Improving Pasture and Hayground With Manure Slurry-Enriched Seeding

Tim Harrigan, Associate Professor, Biosystems and Agricultural Engineering (harriga1@msu.edu)
Rich Leep, Professor, Crop and Soil Science (leep@msu.edu)

In recent years, interest has grown in the use of managed intensive grazing for beef and dairy cattle. Pasture land is often nutrient-deficient because crop nutrients are removed in harvested hay early in the growing season when the forage supply exceeds grazing demand. Thinning stands are often a problem on a grazing farm, particularly after a dry summer when overgrazing occurs. The objective of this work was to develop and evaluate a process whereby forage grass and legume seed is carried in nutrient-rich manure slurry to seed microsites in small-grain stubble or established pasture and hay ground. This shallow mixing of the seed-laden slurry will increase the species richness, yield and quality of hay and grassland, extend the grazing season and provide a more complete, balanced feed for grazing stock.

A new manure land application process—manure slurry-enriched seeding—has been developed at Michigan State University. This new process combines low-disturbance aeration tillage, manure application, and the seeding of forage or cover crops in one efficient operation.

Equipment

The slurry seeding was done with a commercially available slurry tanker (3,000-gallon capacity) equipped with a rear-mounted rolling-tine aerator (Aer-Way) and a SSD (subsurface deposition) slurry distribution system. The rolling-tine aerator was ground-driven with 8-inch tines on a rotating shaft with 7½-inch spacing between sets of tines. The angle of the rotating shaft was adjustable in 2.5-degree increments from 0 degrees to 10 degrees relative to the direction of travel. The 0-degree gang angle provided little soil disturbance; the 10-degree gang angle provided the most soil loosening.

Slurry seeding involves mixing seed in the slurry tank and passing the seed-laden slurry through a rotating chopper/distributor and then through drop tubes to the fractured and loosened soil behind each set of rolling tines. Excess PTO pump capacity provides bypass flow for seed mixing and distribution. Slurry application rate calibration is based on tractor engine RPM, travel speed, machine width and slurry flow rate measured with a flow meter. A 150-PTO-hp tractor or larger is needed to draw the slurry tank and aeration tool.

Forages for late-season grazing

Forage rape (Barkant var., 6 lb/acre), forage turnip (Pasja var., 6 lb/acre), brown midrib sorghum-Sudangrass (Sudex var., 30 lb/acre) and common oats (64 lb/acre) were sown in untilled wheat stubble on a Capac sandy loam soil on Aug, 8, 2005. Two seeding methods were used: conservation tillage with two passes of a combination tillage tool (12-foot Kongskilde Triple-K, 3-inch tillage depth), and slurry seeding with aeration tillage and seed-laden swine slurry (10-degree gang angle, 6,000 gal/acre). Fifty lb/acre of nitrogen (N) as urea was applied to the tilled-and-drilled plots before tillage

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and planting. No commercial N was applied to the slurry-seeded plots. The Sudex and oats were harvested Oct. 21, and the rape and turnip, Oct. 27, 2005.

The weather was hot and dry in August. The tilled-and-drilled oat stand (43 plants/sq ft) was significantly greater than the manure slurry-seeded oat stand (24 plants/sq ft), but there was no difference between the tilled-and-drilled and slurry-seeded forage rape, forage turnip or Sudex stands. Sudex did not establish well with either seeding method. Forage rape and forage turnip yielded greater than sorghum-Sudangrass and oats, but there were no significant differences within a crop due to the seeding method.

Hay and Grassland Improvement--Orchard Grass and Red Clover in Bromegrass Sod

Orchard grass (12 lb/acre) and medium red clover (10 lb/acre) were sown in an established bromegrass sod in 2005 using frost, no-till and slurry seeding methods. Frost seedings were done in March. On Aug. 31, seedings were no-till drilled (Great Plains no-till drill) or slurry seeded with 6,000 gal/acre swine manure. One week before seeding, the bromegrass in half of each plot was suppressed with Gramoxone to minimize competition for sunlight and moisture. No commercial fertilizer was applied to the non-manured plots. Forage yield and quality improved when the red clover was added to the grass pasture. Two-year forage yields and quality were significantly better with no-till or slurry seeding compared to grass mixtures alone. (figure 2).

Fig. 1. Seed is mixed directly in the tank and applied with the manure slurry.

Summary

- Slurry seeding of forage turnips, forage rape, oats and other forages in wheat stubble is an effective alternative for establishing late-season grazing crops to extend the grazing season.
- Interseeding forage grasses and legumes into an existing sod is a challenge because the manure nitrogen stimulates growth of the existing grass, which competes with emerging seedlings.
- No-till and slurry seeding was more effective than frost seeding of red clover and orchard grass in bromegrass sod.
- The preplant burn-down improved the interseeding of orchard grass, but it did not enhance the red clover stand.
- If cattle had access to pasture where no manure had been applied, they preferred the non-manured area even after 1 inch of rainfall. However, if pasture was short, they preferred the manured pasture to less desirable species such as tall fescue in the non-manured area.
- When slurry seeding a pasture, we recommend:
  - Graze the pasture down tight and slurry seed in mid-August.
  - Do not graze the pasture in the fall after the seed/slurry application.
  - If possible, harvest the first cutting the following spring as hay, or manage the pasture carefully to prevent preferential grazing of the new growth.

Fig. 2. Forage dry matter, Cut 1, May 2007

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