the application that was used for the seeding year. Soil samples should be collected again in the fall of the first full year of production. The amounts of phosphate and/or potash needed for the second and third production years can be based on the results of the soil test. Needed fertilizer can be applied in either spring or fall if soils are not sandy. Spring applications are suggested when soils are sandy.

Several research trials have clearly demonstrated that the use of sulfur (S) in a fertilizer program will increase the production of alfalfa grown on sandy soils. Recent research in northeast Iowa has shown positive yield responses to S on soils with organic matter concentrations of less than 3.0% in the top 6-8". These heavier textured soils can be found on side slopes and eroded spots in fields. In Minnesota, the soil test for S is only reliable for sandy soils. This soil test has no value for medium and fine textured soils. Sulfur is mobile in soils - especially sandy soils. When needed, this essential nutrient should be applied each year in early spring. The annual applications of S fit easily with annual applications of phosphate and/or potassium.

In Minnesota, boron (B) is the only micronutrient that might be needed in a fertilizer program for alfalfa. Soils in Minnesota contain adequate amounts of copper (Cu), manganese (Mn), iron (Fe), and zinc (Zn) for optimum alfalfa production.

Soils that have either marginal or deficient levels of B are limited to the state's east-central and northeastern regions. A soil test for B is available, but this test is recommended for use only in the two areas just mentioned. When needed, B fertilizers can be top-dressed to established stands. Because of the low rates of B needed, this nutrient should be broadcast with phosphate and/or potash fertilizers for best results. Boron is also mobile in soils and should be applied each year. This nutrient should not be applied directly to actively growing green tissue because some serious plant injury could occur. Boron fertilizers should never be applied to germinating seed.

More information on nutrient management can be found in *Fertilizing Alfalfa in Minnesota* - http://www.extension.umn.edu/distribution/cropsystems/DC3814.html.