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Fertilizing Pasture and Hayland

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Phosphate fertilizer increased net crop return by almost 40% on this field of alfalfa.

↑ WITH FERTILIZER
← NO FERTILIZER

Cooperative Extension Service
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Fertilizing Pasture and Hayland

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Forages are essential to South Dakota agriculture because they provide much of the feed for livestock enterprizes. Nearly three-fourths of South Dakota's land is used for pasture and hay production. It is estimated that less than 1% of this forage area is fertilized compared to fertilizer-use on 15% of the corn acreage.

Frequently overlooked is the fact that 5 tons of quality alfalfa is equivalent in feed value to about 113 bushels of corn, 104 bushels of wheat, or 223 bushels of oats. Equivalent amounts of good grass forage compare favorably to alfalfa in total digestible nutrients (T.D.N.).

Proper fertilization is a key factor in producing high quality livestock feed. It also extends the productive life of fields seeded to some forages.

Not all grasses can be fertilized profitably, however.

Here are some advantages you can expect from properly fertilized forage crops:

- Increased forage yield.
- Increased seed production of forage plants.
- Earlier spring grazing.
- Later fall grazing.
- Increased nutritive feed value.
- Increased efficiency of water-use by plants.

Important increases in forage yields and protein content from fertilizer use have been demonstrated by research in South Dakota and neighboring states.

For example, here's what 60 pounds of actual nitrogen per acre did for crested wheatgrass in Lyman County:

- Nearly doubled the hay yield (from 1,480 to 2,760 pounds per acre).
- Protein content of harvested hay was boosted (8.4% protein for unfertilized, 10.7% for fertilized).

Likewise research shows significant alfalfa yield increases from fertilizer use, particularly those containing phosphate. Alfalfa in Grant County fertilized with 60 pounds per acre of actual phosphate (P_2O_5) yielded about 1,800 pounds more forage per acre than that not fertilized. Such yield increases are more likely on soils testing low in available phosphate.

Grasses differ from legumes in their nutrient needs. As a result, recommended fertilization practices also differ. Both grasses and legumes require all of the essential plant food elements for most favorable growth. Basically, however, grasses — particularly the cool season varieties — respond to nitrogen fertilization whereas legumes respond primarily to phosphorus and in some cases to potash fertilization. Soil testing is a reliable guide in determining the best rates of fertilizer to use. Fertilizing is not a substitute for adequate moisture and proper management, but plants use available water more effectively when high soil fertility exists.

Research has not clearly proven any particular advantage to spring or fall fertilizer application as far as its effect on yield or protein content. One advantage of fall fertilizer application is that of earlier spring grazing.

LEGUMES

Fertilizing at Seeding Time

Stand, seedling vigor and eventual yield can be improved by using fertilizer at seeding time. This practice can mean the difference between a stand and essentially no stand where soil fertility levels are very low. The preferable application method is to apply starter fertilizer at seeding time with a fertilizer attachment on the grass seeding implement. Fertilizer may also be broadcast on or near the soil surface at seeding time; however, increased weed competition may decrease growth rate of newly seeded legumes and grasses. This is particularly true if the fertilizer contains a high percentage of nitrogen. Band placement of starter fertilizer about an inch directly below the seed gives more effective fertilizer use by new seedlings yet minimizes benefits to weeds. Occasional weed clipping may be necessary if serious competition restricts new seedling growth.

Fertilizer rates at seeding time should be based mainly on the available plant nutrients in soil. Soil tests are effective ways to determine these existing soil fertility levels.

Fertilizers containing nitrogen and phosphate in one-to-four ratios (i.e. 11-48-0, 8-32-0), are well suited for use as a starter. Table 1 shows fertilizer rates to be used at seeding time depending on soil test level. For example, a soil testing *medium* in phosphorus and *very low* in potassium would require a fertilizer application rate of 40 pounds of phosphate (P_2O_5) and 80 pounds of potash (K_2O) per acre for a new legume seeding, with the nitrogen application being one-fourth the rate of phosphate, or 10 pounds of nitrogen (N).

Fertilizing Established Stands

Phosphate and potash, but no nitrogen should be used when fertilizing established stands of legumes.

Table 1. Recommended Dryland Fertilizer Rates. Establishing New Legume Seedings

Soil Test	Fertilizer—Lbs./A. N*	P_2O_5	or P	K_2O	or K
Very Low	—	60	26	80	66
Low	—	60	26	60	50
Medium	—	40	18	45	37
High	—	0	0	0	0

*Regardless of the soil test for organic matter (nitrogen availability), apply nitrogen at ¼ th the phosphate application rate.

The reason for not using nitrogen is that the nitrogen supplying ability of legume seedlings is nil but mature legume plants can adequately provide nearly all of the plant's nitrogen needs. Seed innoculation at planting time helps provide mature legume plants with active bacteria which can supply the needed nitrogen from the air rather than from the soil. Phosphate and potash fertilizer rates for established legume stands should be based on soil test results as listed in table 2.

Fertilization for Seed Production

Proper fertilization can increase seed production. Fertilizer rates for established legume seed fields would be the same as those for forage production (table 2).

Table 2. Recommended Dryland Fertilizer Rates. Established Legume Stands—Hay and Pasture*

Soil Test	Fertilizer—Lbs./A. N*	P_2O_5	or P	K_2O	or K
Very Low	0	60	26	80	66
Low	0	60	26	60	50
Medium	0	40	18	45	37
High	0	0	0	0	0

*Apply fertilizer every other year unless yields exceed 3 tons per acre, then apply fertilizer every year.

GRASSES

Fertilizing established grasses is different from fertilizing legumes because grasses do not obtain nitrogen from the air. For this reason, nitrogen should be supplied from other sources, such as commercial fertilizer, to increase forage production. Phosphate and potassium, although necessary for best yields, are generally required by the plant in somewhat smaller amounts than nitrogen. Here again soil tests can help determine such needs.

Fertilizing at Seeding Time

Proper fertilization also improves grass seedling vigor and stands. Use of starter fertilizer is a recommended practice for new grass seedings. It can be applied with an attachment on the seeding equipment or by broadcasting. New grass and legume seedlings initially have about the same nutrient needs. Recommended fertilizer rates and application methods for new grass seedings are the same as those for new seedings of legumes (see table 1).

Fertilizing Established Stands

Grasses are classed as cool season or warm season, depending on what part of the growing season major growth takes place. Commonly grown cool season varieties include smooth bromegrass, intermediate wheatgrass, crested wheatgrass, western wheatgrass, Reed canarygrass, Russian wildrye, green needlegrass and bluegrass. Warm season grasses include switchgrass, Indiangrass, the bluestems, the grama grasses, buffalo grass and others. Nearly all cool season grasses respond profitably to fertilizer while most warm season grasses do not, with the exception of switchgrass and sudangrass. Major growth by cool season grasses is in the early and late parts of the growing season when moisture is less likely to be limiting and mineralization or release of soil nitrogen is slower. These factors, plus differences in plants themselves, usually make nitrogen fertilization of cool season grasses profitable.

Sod-bound conditions can occur in older pure grass stands where few or no legumes, manure or nitrogen fertilizer have been used. Adequate nitrogen fertilizer use can prevent and correct such conditions. Tearing up old sod apparently gives no permanent correction of the problem.

Fertilizer rates for cool season grasses range from 40 to 60 pounds per acre of actual nitrogen, depending on expected rainfall during the growing season. Good stands of cool season grasses in the eastern quarter of South Dakota need 60 pounds of actual nitrogen per acre, applied in very late fall or early spring for best results. Normally little or no nitrogen will be lost from fall or spring applied fertilizer. Occasionally, however, losses occur on sloping land where fertilizer has been spread on frozen soil or snow and rains or thawing results in heavy surface-water runoff. The 40- to 50-pound rate per acre of nitrogen should be applied in western counties where forage yields may be restricted by limited rainfall. Phosphate and potash may be used for established grass where soil tests indicate low nutrient levels of these elements. See table 3.

Many pastures contain mostly Kentucky bluegrass. It's yielding potential is lower than that of other cool-season grasses. Thus, fertilizer application rates, consisting mainly of nitrogen, should be reduced to about 60% of those rates in table 3 recommended for other cool season grasses grown in the same area.

Generally warm season grasses do not respond as much as cool season grasses to fertilizer in terms of total increased forage. However, there are two possible exceptions — switchgrass and sudangrass. These

two varieties respond to fertilizer nearly like cool season grasses and, therefore, should be fertilized as such (see table 3).

Table 3. Recommended Dryland Fertilizer Rates. Established Grass Stands—Forage

Soil Test	Fertilizer—Lbs./A. N	P_2O_5 or P	K_2O or K
Very Low	40 to 60	20 9	80 66
Low	40 to 60	20 9	60 50
Medium	40 to 60	0 0	45 37
High	40 to 60	0 0	0 0

Seed Production

Fertilizer — especially nitrogen — helps increase grass seed production. Fertilizer should be applied at the rate of 40 pounds actual nitrogen per acre in lower rainfall areas of South Dakota and up to 60 pounds in higher rainfall areas during late September or early October of the year before seed harvest. Additional phosphorus, and in some cases potash, may also be needed for top seed production on fields suspected of having unusually low fertility. Phosphorus and potash may be applied at the same time with nitrogen as a mixed fertilizer at rates shown in table 4, based on soil tests.

Table 4. Recommended Dryland Fertilizer Rates. Grass Seed Production

Soil Test	Fertilizer—Lbs./A. N	P_2O_5 or P	K_2O or K
Very Low	40 to 60	30 13	80 66
Low	40 to 60	30 13	60 50
Medium	40 to 60	0 0	45 37
High	40 to 60	0 0	0 0

GRASS-LEGUME MIXTURES

Fertilizing new seedings or established stands of grass-legume mixtures is as important as fertilizing pure stands of either.

Fertilizing at Seeding Time

The same fertilizer rates are recommended for new seedings of mixed stands as are used in pure legume or grass stand establishment. For the particular type and amount of fertilizer see table 1.

Fertilizing Established Stands

Applying phospate and potash fertilizer to mixed stands frequently increases legume vigor and growth more than that of the grass. More legume growth, however, permits greater nitrogen fixation by the legume, thus assuring more available nitrogen for increased growth and vigor of the grass. This effect is more likely to occur where the forage stand consists of more than 35% legumes. Fertilizer application rates correspond to those in table 2 and vary from 40 to 60 pounds of phosphate (P_2O_5) and 45 to 80 pounds of potash (K_2O) depending on soil tests.

Where mixed legume-grass stands contain predominately grass vegetation, maximum forage yields will be obtained by applying fertilizer containing nitrogen. Fertilizer rates under these conditions vary from 40 pounds in areas where limited rainfall may restrict yield, to 60 pounds in extreme eastern South Dakota as found in table 3. Eventual loss of the limited number of legume plants in such a stand should be expected where straight nitrogen is used. If the legume plants are to be kept in the stand, some phosphate and potash should be applied with nitrogen fertilizer.

FERTILIZING IRRIGATED FORAGE

Irrigation can provide substantially greater forage yields — but a correspondingly greater amount of plant food is also required. The ratios of nutrient demands of irrigated plants differ little from those grown under dryland conditions; however higher rates of fertilizer should be used.

Phosphate and potash application rates for established irrigated forage should be increased 30% over those recommended for the same dryland conditions. For example, a recommendation for established dryland forage, calling for 0+60+30, should be increased to 0+80+40 if the same field is to be irrigated. Nitrogen application rates for established irrigated grass to be harvested for forage should be increased two to three times over those for similar dryland conditions. For example, a recommendation for established dryland grass forage, calling for 60 pounds of actual nitrogen per acre, should be increased to 150 pounds under irrigated conditions. This 150-pound rate should be a split application, half of it in early spring and the other half immediately after the first cutting.

Read these Fact Sheets for additional information on stand establishment, utilization and improvement of grasslands:

Interseeding for Pasture Improvement ● Planting Tame Pasture & Hayland ● Grasses for Pasture and Hayland ● A Pasture System For You ● Grazing Management Based on How Grasses Grow ● Weed Control in Pasture & Hayland ● So. Dak. Range — its Nature and Use ● "Proper" Range Use ● Reseed Native Range Grass? or Plant a Tame Pasture? ● Range Seedings ● Graze Longer and Feed Less Roughage ● My Rangelands — What Kinds? How Good?

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