University of Idaho
College of Agricultural and Life Sciences

CIS 820

Northern Idaho Fertilizer Guide

Grass Seedings for Conservation Programs

by Robert L. Mahler

These fertilizer guidelines, developed by the University of Idaho and Washington State University, are based on relationships between soil tests and crop yield responses. The fertilizer rates suggested are based on research results and are designed to produce above-average grass stands with optimal ground cover if other factors are not limiting. Thus, the fertilizer guide assumes good management. Fertilizer recommendations may differ slightly with different grass varieties. Recommendations will differ drastically if legumes are included in the seeding mixture.

The use of a soil test is the best way to ensure the proper type and amount of fertilizer to be applied. Without a soil test an estimate of fertilizer needs can lead to improper fertilization.

The suggested fertilizer rates will be accurate for the field provided (1) the soil sample was properly taken and is representative of the areas to be fertilized, and (2) the crop and fertilizer history supplied is complete and accurate. For help in obtaining a proper soil sample, confer with the extension educator in your county.

Nitrogen

Nitrogen (N) is the most important nutrient for establishing and maintaining grass stands. Nitrogen, however, is not important for legumes in a grass/legume mixture. The higher the rainfall the more N needed (Table 1). Response to N is generally best when the fertilizer is applied as split applications, with some applied in the fall and some applied in the spring. Split applications also are more expensive, however; two separate applications nearly double the application cost. Thus, a single annual application is recommended. A fall application may be the most convenient because fall work demands may be less and soil conditions may be drier. Fall applications, however, may result in substantial overwinter losses of N through leaching, runoff, and denitrification. On the other hand, spring applications may be hampered due to wet soil conditions and time limitations created by heavy spring workloads.

The N fertilizer increases the vigor of the grass crop, which helps it compete with weeds. The increased grass vigor actually enhances control of weeds with herbicides.

Table 1. Nitrogen (N) fertilizer rates suggested for good stand vigor on established stands of grass.

Precipitation	Suggested N rate
(inches/year)	(lb/acre)
< 18	30 to 40
18 to 20	35 to 50
20 to 22	40 to 55
22+	45 to 60

Nitrogen is also necessary for grass seedling establishment. The rate required will depend on past cropping and fertilizer history. Nitrogen fertilizer recommendations for grass seedings range from 20 pounds N per acre when the previous crop was peas or lentils to 40 pounds N per acre for grass seedings when the previous crop was grain. When following cereal crops, an additional 15 pounds N per acre is needed for each ton of straw residue incorporated into the soil. A nitrogen application is not necessary for a grass seeding if the field is in fallow the year before seeding.

Phosphorus

Phosphorus (P) is important for seedling vigor and good root development. Phosphorus is most efficiently used when it is incorporated into the seedbed before seedling establishment since P is not mobile in soils. For established stands, P can be surface-applied in the fall. Phosphorus needs on established grass or on seedbeds before seeding can be determined effectively by a soil test (Table 2).

Table 2. Phosphorus fertilizer rates for grass seedings based on a soil test.

Soil test P (0 to 12 inches)[1]			
NaOAc	Bray I	$NaHCO_3$	P_2O_5 application rate[2]
----------(ppm)----------			(lb/acre)
0 to 3	0 to 30	0 to 11	30
3 to 6	30 to 60	12 to 18	15
over 6	over 60	over 18	0

[1] Soil test P can be determined by three different procedures: sodium acetate (NaOAc), Bray I method, or sodium bicarbonate ($NaHCO_3$). Sodium bicarbonate should not be used on soils with pH values less than 6.2. Use the column indicated by your soil test report.

[2] $P_2O_5 \times 0.44 = P$

Phosphorus is especially effective in enhancing vigor of legumes in a grass-legume mixture. Phosphorus also has the undesirable effect of enhancing the growth of broadleaf weeds, however.

Potassium

Potassium (K) is an important nutrient in grass production. Because potassium is relatively immobile in the soil, it should be applied at seeding and incorporated into the soil. For established stands, apply K as a topdress treatment in the fall. Most soils in northern Idaho contain sufficient amounts of K for maximum plant growth and yields. Consequently, K fertilizer will rarely be needed on fields in conservation programs in Idaho. However, the soil should be tested every 3 to 5 years for K. Potassium needs on established stands or seedbeds before seeding can be determined by a soil test (Table 3).

Table 3. Potassium fertilizer rates for grass seedings based on a soil test.

Soil test K (0 to 12 inches)[1]	K_2O application rate[2]
(ppm)	(lb/acre)
0 to 50	40
50 to 80	25
more than 80	0

[1] Sodium acetate-extractable K in the 0-to 12-foot depth.

[2] $K_2O \times 0.83 = K$

Sulfur

Adequate levels of sulfur (S) are necessary for good grass production. Sulfur is second only to N in importance for grass production. Without adequate S, the grass will appear light green to yellowish-green in color. This is similar to the appearance of plants having a shortage of N. Plants require S to use N efficiently.

Sulfur is usually more important than N in grass-legume mixtures. Since legumes in the mixture will symbiotically fix N for their own use as well as provide N for the use of the grasses in the mixture, the S fertility will be the most limiting factor.

Table 4. Sulfur fertilizer needs of grass seedings based on a soil test.

	S application rate	
Soil test S (0 to 12 inches)	Grass	Grass-legume mixture
(ppm SO_4-S)	(lb/acre)	(lb/acre)
0 to 10	15 to 20	25 to 30
over 10	0	0

Since S is mobile in soils, it is subject to leaching. Consequently, soil should be tested for S every year, especially in areas of annual cropping and high precipitation. In areas of summer fallow, soil testing for sulfur may only be necessary every other crop year. Sulfur needs based on soil test results are shown in Table 4.

Micronutrients

Responses of grasses to applications of micronutrients in Idaho are rare.

Boron —Boron (B) is most likely to give a response on legumes in a grass-legume mixture. In grass-legume stands, B should be applied only when soil test levels are less than 0.5 ppm B. When needed, the B should be surface broadcast at a rate not to exceed 1.5 pounds B per acre. Boron is not recommended for pure grass stands. For more information on B and specific fertilizer materials, refer to University of Idaho CIS 1085, *Boron in Idaho*.

Other micronutrients—Grasses have rarely been shown to respond to applications of zinc (Zn), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), or molybdenum (Mo). Therefore, applications of these materials for pure grass stands are not recommended. For a grass-legume mixture, the legume seed should be treated with Mo before planting. For more information on Mo, refer to University of Idaho CIS 1087, *Molybdenum in Idaho*.

Lime

Grass is more tolerant of low pH (acid) conditions than most other crops grown in northern Idaho. Legume crops are the most sensitive to low pH. Poor grass vigor will only occur when the soil pH is less than 5.0. Where soil pH is less than 5.0, lime applications of 1 to 1 ½ tons per acre should be considered for best grass vigor. For legumes, soils with pH values of less than 5.6 may need applications of lime to get vigorous growth. Lime must be incorporated into the soil to be effective, so it can only be applied with seeding establishment. Topdress applications of lime on established sod are not effective and are not recommended.

Fertilizer sources

All fertilizer sources of N, P, and K are equally good for grass seed production. Sulfate (SO_4^{2-}) forms of S are recommended over elemental S. Elemental S should not be considered as an S source because of its slow availability to plants.

Agronomy/Water quality considerations

- Fertilizers are best applied prior to seeding. After establishment the amount of fertilizer needed to maintain the grass stand is minimal. If soil testing or visual diagnostics indicate the need for additional fertilizer after the establishment year, only minimal amounts should be applied.
- Grass seedings for conservation programs are not planned for maximum yield. But good stands and strong plant vigor are necessary to obtain ground protection and erosion control and to provide competition for weeds.
- Care should be used to prevent overfertilization, especially with N. Since no crop can be harvested from the area, nutrient removal will be limited to leaching and runoff losses. Overfertilization can result in nutrient losses, which will contribute to pollution of the environment.
- Legumes in grass-legume mixtures do not require N fertilization. When properly nodulated, legumes have the capability of fixing their own N and also provide N for the grasses in the mixture.
- If grass-legume mixtures are planted, the legume seed should be treated with Mo and the proper *Rhizobium* inoculum. Proper inoculum are *Rhizobium trifolii* for clover, *Rhizobium meliloti* for alfalfa, *Rhizobium leguminosarum* for vetch, and *Rhizobium lupini* for birdsfoot trefoil.
- Using phosphorus fertilizer encourages both legumes and broadleaf weeds.
- Timely clipping of grass seedings can help to discourage weed competition.
- Nitrogen and sulfur are the two nutrients most responsible for vigor of grasses. Sulfur is the most important fertilizer nutrient for grass-legume mixtures.
- Nitrogen, especially in high amounts, can be detrimental in grass seeding establishment. Nitrogen in new grass-legume seedings may inhibit the nitrogen-fixing capacity of legumes.

Further reading

BUL 704, *Soil Sampling*, $2.00
CIS 811, *The Relationship of Soil pH and Crop Yields in Northern Idaho, 35 cents*
CIS 1085, *Essential Plant Micronutrients: Boron in Idaho*, $3.00
CIS 1087, *Essential Plant and Animal Micronutrients: Molybdenum in Idaho*, $1.00

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CIS 447, *Alfalfa*
CIS 453, *Winter Wheat*
CIS 785, *Winter Rapeseed*
CIS 788, *Bluegrass Seed*
CIS 815, *Blueberries, Raspberries, and Strawberries*
CIS 820, *Grass Seedings for Conservation Programs*
CIS 826, *Chickpeas*
CIS 851, *Legume and Legume-Grass Pastures*
CIS 853, *Grass Pastures*
CIS 911, *Northern Idaho Lawns*, also available in print for $1.00
CIS 920, *Spring Barley*
CIS 954, *Winter Barley*
CIS 1012, *Spring Canola*
CIS 1083, *Lentils*
CIS 1084, *Spring Peas*
CIS 1101, *Soft White Spring Wheat*

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