Saskatchewan
Soil Conservation
Association

Soil Facts

Rejuvenating Forages

It is often considered necessary to re-seed pastures or hay lands once they have become unproductive. Traditionally that has meant ripping up the forage. This is not only time consuming, but also costly. But when was the last time the field was soil tested? Fertilized? Had some manure spread on it? Been allowed to rest? Often the answer is "not for awhile." Tame pastures and hay land are no different than any other crop. They require balanced fertility for good performance. Maintaining good fertility and providing timely rest periods costs far less than the operations required for re-seeding.

Figure 1. Nitrogen fertilizer applications in mixed grass/legume stands favours grass production which can alter the stand mix.

Generally forage stands have high production in the first few years after their establishment. However the productivity of perennial forage stands tends to decline over time as nutrients, nitrogen in particular, become tied up in plant biomass or nutrients are removed via grazing or haying of the forage. The decline can be accelerated by a number of factors such as drought, salinity, poor fertility, winter injury or long-term management problems that allow the loss of desirable species.

Desirable species, good nutrition, and proper rest when grazing are critical to ensure quantity as well as quality of the forage.

Fertilization

The first step in the rejuvenation process is to decide if the plant population is still adequate; are there sufficient numbers of the desired plant species? Does the forage stand have more than 50% of the original seeded species? Fertilization of stands that are severely abused or depleted will not have the desired impact. Many of the invading species do not provide enough yield or quality to cover the cost of fertilization.

If the forage stand is determined to have the desired species, fertilization can be an effective tool for rejuvenation. Disappointing forage yields are most often caused by depleted fertility, specifically nitrogen. When tillage is used to break up old forage stands, nutrients that were tied up in the organic matter are released. The release of nutrients is simply a short-term benefit, however. Through haying or grazing more nutrients are removed from the land than are replaced.

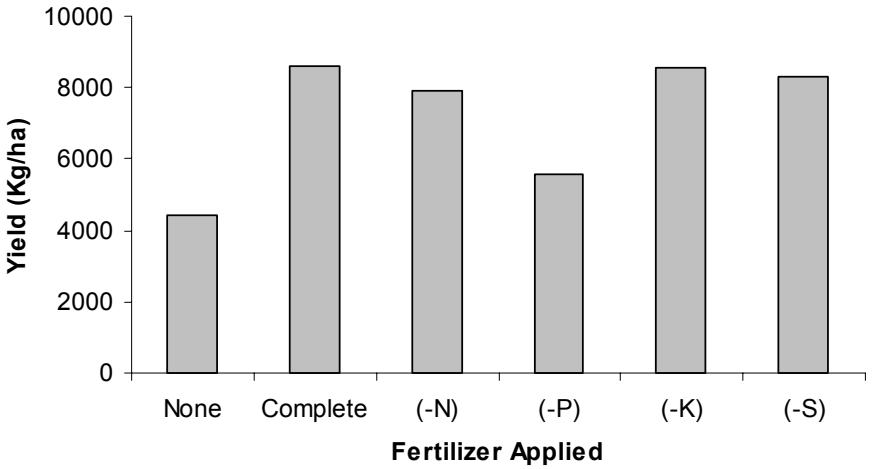
Applying nitrogen (N) to a forage stand usually results in increased forage yield, improved soil organic matter, and even extended life of the stand. Grass stands respond well to nitrogen if moisture is not limiting. Phosphorus (P), is also an important nutrient for stands four years or older. Potash (K) and sulphur (S) may be needed, especially on sandy and gray-wooded soils. No nitrogen fertilizer is required for fields with alfalfa and sweet clover if the seeds were inoculated with nitrogen fixing bacteria. Legumes however, do require higher levels of P, K and S for effective N fixation. A soil test is the best way to determine the level of each nutrient present in the soil.

It is usually better to band fertilizer below the soil surface than to broadcast it on the surface. Using a

coulter drill is effective for not only banding the fertilizer, but also providing minimal disturbance to the forage stand. Banding will reduce losses of nitrogen to the atmosphere, and increase the effectiveness of phosphorus due to its slow mobility in the soil. Banding should be done when plants are dormant. It is also better done when the soil is moist, to minimize root disturbance and plant injury.

To maintain consistent forage yields each year, nitrogen may need to be applied every year. However it may be possible to apply higher applications of P, K, and S every three to four years according to soil test recommendations.

Figure 2: Effect of Fertilizer on Total Yield of Mixed Forage. Fertilizer Applied annually at a rate of 100 kg/ha of N, 50 kg/ha of P, 90 kg/ha of K, and 30 kg/ha of S. Jerome Lickacz, Alberta Agriculture. (Mayerthorpe 1997-2000)



Fertilization tends to favour seeded tame grasses. They typically respond with greater growth than native species. Through fertilization, tame grasses become more vigorous and competitive.

In mixed legume/grass stands, N fertilization reduces nodulation of the legumes thereby decreasing their ability to fix atmospheric N. The grasses are able to use soil nitrate more effectively than the legumes and thus become more competitive against the legume (Figure1). The result can be a reduction of the legume component of the stand.

Recent surveys suggest that most farmers do not fertilize forages. While some research suggests that fertilizer may not result in economic yield increases in dry years, most of this fertilizer will remain in the soil and be available for future years. Research from Alberta found that forages do respond to fertility, but it is not always N that is the problem (Figure 2 and 3). In the figures below, each field has a different history resulting in different nutrient deficiencies. The key is addressing their requirements appropriately. A soil test can be an integral component in properly meeting the needs of the forage.

A novel approach to fertilizing forages is infield feeding. Cattle do not use a lot of nutrients in their feed. Research has found that feedlot yearlings only retained 10 % of the N, excreting the remaining 90 %. The excreted N is then susceptible to loss by volatilization. By feeding cattle infield these N losses can be reduced.

When infield feeding was compared to cattle fed in the corral (using traditional methods), Jungnitsch et al., (2005) found feed costs to be similar. But infield feeding provided savings in machinery use and manure handling costs, and gains in pasture productivity. Concentration of nutrients followed bedding and feeding patterns and appeared to be due to the capture of urine nutrients that had been lost when the cows were fed in the corral.

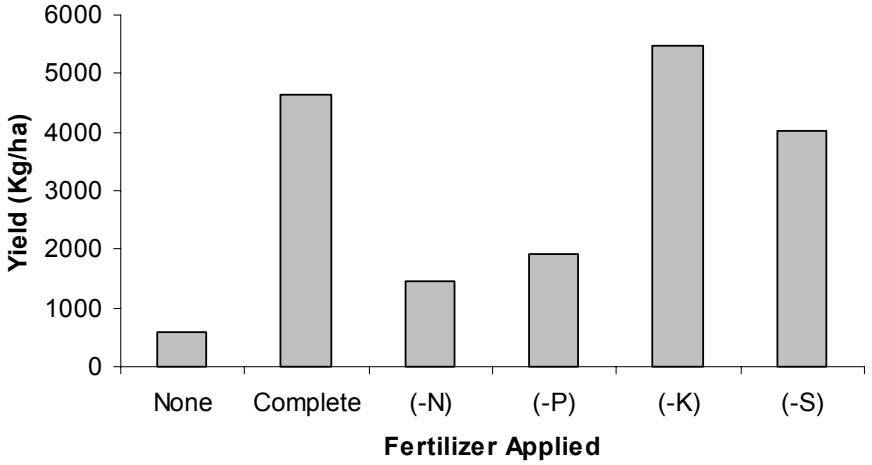
Jungnitsch et al., (2005) found grass growth was increased in all their manure treatments, both with infield grazing and when equivalent amounts of raw and composted manure were spread on the pasture. Growth in the spread manure areas was early and even, with composted manure giving a noticeable gain over the raw manure. On the pasture where cattle were fed infield forage, growth was later but stronger and held its quality much later in the year.

Sod Seeding

If improving the fertility status of the stand is not likely to improve its productivity, then it may be time to reseed. Plant densities have become too low and/or perennial weeds too numerous. Re-seeding is also one way to introduce more legumes into a grass stand.

The first step in sod seeding is to remove the existing vegetation. Traditional breaking and reseeding can expose the soil to erosion and loss of wildlife habitat. These methods can cause establishment failures, several years of lost production and increased costs to the producer. Using minimal disturbance methods not only prevents erosion but also generally reduces fuel and labour.

Figure 3: Effect of Fertilizer on Total Yield of Pasture. Fertilizer Applied annually at a rate of 100 kg/ha of N, 50 kg/ha of P, 90 kg/ha of K, and 30 kg/ha of S. Jerome Lickacz, Alberta Agriculture. (Mayerthorpe 1997-2000)



Coulter drills do an excellent job of sod seeding. The key is to penetrate the litter layer and place the seed at a constant shallow depth.

Success is dictated by a number of factors:

1. Good moisture conditions.
2. Killing out existing vegetation.
3. Sod seeding soon after herbicide treatment.
4. Quick emergence of the forage seedlings.

When deciding what to re-seed, think of adding legumes to the mix. It is well established that grass-legume mixtures will produce more dry matter than grasses alone. The difference is most pronounced during drier seasons. The deep-rooted legumes such as alfalfa are able to take advantage of sub-soil moisture reserves. The quality of the forage will increase relative to the proportion of alfalfa in the stand. Introducing alfalfa into pasture fields does increase the risk of bloat.

Even a pasture with a good grass stand may need to get more legumes into the mix.

There are three primary benefits to adding legumes to a forage stand:

1. Legumes increase the total yield of forage per acre.
2. Legumes improve forage quality over grass alone.
3. Legumes can fix their own nitrogen requirements.

When rejuvenating a forage stand dominated by grass with legumes, don't apply N. More N stimulates grass growth, which in turn increases the competition to the establishing legumes. The burnoff prior to seeding is not to kill out the grass completely. It is simply to suppress the grass to minimize the competition to the young legume seedlings. Paraquat or glufosinate ammonium may be an option compared to using glyphosate. Also make sure the legume is inoculated to encourage maximum N fixation.

Finally, continue to control the grass and weed competition. The grass should be kept short using grazing or mowing until the legume plants reach 3 to 4 inches. Once the animals start to bite off young legume leaves, it's time to stop grazing for several weeks to allow the new plants to become established. The key is to not overgraze during the establishment year.

Summary

Sod seeding is an effective alternative to traditional breaking and reseeding methods. As in any forage establishment, moisture is the key ingredient for success. Thus the burnoff to control existing vegetation will be an integral part of any success or failure. Quick forage establishment is crucial for success.

Improving and maintaining soil fertility in forage stands is important for the optimization of forage and livestock production. High yielding and high quality forages require large amounts of nutrients. These nutrients must either come from the soil, the air, or as manure or fertilizer. Developing a nutrient management plan that includes regular soil testing and early spring fertilizer applications will ensure sustained productivity into the future.

Developing a planned grazing system is key to maintaining the desired species. Adequate fertility combined with planned rest will increase the condition of the forage stand.

Sources

Jungnitsch, P, J.J. Schoenau, H.A. Lardner, and T. Highmoor. The Effect of Winter Feeding Systems on Nutrients, Forages, Cattle and Economics. Soils and Crops Workshop, 2005

For More Information
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