Hay & Pasture Renovation with Low-Disturbance Slurry Seeding of Red Clover

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In recent years there has been renewed interest in management-intensive grazing for beef and dairy cattle. Thinning stands are often a problem in pastures, particularly after a dry summer when over-grazing occurs. Manure slurry seeding is an innovative process which combines low disturbance aeration tillage, manure slurry application, and the seeding of cover crops in one efficient operation. When used for pasture and hay crop restoration, this new process can increase botanical diversity, yield and quality, and provide a more complete, balanced feed for grazing stock. A short video of slurry seeding cover crops in wheat stubble can be viewed on YouTube: http://youtu.be/3st0qZ_3vH0.

Seed-laden slurry is placed through drop tubes in the fractured soil behind the aeration tines.

Methods

Red clover (medium; 10 lbs/ac pure live seed [PLS]) was sown in an established smooth bromegrass sod (Scout; 10 lbs/ac PLS) in a Capac fine sandy loam soil at Michigan State University. The seeding methods compared were: 1) no-till drilled red clover, 2) slurry seeded red clover, 3) frost seeded red clover, and 4) undisturbed check (no slurry; no aeration tillage).

The no-till red clover was sown with a Great Plains no-till drill with coulter openers and trailing semi-pneumatic press wheels in mid-August. The manure slurry seeding was done on the same day as the no-till drilling with a commercially available slurry tanker (3,000 gallons) equipped with a rear-mounted rolling-tine aerator (12', Aer-Way and a SSD slurry distribution system; see photo). A 2.5˚ gang angle was used for the aeration tines. Red clover was surface broadcast in early-March for frost seeding. No additional seedbed tillage or soil firming was used.

The manure slurry seeding process involved mixing red clover seed in the slurry tank and passing the seed-laden slurry through a rotating chopper/distributor (300 rpm), and then through drop tubes to the fractured and loosened soil behind each set of rolling tines. Dilute swine slurry (1.02% solids) was applied at 4,000 gallons/ac to supply a moderate amount of nitrogen (N) for crop growth, yet avoid excessive competition for sunlight between the existing forage and seeded forages. The application supplied 70 lbs/ac total N, 50 lbs/ac N in ammonium form, and 20 lbs/ac N in the organic fraction. No commercial fertilizer was applied.

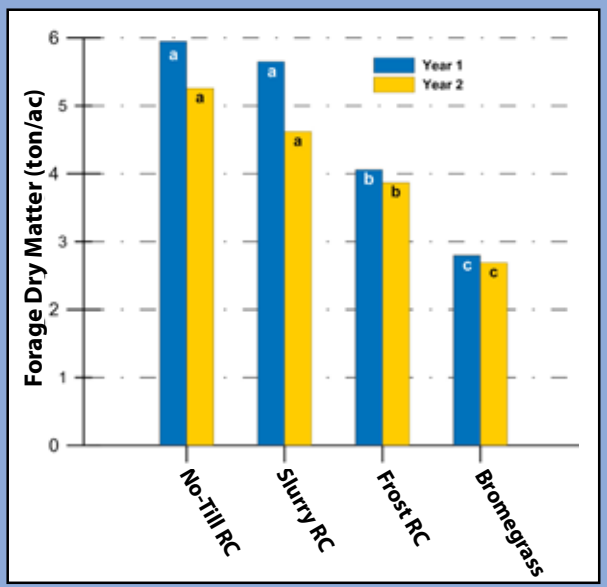
Forage Dry Matter Yield

The total forage dry matter over two growing seasons was significantly greater for no-till (11.2 tons/ac) and slurry seeded (10.3 tons/ac) red clover than the frost seeded red clover (7.9 tons/ac; Figure 1). Compared to the untreated bromegrass stand, the no-till, slurry and frost seeded red clover plots increased dry matter yields by 105%, 87%, and 43%, respectively.

In the first year after seeding, forage dry matter was increased by both the N in the manure slurry and the N fixed by the red clover. A uniform stand of red clover was expected to supply 40-70 lbs/ac N to the growing crop. The annual dry matter yield of the no-till (6.0 tons/ac) and the slurry seeded (5.6 tons/ac) treatments were significantly greater than the frost seeded and control treatments. Compared to the untreated control (2.8 tons/ac), the no-till, slurry seeding and frost seeding of red clover increased dry matter yields by 112%, 102%, and 43%, respectively.

The yield advantage from the N contribution of the red clover to the bromegrass stand was clear in the second year after seeding. The red clover was not evenly distributed throughout the frost seeded plots. In year two, the no-till red clover increased forage yield by 96%, slurry seeding 72%, and frost seeding 44% compared to the untreated bromegrass plots. The annual dry matter yield of the no-till (5.3 tons/ac) and slurry seeding (4.6 tons/ac) was not significantly different, but each yielded significantly greater than the frost seeding (3.9 tons/ac).

Figure 1. Both no-till and slurry-seeded red clover in bromegrass yielded significantly greater than the frost-seeded red clover or bromegrass alone.



Yields with the same letter within the same year are not significantly different (p=0.05).

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Recommendations

The most consistent results with slurry seeding of cover crops have been in wheat stubble, corn silage stubble, or other areas where there is little competition from an existing crop. Slurry seeding in existing pasture or hay ground is challenging due to the addition of manure nitrogen which causes vigorous growth of the existing crop and competition with the new seedlings for moisture, sunlight, and other conditions needed for germination and emergence.

Based on the results of this study, the following recommendations were developed for improving pasture and hay ground with slurry seeding:

- Thinning and nutrient deficient pasture and hay fields are good candidates for renovation with slurry seeding. Limit the manure application to apply 70-100 lbs/ac N to minimize aggressive regrowth of the existing forage and competition with the new seedlings for available light.
- Minimize competition from the existing forage crop by harvesting or grazing the pasture aggressively and slurry seeding in mid-August.
- Allow time in the fall for seedling establishment. Do not traffic or graze the slurry seeded area in the fall.
- Take the first cutting as an early hay crop the following spring, if possible. This will prevent damage to the new seedlings from foot traffic and selective grazing.
- Dilute, flowable liquid manure is most suitable for slurry seeding because it quickly infiltrates and carries the seed to protected micro-sites below the soil surface. Thick, viscous slurries are less suitable because they infiltrate slowly or remain on the soil surface and crust over.