

# Manure Management

## *Capturing Land-Applied Manure in the Root Zone*

**M**anagement practices that capture land-applied manure in the root zone will make the nutrients available for this season's crop, improve soil quality, and prevent manure nutrient and contaminant loss in runoff.

"The idea of capturing manure in the root zone is quite simple, but in practice it can be quite challenging as weather, soil and site-specific field conditions change," says Dr. Tim Harrigan, MSU Extension Biosystems and Agricultural Engineering Dept.

The single most important tool in preventing manure nutrient and contaminant loss to the environment is your knowledge of your fields. Producers know which fields are erosive and prone to rapid runoff during snow melt and spring rains. Manure will be lost in runoff water, so soil conservation practices should be employed that stabilize soil and hold land-applied manure in place.

"The best manure management plans are custom designed on a field-by-field basis," Harrigan says.

These plans should be established within the context of established best management practices and fine-tuned for each field by using a process of application, careful observation, and evaluation of the results. Apply manure, observe what happens, and evaluate the effectiveness in capturing manure in the root zone where it will be a benefit to your cropping system rather than be a hazard to society.

### **Reduce the Risk of Manure Runoff**

Evaluate your farm on a field-by-field basis and rank them based on the potential for manure loss. Ask yourself: "if it rains tomorrow, will runoff leave the field?" Then ask yourself what could be done to minimize this risk.

Excessive application rates increase the chance of runoff and nutrient loss. Calibrate manure spreaders, and verify that the desired rate is the rate that is actually applied to the field. Based on observation and evaluation, determine the right application rate for your fields.

On some fields, the right rate may be considerably less than the agronomic rate. Tile drained lands need special attention, especially with very dilute manures. Macro pores and soil cracks can be direct conduits to tile lines. Check tile outlets before and after manure applications. Decrease rates and/or utilize tillage to disrupt flow to tile lines.

Inject, use rapid incorporation whenever possible, or loosen the soil with tillage before spreading to create a rough, permeable surface. This will encourage the manure to stay in the root zone and not runoff.

Use soil and water conservation practices such as crop residue management, grassed waterways, buffer strips, strip crops, or planting on the contour.

Use spreading setbacks to separate manure from streams, and from ditches that flow to streams.

Establish a cover crop that will be growing during manure applications. Cover crops reduce sediment and nutrient runoff and improve infiltration.

Decrease the manure application rate, and avoid spreading in the rain or when rain is in the forecast.

Read, understand and adopt the *Generally Accepted Agricultural and Management Practices for Manure Management and Utilization*. The practices will form the foundation of your site-specific manure application plan, including:

- Manure should be uniformly applied and the amount applied should be known.
- Manure should not be applied to soils within 150 feet of surface waters or to areas subject to flooding.
- Liquid manures should be applied in a manner that will not result in ponding or runoff to adjacent property, drainage ditches, or surface water.
- As land slope increases, the risk of runoff and erosion also increases. Soil and water conservation practices should be used which will control runoff and erosion for a particular site.
- Records should be kept of manure analysis, soil test reports, and rates of manure application for individual fields.

### **Pay Special Attention to Tile-Drained Land**

When liquid manure is spread on tile drained land it can move within minutes to the tile lines through worm holes, root channels, cracks in the soil, and other macropores. High application rates and highly flowable liquids such as parlor wash water generally cause more problems than thicker slurries with a high solids content.

“Spreading on tile drained land requires special efforts to prevent manure loss through subsurface drains” Dr. Harrigan says.

“It is very important for producers on tile-drained lands to keep records,” says Natalie Rector, MSU Extension Nutrient Management Agent. “Producers should take seriously the need to have documentation that manure is not reaching outlets.”

## Evaluate the Risk of a Tile Line Discharge

The first step in creating a field-by-field land application plan is to evaluate each field. Any field where subsurface drains discharge into ditches that flow to surface water should be considered a high risk field and monitored carefully before and after land application.

Although a discharge could happen in any field, farmers report that problems are more likely with high application rates and highly flowable liquids such as parlor wash water.

High application rates increase the probability of a discharge.

No-till fields often have more worm holes and root channels than more conventionally tilled fields. An abundance of such large pores increases the likelihood of manure loss through tile lines.

Clay soils (soil management groups 0, 1, 1.5 and 2.5) tend to shrink and crack. Soil cracks may provide a direct route to subsurface drains.

Slurry injection is a not sure solution. Manure has been found in tile lines within minutes of injection with sweep injectors.

## Prevent a Tile Line Discharge

Excessive application rates increase the chance of runoff and a tile line discharge. Calibrate manure spreaders and verify that the calibrated rate is the rate that is actually applied to the field. Based on observation and evaluation, determine the right application rate for your fields. *On some fields, the right rate may be considerably less than the allowable rate based on manure nutrient content.*

Use soil and water conservation practices such as crop residue management, and grassed waterways that prevent local ponding and overland flow. Local ponding can funnel waste water to tile lines through macropores.

Use surface tillage to disrupt the continuity of worm holes, macropores and root channels and reduce the risk of manure reaching tile lines

Do not apply manure to tile drained fields when the tiles are flowing.

Manure with a high solids content is less likely to move off-site. Separate lot runoff, parlor wash water and other water sources from the herd manure stream and handle them separately.

Apply, observe and monitor tile outlets, evaluate the results, and make adjustments as needed to develop a site-specific land application plan. Match the manure application rate with soil infiltration rates and water holding capacity.

Make more frequent, lower rate applications rather than a single heavy application.

Should a discharge occur, have a plan for dealing with manure that may reach tile lines, such as blocking outlets or blocking the flow once it reaches the ditch.

Surface applications with rapid incorporation may be the best choice on land with subsurface drainage. Conservation tillage before spreading will create a rough, permeable surface. Injection may actually increase problems by placing the manure closer to the tile lines.

Decrease the manure application rate, and avoid spreading in the rain or when rain is in the forecast.

Read, understand and adopt the *Generally Accepted Agricultural and Management Practices for Manure Management and Utilization*. These will help build the foundation of your site-specific manure land-application plan. These points include:

- Application rates should be based on the ability of the soil to accept and store water and the ability of plants to utilize nutrients.
- Manure should be uniformly applied and the amount applied should be known.
- Liquid manures should be applied in a manner that will not result in ponding or runoff to adjacent property, drainage ditches, or surface water.
- Records should be kept of manure analysis, soil test reports, and rates of manure application for individual fields.

*Contributors to this article include: Tim Harrigan and Bill Northcott, Biosystems and Agricultural Engineering Department; Dann Bolinger and Natalie Rector, Extension Agricultural Agent, Michigan State University.*

**In the event of a manure release to surface waters, call the Pollution Emergency Alerting System 1-800-292-4706**