



Northern Idaho Fertilizer Guide

Legume and Legume-Grass Pastures

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These fertilizer guidelines have been developed from research by the University of Idaho and Washington State University based on relationships obtained from 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 good management.

The suggested fertilizer rates will be accurate for your field provided that (1) the soil samples are properly taken and are representative of the field to be fertilized, and (2) the crop and fertilizer history supplied is complete and accurate. For help in obtaining a proper soil sample, see University of Idaho Extension Bulletin 704, *Soil Sampling*, or consult your Extension Agricultural Agent.

Harvested legumes and legume-grass mixtures remove large quantities of nutrients from the soil. Adequate fertilizer should be incorporated into the seedbed as it is prepared, and additional amounts should be applied periodically over the life of the stand.

Established Non-Irrigated Legumes and Legume-Grass Mixtures

Nitrogen (N), phosphorus (P), potassium (K), sulfur (S), boron (B) and molybdenum (Mo) are nutrients essential for plant growth that are often defi-

cient in northern Idaho pastures. Conversely, deficiencies of other essential plant nutrients copper (Cu), chlorine (Cl), manganese (Mn), iron (Fe) and zinc (Zn) are rare in northern Idaho pastures.

Nitrogen — Pure stands of legumes such as alfalfa, birdsfoot trefoil and clovers should not require commercial N fertilizer because legumes have the capacity to fix their N requirement if they are sufficiently nodulated with rhizobia. Efficiency of N fixation depends on adequate levels of other nutrients (especially S) and optimum soil pH (non-toxic levels of aluminum and manganese). Excessive soil acidity can interfere with nitrogen fixation.

Nitrogen fertilization is often beneficial when the pasture contains a legume-grass mix. When the legume stand is sparse and the grass stand is dense, apply 30 to 50 pounds of N per acre in the early spring. The lower rate (30 pounds/acre) should be used on sandy soils, while the higher application rate (50 pounds/acre) is recommended for finer-textured soils (loams, silt loams, silty clay loams, silty clays, clay loams). When legumes comprise up to 60 percent of the stand, annual N application rates of 10 to 25 pounds per acre are recommended. Excessive N applications in these situations will lower the percentage of the legume in the stand.

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

Soil test* (ppm P)	Rates of P ₂ O ₅ ** to apply for		
	1 year	2 years	3 years
0 to 2	60	100	125
2 to 4	40	60	80
4 to 8	20	30	40
over 8	0	0	0

*Sodium acetate extractable P in the 0- to 12-inch depth.

**P₂O₅ × 0.44 = P, or P × 2.29 = P₂O₅

Phosphorus — A soil test is needed to assess the P status of pastures. On established stands, fall or winter surface applications of P-containing fertilizers are preferred. Phosphorus may be applied on established stands in sufficient quantity to last for 2 or 3 years. Rates of P needed for optimum forage production, as determined by soil test, are shown in Table 1.

Potassium — Legume and legume-grass pastures remove large quantities of K from the soil. On established stands, fall or winter topdress applications of K are preferred. Most northern Idaho soils contain enough K for optimum forage production, but deficiencies can be found in localized areas. Potassium needs can be effectively determined with the aid of a soil test (Table 2).

Sulfur — Northern Idaho soils are often S deficient. An S deficiency in

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

Soil test*	Apply	
	K ₂ O	K**
(ppm K)	(lb/acre)	
0 to 35	80	65
35 to 75	60	50
75 to 100	40	33
over 100	0	0

*Sodium acetate extractable K in the 0- to 12-inch depth.

**K₂O × 0.83 = K, or K × 1.20 = K₂O

plants appears as a yellowing of the entire plant early in the growing season. This resembles a nitrogen deficiency. Yield and quality reductions can result from S deficiency.

Soils testing less than 10 ppm SO₄-S should receive 15 to 20 pounds of S per acre. Sulfur can be applied as gypsum or with liquid or dry fertilizer materials which contain S. Since S is mobile and subject to leaching in soils, S applications should be made in the early spring. Fall applications of S are not recommended.

Boron — Legumes have a greater boron (B) requirement than grasses. Consequently, in boron-deficient soils, the quantity of legume forage produced is reduced in relation to the grass yield. Legumes grown in northern Idaho will respond to B applications when soils are deficient. The need for B can be determined with a soil test. A soil testing less than 0.5 ppm of B should receive 1 to 2 pounds of B per acre. Boron should be broadcast and not banded. High concentrations of B are toxic and could damage the legume.

Use of borated gypsum is an effective and economical method of applying needed B and S. An application of 100 pounds of borated gypsum (1 percent B and 20 percent S) per acre would supply 1 pound of B and 20 pounds of S per acre. For more information on B and availability of specific fertilizer materials, see University of Idaho Current Information Series 608, *Boron in Idaho*.

Lime — On highly acid soils (pH less than 5.6), lime should be applied to obtain maximum legume yields. A

highly acid soil reduces the nitrogen-fixing potential of legume root nodules. Soil pH values above 5.8 are most desirable for legume production in northern Idaho. On the other hand, grass production in pastures is not adversely affected until soil pH values fall below 5.1. For more information on acid soils, see University of Idaho CIS 629, *Implications of Acidification of Farmland in Northern Idaho*, CIS 787, *Liming Materials*, and CIS 811, *Relationship Between Soil pH and Crop Yields in Northern Idaho*.

Established Irrigated Legumes and Legume-Grass Mixtures

The P, K, S, B and lime recommendations for irrigated legumes and legume grass mixtures are similar to recommendations provided for non-irrigated legumes and legume-grass mixtures. Nitrogen recommendations, however, are different. When the legume composes less than 60 percent of the stand, additions of N fertilizer will improve both forage quality and yield. Annual N applications between 60 and 80 pounds per acre are recommended. This recommended rate of N should be applied in split applications with one-half applied in the fall and the rest about the middle of June. If late growth is desired, apply an additional 20 to 30 pounds of N per acre in late July.

Where pasture yield potential exceeds 5 tons per acre, N application rates of 80 to 120 pounds of N per acre may be desirable. These high N rates will result in decreased competitiveness of the legumes, however, and may increase the incidence of grass tetany (magnesium deficiency) in the spring.

New Forage Seedings

Consider soil fertility needs before establishing new pastures. Both P and K are particularly important because these nutrients are immobile in the soil and are more available when worked into the seedbed before seeding. At establishment, 60 pounds of P₂O₅ per acre and appropriate amounts of potassium (rate based on soil test; see Table 2) should be worked into the seedbed.

Sulfur should be added when a need is predicted by soil testing. S does not need to be incorporated into the seedbed because it is mobile in soils and will reach plant root zones with normal precipitation. In addition, 20 to 30 pounds of N per acre will aid in legume establishment until the plants are able to fix their own nitrogen.

The legume should be inoculated with the appropriate strain of rhizobia inoculant, and the seed should be coated with molybdenum (Mo). For additional information on Mo, see University of Idaho CIS 589, *Molybdenum in Idaho*.

General Comments

1. Phosphorus (P), sulfur (S) and boron (B) are the elements most often needed in northern Idaho legume and grass-legume pastures. At times applications of nitrogen (N) and potassium (K) will also improve plant growth.
2. Since P and K are relatively immobile in soils, it is best if these nutrients are worked into the seedbed before seeding.
3. Molybdenum (Mo) should be applied in the seedcoat of legumes when the pasture is established.
4. Legumes grow poorly in soils with pH values less than 5.6. Under such situations lime may be necessary to correct soil acidity. The lime should be applied and incorporated into the soil before the pasture is established.
5. Acid soils and high levels of soil N will promote grass growth at the expense of legumes.
6. Use of N will tend to reduce legumes in a grass-legume mixture while use of P will tend to encourage legumes.
7. When seeding, select the best adapted legume and grass varieties for your area.
8. Legume-grass mixtures often yield higher than straight grass and have higher protein content.
9. S and N increase protein (quality) content of forages.