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Idaho Fertilizer Guide

Irrigated Alfalfa In Southern Idaho

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The following fertilizer guidelines are based on relationships established between University of Idaho soil tests and crop yield response. The fertilizer rates suggested are based on research results and are designed to produce above-average yields if other factors are not limiting production. Thus, the fertilizer guide assumes use of good crop management practices.

The suggested fertilizer rates will be accurate for your field provided (1) the soil samples represent the area to be fertilized and (2) the crop history information supplied is complete and accurate.

Nitrogen

Nitrogen (N) fertilizer is generally not needed for alfalfa since a healthy alfalfa stand is capable of fixing adequate levels of N. Responses to applied N usually indicate the alfalfa stand is not effectively nodulated due to lack of proper seed inoculation at planting, or that the stand is aging.

Soils containing 20 to 30 pounds (4 to 7.5 ppm) of nitrate-nitrogen (NO_3-N) in the top 12 inches have sufficient N to establish a stand of alfalfa seeded alone. Adding fertilizer N at establishment reduces nodule number and nodule activity.

Establishing alfalfa with a companion crop is not recommended because the alfalfa stand typically is reduced by the excessive competition from the companion plantings. When growers plant alfalfa with a companion crop, both crops compete for the N. Under these conditions, N rates of 30 to 40 pounds per acre are suggested to establish alfalfa stands.

Phosphorus

Alfalfa responds well to applied phosphorus (P). The need for P fertilization can be determined by a soil test. Phosphorus materials should be broadcast and incorporated into the seedbed before planting.

For best results, P fertilizers should be applied on established stands in the fall. Rates of P relative to soil test levels are given in Table 1. The recommended application should be sufficient for 2 years of production.

Table 1. Phosphorus fertilizer rates based on a soil test.

Soil test* (0 to 12 inch)	Apply (P_2O_5)
(ppm)	(lb/acre)
0	160
3	120
7	60
over 10	0

*P test by $NaHCO_3$ extraction.

Potassium

Alfalfa has a high potassium (K) requirement. Recommended K fertilization levels are determined by soil test (Table 2). Broadcast and incorporate K at establishment or apply in the fall or early spring on established stands.

Table 2. Potassium fertilizer needs based on a soil test.

Soil test* (0 to 12 inch)	Apply (K_2O)
(ppm)	(lb/acre)
0	240
56	160
112	80
150	0

*K test by $NaHCO_3$ extraction.

Sulfur

Mountain valleys and foothill areas that receive higher amounts of precipitation and/or that are irrigated with low sulfur-containing water are likely areas for sulfur (S) deficiency. Areas irrigated with water from the Snake River or any water containing the sulfate (SO_4) form of sulfur should have an adequate amount of S.

Alfalfa and other legumes require more S than grasses. Plant tissue testing is an excellent tool for detecting S-deficient alfalfa. Samples should be analyzed for total N and total S. These values are used to calculate the nitrogen/sulfur ratio, which should be less than 15. When the ratio is greater than 15, an S deficiency is suspected.

Soils testing less than 8 ppm SO_4-S for 0- to 12-inch soil depth should receive 40 pounds S per acre. This rate of application should provide adequate sulfur for 2 years of production. Many southern Idaho soils contain accumulated S below the 12-inch depth. Although the 0- to 12-inch soil zone may be low in S (8 ppm), the soil below 12 inches may supply enough S for alfalfa production. Thus, testing the soil at both 0- to 12- and 12- to 24-inch depths is advised for a good S recommendation.

Fertilizer S sources include gypsum ($CaSO_4$) and elemental sulfur. S is also included in some N, P and K fertilizer materials. Elemental S must be biologically converted to the SO_4 form to be used by the plant. The rate of conversion depends on soil temperature, soil water content and particle size of the elemental S applied. To correct an S deficiency the year of application, use a fertilizer containing SO_4 as the readily available S source. Elemental S can be used to provide long term S release.

Micronutrients

Zinc (Zn) deficiencies on alfalfa have not been observed in Idaho. Crops such as beans, corn, potatoes and onions would normally exhibit Zn deficiency before alfalfa. Zinc applied to any of those crops would have sufficient residual for alfalfa.

Boron

Alfalfa is sensitive to low soil boron (B). B deficiencies have been observed in southern Idaho, but they are not widespread. Deficiencies normally occur on acidic soils (pH less than 7.0) and droughty (gravelly and sandy) soils. If the soil tests less than 0.25 ppm B, apply 1 to 3 pounds per acre of B. Do not use higher rates because B in excessive amounts is toxic to plants.

General Comments

1. Complete information on cultural practices necessary for alfalfa production is contained in University of Idaho Current Information Series 144, *Producing Maximum Yields of Irrigated Alfalfa Hay.*
2. Irrigation, weeds and insects can influence the effectiveness of a fertilizer application.
3. Alfalfa fields in southern Idaho frequently become yellow during the regrowth of the second and third crop. These fields have not responded to applications of fertilizer to correct this temporary yellowing condition.
4. Alfalfa can become a cash crop in the rotation by the application of needed management inputs such as water, fertilizer and pesticides and by timely harvesting. Alfalfa quality is enhanced by cutting at the early bud stage and more frequently during the growing season. This practice will reduce stand life, however.
5. Alfalfa hay should be analyzed to determine P content. Phosphorus is important for animal nutrition and can greatly influence animal performance and animal health. Fertilization can increase P content of forage.
6. Applications of S have been shown to reduce alfalfa selenium (Se) concentrations on soils low in available Se. Levels of Se above 0.1 ppm in the dry forage are considered adequate to prevent white muscle disease and other disorders related to limited Se forage.

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