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Michigan State University Extension Service
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August 1989
4 pages

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Improving Pastures in Michigan by Frost Seeding

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Frost seeding — sometimes referred to as snow seeding or overseeding — can be used to establish legumes in existing grass pastures, and to improve forage palatability and yield. Frost seeding is not new in Michigan. Many cash crop producers in the Saginaw Valley area have been using this technique for seeding legumes into winter wheat in early spring. The freezing and thawing of the soil, combined with early spring rains, help the germination of the broadcast legume seeds. The key to success with this method is to seed at the proper time and follow up with rotational grazing or mowing to reduce grass competition.

It is possible that grasses could also be established with this method, but there has been little recent experience or research with grasses in Michigan. Generally, you can winter seed grasses any time after mid-November.

Research results and experience in Michigan

Results from research conducted in Michigan has shown that grass suppression is vital for seedling establishment and yields when legumes are frost seeded into grass sods. In frost seeding with four cuts versus drilling into a sod, using a herbicide for grass suppression, results for seeding establishment and yield were comparable for both red clover and birdsfoot trefoil (Tables 1 and 2). Red clover either drilled or frost-seeded showed dramatic reduction in yield in the third year of growth, while birdsfoot trefoil yields sharply increased in the third year. This indicates that trefoil needs a longer establishment period and possesses a more perennial nature than red clover. Red

clover needs to be seeded every other year since it is a short-lived perennial.

Since the early 1980s, many livestock producers have used frost seeding as an inexpensive method to improve pastures. The use of intensive grazing has worked particularly well with frost seeding, because this method of grazing provides good grass suppression.

Research and farmer experience have shown frost seeding of red clover and birdsfoot trefoil to be a low cost, satisfactory method of pasture improvement when competition of grass in the seeding year is reduced by either repeated mowing or rotational grazing.

Legume selection and seeding rate

Both research and producer experience in Michigan have shown red clover and birdsfoot trefoil to be the best choices for frost seeding. Seedlings of both species can tolerate the lower temperatures in the early spring better than alfalfa seedlings.

Red clover has good seedling vigor and is one of the easiest legumes to establish. It is also tolerant to slightly acidic and somewhat poorly drained soils. However, red clover will only last two years since it is a short-lived perennial.

Birdsfoot trefoil is slow to establish but is one of the most long-lived pasture legumes grown in Michigan. It can adapt to a wide range of soil conditions, such as low soil pH and poor soil drainage. Additionally, it does not cause bloat in feeding animals. Red clover and birdsfoot trefoil are often seeded together; red clover provides quick establishment and yield in the first two years, and birdsfoot trefoil contributes more to

the stand and yield in the third year as the red clover suffers stand losses.

Red clover broadcast alone should be seeded at 12 lbs. per acre, while birdsfoot trefoil alone should be seeded at 8 lbs. per acre. If seeded together, the rates should be about 8 lbs. per acre for red clover and 4 lbs. per acre for trefoil.

Steps for successful frost seedings

1. Site selection. Select a closely grazed grass pasture with a loam, silt loam, or sandy loam soil. Frost-seed into established pasture grasses such as bluegrass, orchardgrass, timothy or bromegrass. Pastures containing more than 50 percent quackgrass are likely to be too competitive for successful frost seedings.

2. Soil Fertility. Soil pH should be 5.5 or above. Both red clover and birdsfoot trefoil may tolerate acid soils, but will grow better at a soil pH above 6.0. A soil test should be taken to determine both soil pH and nutrient status of the soil. Both forage grasses and legumes are heavy users of potassium and, to a lesser

extent, phosphorus. Phosphate and potash should be broadcast by mid-May, after new seedlings are established. The phosphorus will help stimulate root growth, and the potassium will increase forage growth and promote winter hardiness.

3. Seeding Time. Broadcast seed in the early spring when the ground is still frozen. Seeding on snow is satisfactory if the snow depth is not great, since rapid melting can cause loss of seeds through runoff. A cyclone seeder, horn seeder, or seeder attachment on the back of a tractor or all-terrain vehicle will work well. Pay close attention to manufacturer's precautions when using all-terrain vehicles. Inoculate the seed just before planting so the legumes will fix nitrogen from the air and make it available to both the legume and grass. The freezing and thawing action helps bury the seed for better germination. Subsequent early spring rains help insure good germination.

4. Grazing Management for Establishment. Close grazing the fall before seeding will reduce grass competition in the spring. Grazing early and close in the spring helps with legume establishment by continued grass suppression. Grazing less closely and rotation-

Table 1. Stand density of two forage legumes

Three and 15 months after seeding into three grass swards that were suppressed with a herbicide or by cutting.

Treatments	Broadcast				Drilled			
	Red clover		Trefoil		Red clover		Trefoil	
	months after seeding							
	3	15	3	15	3	15	3	15
	<i>Established plants as % of herbicide treatment stand</i>							
0 cuts	69	51	74	52	64	49	76	52
2 cuts	79	82	88	96	81	76	91	94
4 cuts	103	107	117	114	103	101	102	116
Herbicide	100	100	100	100	100	100	100	100

Data averaged over 3 grass sods (bromegrass, reed canarygrass and orchardgrass).

SOURCE: Dr. Milo Tesar, Professor Emeritus of Crop and Soil Sciences, Michigan State University.

ally at least three additional times during the first season will aid greatly in establishing the legume.

5. Management after Establishment. Once the legume is established, a yearly application of phosphorus and potassium fertilizer should be made based upon need determined by a soil test. Rotational grazing will continue to help maintain the legume in the stand. A good red clover or birdsfoot trefoil mixture with grass should double the yield of unfertilized grass.

6. Reseeding. Red clover needs to be frost seeded every other year since it is a biennial and will thin out after the second year. Birdsfoot trefoil should continue to become better established after the second year of production. Leaving a seed crop from the late summer growth can increase stands of both legumes.

Economics of frost seeding

Both research and farmer experience have shown frost seeding to be a simple and inexpensive method of pasture improvement. However, frost seeding is more risky when seeding into dominant quackgrass

sods or during droughty, early spring conditions, since this system depends upon early spring rains and good suppression of grass with grazing. The cost of seed, inoculant and starter fertilizer at \$20 to \$25 per acre can double the yield of unfertilized grass. When properly done, a yield increase should be obtained of 1.5 to 2.0 tons per acre dry hay equivalent for a \$20 to \$25 per acre annual investment. Numerous livestock operators in Michigan have reported good success with frost seeding and continue this practice.

For more information on pastures in Michigan, consult the following bulletins, available from your county Cooperative Extension Service office:
 E-752, "Pastures for Northern Michigan."
 E-1536, "Growing Birdsfoot Trefoil in Michigan."
 NCR 109, "Pasture Lease," 15 cents, for sale only.
 NCR 149, "Pasture Rental Arrangements for Your Farm," 55 cents, for sale only.
 NCR 199, "Norcen Birdsfoot Trefoil."

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Table 2. Yield in the second and third years of growth

From two forage legumes sod seeded into three grass swards that were suppressed with a herbicide or by cutting.

Treatments	Broadcast				Drilled			
	Red clover		Trefoil		Red clover		Trefoil	
	2nd year	3rd year	2nd year	3rd year	2nd year	3rd year	2nd year	3rd year
	<i>HAY (Tons/Acre)</i>							
0 cuts	0.5	1.1	0.3	1.9	0.4	1.2	0.2	1.7
2 cuts	2.7	1.0	1.4	2.8	2.8	1.4	1.1	2.8
4 cuts	3.7	0.9	1.6	2.8	3.6	1.2	1.5	2.6
Herbicide	3.8	1.4	1.9	3.3	3.8	1.9	1.9	2.3

Data averaged over 3 grass sods (bromegrass, reed canarygrass and orchardgrass).

SOURCE: Dr. Milo Tesar, Professor Emeritus of Crop and Soil Sciences, Michigan State University.

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