

# Odor

and

# Nutrient Management

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## Manure and residue management

by Paul Miller, USDA–Natural Resources Conservation Service, Des Moines

**A**s autumn approaches, thoughts turn to harvesting the year's crops. It is also a good time to empty manure storage facilities and return nutrients to the land for next year's crop. Because manure is applied to the land, management of the crop residue is as important as managing the manure.

If you apply manure to highly erodible land, you need to review your conservation plan and ensure that you can maintain the desired residue levels with your manure application equipment. You also need to keep in mind that Iowa regulations require liquid manure from a confinement operation that is not considered a small animal feeding operation to maintain a 750-foot separation distance from other residences, businesses, churches, schools, and public use areas if the manure is surface applied. This separation distance is not needed if the liquid manure is injected or incorporated within 24 hours of application. If the desired residue levels of a conservation plan cannot be obtained after manure application and subsequent tillage and/or planting operations, then changes need to be made in the equipment or the conservation system on the land.

When estimating soil loss from a field, the Natural Resources Conservation Service (NRCS) considers various factors, including the amount of residue on the soil surface and the residue and organic matter buried below the surface. Other factors are the number of tillage passes and the extent of disturbance to the ground. Equipment manufacturers' have developed and continue to improve injectors that disturb less ground and surface residue. If you are not able to change your manure application equipment or meet the requirements of your conservation plan, you need to visit with the conservationist at your local NRCS office. Additional or different conservation practices may need to

be implemented to compensate for the reduced residue levels.

Before applying manure this fall, take time to review your manure management plan and your conservation plan to ensure that they can be implemented effectively. Following both plans will result in proper manure use and good erosion control.

### This issue

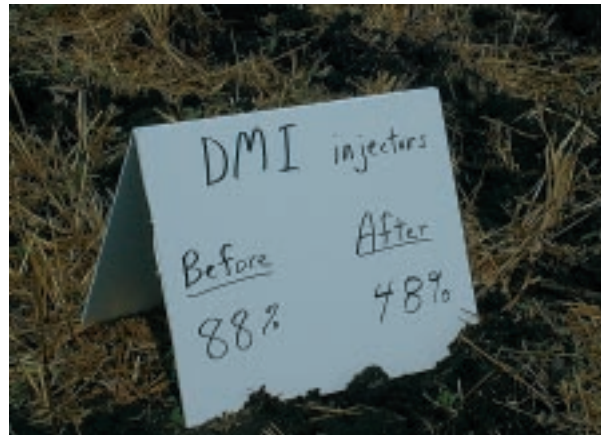
Manure and residue management

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## Sampling and agitation of swine manure pits

by Jeffrey Lorimor, Department of Agricultural and Biosystems Engineering, and Kris Kohl, Northwest Iowa extension ag engineer

**M**anure experts recommend sampling your manure pit to get the best estimate of the actual nutrient content, rather than using book values. But producers know that the manure is not the same from the top to the bottom of pits, and they question how large the changes in concentration will be from the first load to last. **Three recent studies done at Iowa State University examined sampling accuracy and how well agitation homogenizes manure.**

The **first study** compared nutrient content in the top, middle, and bottom of manure pits from 278 samples taken across the state. Table 1 shows the results of the pit sampling. The last row of the table, labeled vertical profile, shows data from samples that were taken by inserting an open polyvinyl chloride tube to the bottom of the pit, to get an average sample throughout the depth of the pit.

Stratification of total Kjeldahl nitrogen (TKN) and phosphorus ( $P_2O_5$ ) is evident in the bottom samples. Ammonia ( $NH_3-N$ ) and potassium ( $K_2O$ ) are uniform from top to bottom. As the last two lines of Table 1 show, a vertical profile sample provides an accurate estimate of the top-middle-bottom average.

In the **second study**, for 109 of the 278 samples, manure dipped off the surface of pits was compared with average vertical profile values from the same pits. A sample dipped from the top of a pit and tested for TKN averaged 95 percent of a vertical profile TKN from the same pit. On the average, a top-dipped sample was within 5 lb/1000 gal

of the pit average. Analyzing the top-dipped sample for ammonia, and then adjusting it to provide a TKN estimate, did not work nearly as well. The variation was greater. The top-dipped sample tested for ammonia (and adjusted by a fudge factor) could only be expected to be within 9 lb of the actual profile TKN. Top sampling did not work for  $P_2O_5$ . An error of 11 lb/1000 gal could be expected.

In the **third study**, the first, middle, and last loads of six separate pits were sampled in northwestern Iowa as the pits were pumped after being vigorously agitated. Agitation varied from a minimum of one 85-horsepower pump running for 4 hours up to two 150-horsepower pumps running for 4 hours. Table 2 shows nutrient concentration results. The  $P_2O_5$  showed some increased concentration from the middle load to the last load. Other nutrients, however, were uniform throughout the pumping process. These data show that with good agitation, uniform manure concentrations can be achieved.

**Summary.** This research indicates that producers can accurately estimate manure nitrogen and potassium levels and handle the manure so that the nutrient concentrations are uniform. For best results, collect a vertical profile sample. However, samples that are dipped off the top of swine pits and tested for TKN provide accurate estimates of average TKN values in the pit. Testing a top-dipped sample for ammonia, however, does not provide reliable information about TKN concentrations. With good agitation, the

average TKN value can be expected on all loads from first to last.

P<sub>2</sub>O<sub>5</sub> is the most difficult to sample. It concentrates in the bottom of pits and

requires a vertical profile sample to get a good estimate. And it is still subject to higher concentrations late in the pumpout process, even with vigorous agitation.

**Table 1. Manure nutrient samples at the top, middle, bottom, and vertical profile of swine pits.**

Location	Samples	NH <sub>3</sub> -N lb/1000 gal	TKN lb/1000 gal	P <sub>2</sub> O <sub>5</sub> lb/1000 gal	K <sub>2</sub> O lb/1000 gal
Top	81	26.8	35.3	18.4	28.5
Middle	51	26.5	35.0	21.1	22.4
Bottom	66	32.7	50.8	71.9	24.8
Average, T,M,B	198	28.7	40.4	37.2	25.2
Vertical profile	96	27.0	38.2	31.4	27.4

T, top; M, middle; B, bottom.

**Table 2. Average values from six pits before and during agitation and pumpout.**

Load	TS lb/1000 gal	TKN lb/1000 gal	NH <sub>3</sub> -N lb/1000 gal	P <sub>2</sub> O <sub>5</sub> lb/1000 gal	K <sub>2</sub> O lb/1000 gal
Profile <sup>a</sup>	7.4	48.6	34.4	49.8	31.4
First	5.1	56.8	38.9	40.3	25.0
Middle	5.6	57.8	37.9	42.2	27.9
Last	9.1	59.5	37.8	50.3	25.8

<sup>a</sup>The profile sample was taken before agitation.



## Plan now for fall manure applications

by Angie Rieck-Hinz, Department of Agronomy

**W**ith harvest time right around the corner, now is an ideal time to plan for fall manure applications. The extended periods of dry, warm weather the past several falls, coupled with early harvests, have given producers more time to apply all stored manure in the fall.

Fall manure applications also have the benefit of good soil conditions. Usually, the soil is drier in the fall than in the spring and fall manure applications made on the right soil

conditions can reduce the potential for compaction.

Although fall manure applications can be beneficial, there is also a concern: nutrient

### Manure Allocation to Fields

Manure should be allocated to fields as follows:

- Fields that test very low in P and K and will be planted to corn.
- Fields that test low in P and K and will be planted to corn.
- Fields that test very low in P and K and will be planted to soybean.
- Fields that test low in P and K and will be planted to soybean.

This information was adapted from Iowa State University Extension Publication PM 1811, *Managing Manure Nutrients for Crop Production*. Also see PM 1688, *General Guide for Crop Nutrient Recommendations in Iowa* for more information.

availability. Ideally, crop nutrient applications should be made as close as possible to the crop growing season to reduce nutrient loss to the environment through volatilization, leaching, denitrification, or surface runoff. Manure should not be applied until soil temperatures are 50°F and falling. If possible, manure should not be applied to frozen or snow-covered soil.

Other factors to consider when applying manure this fall include the following:

- Take soil tests and determine which fields will benefit most from manure phosphorus (P) and potassium (K).
- Consult your manure management plan regarding rates to be applied.
- Document manure applications: where, when, how, and amount applied.
- Follow your conservation plan to maintain residue and manage erosion concerns.
- Follow setback distance requirements for manure applications.

## Confidentially assess your manure storage practices

by Robin Prusiner, Iowa\*Farm\*Syst

If you have questions about manure storage practices for confinement animal feeding operations or open lot feedlot operations, Farm\*A\*Syst (FAS) can confidentially answer questions such as “I have an unused livestock facility. Do I need to do anything special with it? What do I need to do if I want to build a new livestock facility? Is my manure storage structure too close to my well? or Can I stack manure in a nearby field?”

FAS is a national program that originated at the University of Wisconsin. Forty-six states and U.S. territories have taken the basic FAS material, modified it to fit their locale, and are currently distributing it. In Iowa, Farm Bureau has taken the lead in adapting the national model to meet the needs of Iowans. Iowa FAS was developed in cooperation with the Iowa Department of Natural Resources with a grant from the U.S. Environmental Protection Agency.

The FAS program is a tool that educates farmers how to safeguard their water supply. FAS alerts farmers if their current practices are against Iowa law or if they are endangering the safety of their water supply.

**How is this accomplished?** Various topics are covered in 8- to 10-page chapters. You can choose to complete one or several different chapters. Each chapter is written in two parts. The first part contains background information on the subject matter, and the second a short assessment of current practices. The materials are written so that you can confidentiality use them without having to seek outside advice. Or you may complete the evaluation with the help of a local technical specialist. If you have questions or need assistance, the FAS materials

direct you to professionals. FAS may be a first step for farmers before more costly and comprehensive environmental audits and it encourages voluntary environmental protection.

**What topics are covered?** The individual chapters cover the following topics and you may request only the chapters that interest you:

- Open Feedlot Manure Management Practices
- Confinement Livestock Manure Storage Practices
- Dead Animal Disposal and Management
- Milking Center Wastewater Practices
- Pesticide Storage & Management
- Fertilizer Storage & Management
- Site Assessment
- Water Well Condition and Maintenance
- Household Wastewater Management
- Hazardous Materials Storage & Management
- Petroleum Storage & Management

**When will this material be released to the public?** This material is being pilot tested in several watersheds this summer. It will be available for mass distribution in fall 2000. If you are interested in receiving FAS material, contact Robin Prusiner, Iowa Farm\*A\*Syst, 312 W. 3rd. St., Carroll, IA 51401, Phone 712-792-6248, E-mail: rrobinson@ifbf.org or Rick Robinson, Iowa Farm Bureau Federation, 5400 University Ave., West Des Moines, IA 50266-5997, Phone 515-225-5432, E-mail: [rpagren@netins.net](mailto:rpagren@netins.net)

Drinking water for 75 percent of Iowa's population is supplied by groundwater reserves. The goal of FAS in Iowa is to reduce the risk of water pollution, particularly groundwater pollution.



# Manure applicators say training will change their practices

by Karen Grimes, Iowa Department of Natural Resources

**C**ommercial and confinement site manure applicators gave high praise to ISU Extension manure applicator training, with many applicators saying they will change the way they do business because of what they have learned.

“I think it’s very encouraging that people recognize there are some practices they can change that will make a difference environmentally,” said Wayne Gieselman coordinator of Department of Natural Resources’ (DNR) animal feeding operation program. Although Gieselman won’t credit the training for a lower number of fish kills this year, he does say the training is paying off by making applicators more aware of potential problems.

Of the 781 commercial applicators who evaluated the training this year, a majority (82 to 89 percent) rated the sessions as “good” or “excellent.” Even more confinement site or private applicators (95 to 97 percent) gave the program high ratings.

Approximately one-fourth of the commercial applicators who attended training “plan to change” their manure management practices because of information they received (see tables). They plan to

- □ sample manure differently (28 percent),
- encourage the producers they work with to sample manure (28 percent),
- maintain better application records (29 percent),
- observe separation distances closely (25 percent), and
- call the DNR for help in case of a spill (24 percent).

Similar results were found among 912 confinement site manure applicators who evaluated the training program. They will change their operations with plans to

- maintain adequate freeboard on formed pits, earthen pits, and lagoons (20 percent);
- maintain records on application of manure (34 percent); and
- implement separation distances for land application of manure (25 percent).

Approximately 60 percent of the commercial and private applicators indicated that they were already using these practices before the training.

“We’re very pleased with the results,” said Angela Rieck-Hinz, ISU Extension coordinator of the training program. “One of the surprises for us was the number of applicators who plan to make changes in their practices based on what they learned at the certification training meetings,” she added. “However, we emphasize different topics each year, and this was the year to focus on manure storage and handling, land application, and handling emergencies.”

This is the second year of the manure applicator certification program that is administered by the DNR. ISU Extension provides training for both commercial and confinement site manure applicators.

## Commercial Applicators’ Plans to Adopt Practices

Changes in Manure Management Practices	Adopted Prior to Training	Plan to Adopt Because of 2000 Training	Do Not Plan to Adopt	Does Not Apply	No Response
Sample manure differently	56	28	4	10	0.9
Encourage producers to sample	58	28	2.8	8.4	1.9
Maintain better application records	63	29	1.3	5.2	1.5
Observe separation distances closely	65	25	2.8	5.4	5.2
Call DNR for help in case of a spill	68	24	1.0	3.4	3.3

Evaluation based on 781 commercial applicators. Values are expressed as percentages.

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### Confinement Site Applicators' Plans to Adopt Practices

Changes in Manure Management Practices	Adopted Prior to Training	Plan to Adopt Because of 2000 Training	Do Not Plan to Adopt	Does Not Apply	No Response
Maintain adequate freeboard on formed pits, earthen pits, and lagoons	58	20	2.5	18	0.7
Maintain records on application of manure	59	34	1.5	3.4	1.4
Implement separation distances for land application of manure	67	25	1.3	4.5	1.6

Evaluation based on 912 confinement site applicators. Values are expressed as percentages.

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**... and justice for all**

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