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Improving Pasture with Frost Seeding

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Introduction

Pasture renovation can be accomplished through a variety of methods. Although conventional tillage, minimum tillage and no-tillage usually have higher rates of success and reliability (see OSU Extension Fact Sheet AGF-002-92), frost seeding is a less expensive option that can be used to renovate pastures. The practice of frost seeding has long been used by forage producers as an effective means to improve pasture yields or change forage species composition. Frost seeding is a relatively low-cost practice that, when implemented at the correct time and managed properly, can yield successful results.

Steps for Successful Frost Seedings

1. Site Selection

Frost seeding can be used at any geographical location but is particularly effective where tillage can create potential erosion problems (fields with light soils or slopes greater than 10%). Sites where maximum seed-to-soil contact can be achieved are essential. Thinning grass stands have been a preferred site to use frost seeding. A bunch-type grass, such as orchardgrass, offers a more favorable environment for frost seedings than does a sod-forming species, such as bluegrass. Regardless of the current grass species present, the site should be closely grazed in the fall or winter to open the stand and expose soil. A chain drag or light disking can also be used to help open the stand. This will increase the opportunity for seed-to-soil contact.

2. Soil Fertility

Proper soil pH and fertility are essential for efficient forage production. Soil tests should be taken every 2 to 3 years to determine nutrient status. Tests should be taken at least six months prior to seeding to allow for corrective measures.

For optimum production, soil pH should be maintained above 6.0. Regardless of the seeding method used, corrective applications of phosphorus and potassium should be applied prior to seeding. If you are frost seeding a legume, applications of nitrogen should not be made the year of the seeding because of the potential for increased competition from grasses.

Frost seeding should not be considered as a substitute for poor fertility management. If a poor pasture is the result of low fertility, frost seeding will not remedy this situation.

For more information on fertilizer recommendations for forages, consult Extension Bulletin E-2567, *Tri-State Fertilizer Recommendations for Corn, Soybeans, Wheat, and Alfalfa*.

3. Species Selection

Historically, most frost seedings have been made to introduce or increase a forage legume species into an established grass stand. The producer needs to select the legume best suited to the soil conditions and intended use.

Forage quality is improved when legumes are added to grass stands. Quality improvement is seen in increased palatability, intake, digestibility, and nutrient content. Research has proven that legumes will improve animal growth rates, milk production, and reproductive efficiency.

Red clover has widely been accepted as the legume of choice for frost seeding. Red clover has high seedling vigor and is somewhat tolerant of a wide range of conditions relating to pH and fertility, drainage, and drought. While work is being done to improve the persistence of red clover varieties, it must be treated as a biannual and will probably require reseeding every two years.

Red clover has proven highly effective as a means to improve the productivity of fescue stands. Fescue is recognized for its vigorous seedlings, responsive growth with adequate fertility levels, and as a superior species for use in stockpiling programs. However, fescue is also associated with complications arising from infections of the endophyte fungus, poor palatability, and low production in the summer months.

Research has shown the benefits of introducing red clover to grass stands. Research conducted at the University of Kentucky (Taylor et al, 1978) compared renovating a fescue pasture using red clover at 6 lbs/acre compared to fertilizing the grass with 90 or 180 lbs/acre of nitrogen. Red clover growth with fescue produced higher yields than fescue fertilized with nitrogen at either level. Studies referenced by Lacefield et. al. in University of Kentucky Fact Sheet

AGR-26 showed increased rate of gain in cows and calves grazing fescue pasture seeded with red and ladino clover when compared to pastures supplemented with 150 lb/acre of nitrogen.

Other legumes can be added to grasses through frost seeding. Birdsfoot trefoil is difficult to establish but is bloat-free and when established, does well in a wide range of conditions. Ladino clover will last somewhat longer than red clover, but is less tolerant of low fertility, drought, and overgrazing. Alfalfa has been frost seeded with highly variable rates of success. This, combined with the high cost of alfalfa seed, makes it a less desirable option for frost seeding.

Regardless of the species, all seedings should be made with high quality seed. While frost seeded is an economical practice, there is no justification to use low quality seed. The economics will be in favor of high quality seed when you consider the entire lifetime of a stand.

There is less experience with trying to establish cool-season grasses through frost seeding. It does appear that grasses do not establish with the same level of success as do legumes. Broadcasting grass seed can present some problems when mixed with legume seed, as the grass seed will not spread as far. Therefore, it is recommended that grasses be seeded separately from legumes when using a broadcast seeder. Minimal work or success rates have been reported with attempts to add grasses to established grass stands through frost seeding.

Work done at the University of Wisconsin (West and Undersander, 1997) compared frost seeding establishment of several cool-season grasses into older established alfalfa stands. Results from this two year trial showed that perennial ryegrass and orchardgrass exhibited the best establishment success, while reed canarygrass and timothy had the least success.

4. Seeding Rates

Forage Species	*Seeding Rate (lb/A)*
Red Clover	8
Birdsfoot Trefoil	6
Ladino Clover	1 to 2
Alsike Clover	3 to 4
Alfalfa	10
Annual Lespedeza	15
Orchardgrass	2 to 5
Perennial Ryegrass	3 to 5
Kentucky Bluegrass	(Not recommended)
Timothy	(Not recommended)
Tall Fescue	(Not recommended)
Reed Canarygrass	(Not recommended)
Smooth Bromegrass	(Not recommended)

Source: Ohio Agronomy Guide, OSU Extension Bulletin 472

These stated seeding rates are based on traditional establishment methods. Frost seeding may require higher seeding rates depending on the given location and desired level of production.

5. Seeding Time and Method

The basic principal behind frost seeding is the "honeycombing" action that is created by alternating freezing and thawing cycles in late winter. This activity helps to incorporate broadcast seed into the soil surface. To take advantage of these environmental changes, frost seeding should occur in Ohio from February 1st through March 15th (earlier in southern Ohio, later in northern Ohio). The trampling effect of high livestock densities can also be effective to ensure seed-soil contact. Use caution when frost seeding on top of snow as rapid meltdown of snow may result in the runoff of seed.

Frost seeding can be accomplished with any broadcast type seeder. Tractor 3-point hitch mounted seeders have been typically used. In recent years, seeders mounted onto all-terrain vehicles (ATVs) such as four-wheelers have become a popular choice for seeding.

6. Seed Treatments

Seed treatments containing nitrogen-fixing rhizobia bacteria are widely available for most common legumes. Rhizobia do survive in soil, so if the legume of interest is present in low amounts in the field to be seeded, rhizobia coating is usually not required. If the legume is not present in the pasture, then a rhizobia seed coating is recommended.

7. Post-Seeding Management

Once a new species has been introduced into an existing forage stand, steps must be taken to maintain them. Sound management practices for maintaining a renovated forage stand include:

- Follow a fertility program based on soil test recommendations to ensure that adequate levels of pH, phosphorus, and potassium are present. Do not use nitrogen if an adequate stand of legumes are present (greater than 35%). Excessive nitrogen rates (higher than 75 lb. N/acre) will increase competition from grasses and weeds.
- Mow or graze pastures as needed to remove excessive grass growth and control weeds and woody vegetation. Grazing management in the first year after seeding is critical to minimizing competition from the existing vegetation. New seedlings are very sensitive to shading by established plants.
- Avoid overgrazing by leaving a minimum of 2 to 3 inches of top growth at all times. Frost seeded pastures will require closer attention to grazing management than established pastures. Use rotational grazing to increase the chances of success.

Summary

Frost seeding can be an effective, economical means of introducing a new forage species to an existing forage stand or to maintain the current composition of a stand. This practice has been very useful for helping farmers reduce the effects of endophyte-infected fescue. Frost seeding is frequently implemented where tillage is not a viable option because of erosion concerns. Desired results can be obtained when attention is paid to site selection, fertility, species selection, seeding rates, seeding times and method, and post-seeding management.

Bibliography

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