Calibration

Know the Application Rate

Photo credit: firmatoering.nl

- Why injection?

- Why minimum disturbance?

Why injection?

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  - decrease ammonia volatilization
    - capture more available nitrogen
    - 5 pounds of N per 1,000 gallons
  - decrease odors

- Why else might injection be preferable?

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  - apply less phosphorus per pound of nitrogen
    - increase the useful life of fields without encountering phosphorus restriction
  - reduce phosphorus in runoff

Which phosphate application is preferable?

- Use liquid dairy manure to supply all the N for a 150 bu/A corn crop
  - injecting? 110 pounds/acre
  - surface application? 170 pounds/acre

- Why minimum disturbance?
  - minimize erosion/retain residue
  - minimize structural disturbance
    - maintain high infiltration rate, soil organic matter

- Hiring a custom applicator?
  - communicate application rate
    - consult nutrient management plan
- Spreading yourself?
  - calibrate the spreader

What's Variable?

- ground speed (mph)
- PTO speed (rpm)

flow rate =

$$\frac{\text{app rate x ground speed x applicator width x ft/mile}}{\text{60 min/hr x 43,560 ft/acre}}$$

Load-Area Method of Calibration

- Need to know:
  - volume of tank (manufacturer's info x 0.9)
  - area on which a load is spread

gallons in tank/acres covered = gallons per acre

- Note ground speed and PTO speed.
- Spread a load.
- Measure the area covered.
- Calculate rate of application.
- Compare actual rate to recommended rate.
- Adjust, if necessary.
- Repeat with 2 more loads when adjustment has been maximized.
- Use average of 3 measurements.

High Tech Method

- Equipment needed
  - control console
- Inputs
  - width of applicator
  - target application rate
- Results
  - ground speed is monitored
  - flow rate is adjusted

Dark Side of Injection

- more expensive & time consuming
  - labor, fuel
- interested in knowing value of nitrogen conserved?
  - *Organic Nutrient Source Calculator*

Three
AVOID EXCESSIVE TILLAGE


Kris Nichols (right), a USDA-ARS soil microbiologist, and veteran no-tiller Kim Holle check soil quality and root growth on Holle's Marysville, Kansas, farm.

One of the best ways to improve soil quality is to reduce tillage. Tillage disturbs soil structure. Beyond that, tillage reduces the amount of organic matter in the soil. That's bad because most soil organisms get their food from organic matter. Plus, large organisms such as earthworms do better when there is lots of residue on undisturbed soil.

"Tilling the soil is the equivalent of an earthquake, hurricane, tornado, and forest fire occurring simultaneously to the world of soil organisms," say researchers from the Natural Resources Conservation Service (NRCS).

Tillage has long been used to loosen soil near the surface, to prepare a seedbed, and to help control weeds. But as University of Minnesota and NRCS researchers point out, "Tillage can also break up soil structure, speed the decomposition and loss of organic matter, increase the threat of erosion, destroy the habitat of helpful organisms, and cause compaction." Following are explanations of these five points.

1 "Tillage generally degrades soil quality by breaking down aggregate structure," says Michigan State University ag engineer Timothy Harrigan. "Stable aggregates are created slowly by natural processes, but they break down quickly under the action of tillage tools."

2 Tillage both disturbs the soil and affects the residue on the surface. According to Iowa State University researchers, "Soil aeration oxidizes soil organic matter, causing carbon loss as carbon dioxide. In the same action, plant residue is incorporated into the soil, creating an ideal environment for rapid organic matter decomposition. Excess decomposition of soil organic matter leads to a loss of the nutrient-holding capacity and degradation of soil quality." No-till can increase organic matter by 1 ton per acre per year.

3 By loosening the soil and burying residue, tillage increases the potential for erosion. The soil near the surface, which is most vulnerable to erosion, has the highest concentration of organic matter.

4 "Soil biological activity is typically double in no-till compared with tilled soil," says Penn State University soil management specialist Sjoerd Duiker.

5 "Tillage and traffic are the primary cause of most soil compaction," says Harrigan. Compaction reduces the space available for larger organisms to move through the soil. It also reduces the space for water infiltration and root growth.

TAKE A SYSTEMS APPROACH

Harrigan says he is often asked what tillage tool should be used to break up soil compaction. "While tillage may be a part of the solution, more often than not producers are surprised when I tell them, 'You can't till your way out of a soil-quality problem.'

"No-tillers are even more surprised when I tell them, 'You can't no-till your way out of a soil-quality problem.'

"The soil environment is a complex and interrelated web of physical, chemical, and biological factors," says Harrigan. "There is no single tillage tool that will repair a soil-quality problem. The key to building soil quality is managing the farming system with soil quality in mind. The soil-quality problems today did not occur overnight, neither will the solutions. Look for opportunities to reduce tillage and add organic matter inputs with cover crops and manure. Give the soil a chance." •

- By Rich Fee

1/4
Worldwide estimate of the soils used for agriculture being degraded at an unacceptable rate.

15

P

Phosphorus

30.974