



Livestock and Poultry Environmental Stewardship (LPES) curriculum

CAFO Fact Sheet series

Fact Sheet #13B: CAFO Requirements for Large Swine Operations

Disclaimer

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By Don Jones, Purdue University; Glenn Carpenter, USDA-NRCS; Karl VanDevender, University of Arkansas; and Peter Wright, Cornell University

Introduction

In December 2002, EPA released new rules defining and clarifying the Concentrated Animal Feeding Operation (CAFO) regulations. They also notified states that these rules need to be implemented. Producers who in the past may not have known about or responded to these requirements will now need to meet them.

The new rules require large pork producers regardless of whether they have had any discharges from their operations in the past to obtain a permit from the regulating agency. Farms that fall under the CAFO rules (see *CAFO Fact Sheet #2: Do I Need an NPDES Permit for My Livestock or Poultry Operation?*) need to implement a Nutrient Management Plan (NMP) and control contamination from their production facilities and from land application areas.

This fact sheet focuses on federal requirements; however, most states are authorized to implement the federal program and may have additional, more stringent requirements. You should contact your state permitting authority to determine the requirements that apply to your operation.

Requirements for Swine Operations

- The CAFO program for swine applies only to those confined feeding operations that have a one-time capacity of 2,500 head (each weighing more than 55 pounds) or 10,000 swine (each weighing less than 55 pounds). Smaller operations can be designated as a CAFO if they meet certain conditions. More information on the applicability of the new CAFO regulations can be found in *CAFO Fact Sheet #2* of this series.

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- There must be no discharge of manure, litter, or process wastewater from the production area unless certain conditions are met.
 - Rainfall causes the discharge AND
 - The production area is designed, operated, and maintained to contain all of the manure, litter, and process wastewater, including storm water plus runoff from the 25-year, 24-hour rainfall event (a 100-year, 24-hour storm in an operation constructed after April 14, 2003), AND
 - The CAFO otherwise complies with the inspection, monitoring, record-keeping, and mortality disposal and other provisions in the rule.



Figure 1. Grow-finish pigs on slotted floor

Pork Production

Today's high-quality pork is typically produced in climate-controlled buildings that protect animals from the elements and from predators. Feed is prepared and brought to the animals; manure is collected, stored, and land applied onto cropland (see Table 1 below).

The phases of pork production that produce hogs ready for market are breeding-gestation, farrowing, nursery, and grow-finish (see Figure 1). Normally, these activities take place in separate buildings, with the phases often located on different farms to minimize the spread of disease among animals.

Common Manure-Handling Systems

Liquid Manure Storages

Most swine manure is handled as a liquid. Manure typically falls through a slotted floor into either a gutter or a concrete storage pit. Four to ten foot deep storage pits, typically providing from 3 to 12 months of manure storage, are usually located directly under the slotted floor. In some operations, the manure falls through the slotted floor into a shallow gutter and is periodically removed to a larger outside storage. The outside storage may be either an earthen or a steel or concrete unit (see Figure 2). In most states, storage size for permitted operations is dictated by regulatory agencies and usually sized large enough to hold at least six month's accumulation, preventing the need to apply manure during the crop-growing season or when weather conditions are unsuitable.

Table 1. Typical swine annual raw manure production per 1,000-pound animal weight

Animal Type	Manure Production		Percent Solids	Nutrient Content					
				N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
	Tons/yr	Gal/yr		Lbs/ton			Lbs/1,000 gal		
Growing pig	11.9	3,008	9.2	13.8	10.8	11.1	54.6	42.7	45.3
Mature hog	5.9	1,425		13.9			57.5	44.7	
Sow and litter	15.9	3,894		4.2	10.7	58.0	43.7		

Source: Ohio State University Extension Bulletin 604; Ohio Livestock Manure and Wastewater Management Guide

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Figure 2. Fabricated steel manure storage

Stored liquid manure must be agitated thoroughly to make the manure nutrient content more uniform from load to load when it is hauled to the field for application. **Note: Take precautions when agitating an underslat storage unit or unit connected to the building through the drain system. Even in low concentrations, the hydrogen sulfide gas released during agitation is toxic.** When a deep pit is agitated, animals on a slotted floor over the pit should be removed if possible. Ventilation fans should be operated at high capacity, and humans should stay out of the building. These precautions are especially important during the first 10 to 20 minutes of agitation. Pipes or drain openings between rooms and the outside storage should be gas trapped or sealed.

Liquid manure is either surface applied or incorporated into the soil (see Figure 3). Mechanical incorporation reduces nutrient runoff as well as odor and nitrogen emission. If soil conditions allow, it is the preferred method of application. In remote areas, liquid manure may be pumped to the land application site and then irrigated or otherwise applied to cropland. Spray irrigation is an efficient method of land application. However, since odor emissions can be significant with spray or surface application, it should be avoided in populated areas. With automated systems, extra care must be taken to prevent spills and water quality problems because there is often less oversight than with tractor or truck application systems.

Lagoons

Lagoons are different from liquid manure storages because they are operated to encourage anaerobic



Figure 3. Injecting liquid manure
Source: Purdue University

digestion of organic material, which reduces odor when the treated manure is land applied. A properly designed and operated treatment lagoon is much larger than a liquid manure storage designed to store the same amount of manure, because of the treatment volume needed to properly treat the organic matter in the manure.

In the Midwest, an equal part of relatively clean dilution water should be added for each part of manure. Manure must be added slowly and uniformly to the lagoon to avoid an upset of the biological treatment system (and subsequent release of odors). A common method of adding manure to a lagoon is to drain or flush it from an underfloor pit or gutter on a frequent basis.

A portion of the lagoon contents must be left in the lagoon when it is pumped, providing a large mass of microbial organisms to treat the new manure entering the system. Multiple lagoons in series normally emit fewer odors than single-cell lagoons (see Figure 4) and are preferred when lagoon effluent is recycled to buildings to hydraulically remove manure from pits and gutters.

Lagoon contents are normally spray irrigated onto cropland (see Figure 5). After treatment and the normal settling of solids to the bottom of the lagoon, typical effluent should have only about 20% as much nitrogen (N) and about 30% to 40% as much phosphorus (P) and potassium (K) as the raw manure.

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Figure 4. Two-stage lagoon system
Source: Purdue University

The P and K that accumulate in sludge near the bottom of the lagoon must be removed every few years and utilized properly as part of the operation's nutrient management plan (NMP). Because the sludge is more concentrated, it may be advisable to haul it to more distant cropland that is not reached via normal irrigation of effluent and that can better utilize the nutrients it contains. If possible, this partially stabilized organic material should be incorporated because of its nuisance odor potential.



Figure 5. Irrigation of lagoon effluent onto cropland
Source: Purdue University

Managers need to keep a tight control over sanitation and other factors that can affect animal health and the environmental impact of the operation. Wash water and water wastage can account for a large portion of the wastewater that a swine facility generates.

All lagoons and storage basins should be sized to handle manure, wash water, rainfall, and runoff. Clean runoff should be diverted around the structure.

Most tanks and pits are emptied with a vacuum tank that has a suction pump operated by the tractor's power takeoff. Unlike an agitation pump, liquid manure is pulled into the tank rather than agitated. Manure is often pressurized and ejected back into the storage to suspend solids.

When earthen basins are used at some sites to store manure, the basin may need to be properly lined, preventing seepage of manure and contaminants into ground water. The liner can be either a plastic or rubber material or bentonite clay incorporated into the upper surface of the soil to prevent leaks into ground water.

Settling basins can remove heavier manure solids and can often reduce the required size of anaerobic lagoons by 25% to 50%, depending on the effectiveness of the settling basin. Settling basins are normally more efficient and less expensive than mechanical solids separators but are often more labor intensive.

To determine the appropriate field-spreading rate, material in both the settling tank and the storage structure must be tested for N, P, and K fertilizer value before land application.

Properly planning the location of new operations can reduce the pollution potential. Many of the problems of diverting or controlling clean outside surface water and catching and treating all runoff from animal areas can be reduced by locating the animal production facility in the right place. For example, placing facilities on higher ground and away from a stream can help prevent pollution.

Keeping Clean Water Clean

Extra water from building roofs, overflowing waterers, and/or overland flow from upslope areas can increase the amount of wastewater that must be stored and handled.

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Roof runoff water can be controlled by using rain gutters or drip trenches. The size of the gutters, their slope, and the placement and size of the downspouts depend on the amount of rainwater to be carried. The 5-minute, 10-year storm is a common design storm for rain gutters. Gutters must be protected against snow and ice damage. Hanging them lower than the projected roofline prevents snow and ice from sliding off barn roofs and damaging the gutters. Extra hangers for the gutters, spaced as closely as 16 inches, or ice-breaking obstacles on the roof that stop sliding snow can also protect gutters.

Drip trenches that collect falling roof water and direct it to a ditch or tile to be carried away from the barnyard can be less expensive and easier to maintain than roof gutters. A gravel-filled trench containing a drainage tile is placed directly under the drip line of the roof. To avoid contaminating the clean water with manure, the drip trench should be protected from animal traffic and contaminated lot runoff.

Diversions or land grading can prevent upslope surface flow from running through the livestock area. If needed, subsurface drainage should be used to prevent ground water from surfacing in the barnyard, further contaminating the runoff water. Contact the Natural Resources Conservation Service (NRCS) or a professional engineer for help in designing diversion structures.

Inspections

Manure storage and treatment sites need to be maintained and monitored. Large CAFO operators are required to perform frequent inspections of all storm water diversion devices, runoff collection structures, and manure storage and transporting systems. To prevent accidental overflows onto animal areas and premature filling of manure storages, water lines should be inspected daily. Depth markers or staff gauges need to be installed in the storage areas to help the operator estimate the amount of storage volume remaining and to ensure that rainfall

amounts less than the design storm will not overtop the structure and that there is adequate free-board (see *CAFO Fact Sheet #15: Liquid Level Markers for Uncovered Manure Storages and Lagoons*). Deficiencies or discharges need to be recorded and then fixed as soon as possible. In addition, mortalities must be disposed of properly. Swine operators must keep a complete copy of these records for five years (see *CAFO Fact Sheet #6: What CAFO Reports Must I Submit?*).

Emergency Spill Response Plan

An Emergency Spill Response Plan must be developed for each permitted operation and kept up-to-date, enabling all workers to react quickly and appropriately. The purpose is to ensure an appropriate response to all likely accidents that could result in a spill. For example, an inventory of nearby earth-moving equipment could be kept so it could be assembled quickly on site if needed. Likewise, a list of phone numbers of affected downstream individuals could be maintained, enabling operators to quickly notify the individuals of any spills, thus protecting public health.

Utilizing Manure and Wastewater Nutrients

Manure and wastewater need to be applied to cropland at agronomic rates. *CAFO Fact Sheet #20: What is Required in a Nutrient Management Plan?* describes this process. Because the nutrient contents of manure can vary considerably, multiple samples are needed to determine the appropriate loading rates.

Compliance Checklist

The checklist on the following page is designed to help you (if you are a Large CAFO operator) determine if your livestock or poultry operation is in compliance with the new federal CAFO regulations. *If you answer "No" to any one of these questions, you may not be in compliance with the new rules and may need to take corrective action.* States may have additional and/or more stringent requirements, so check with your state permitting authority to identify the requirements that apply to your facility.

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Compliance Checklist

<p>1. Is my operation a CAFO? Information to help you answer this question can be found in <i>Fact Sheet #2: Do I Need an NPDES Permit for My Livestock or Poultry Operation?</i> If you circled “No,” the new federal regulations do not apply to your operation, but your state may have special requirements that are more stringent than the federal regulations, so check with your state permitting authority.</p>	Yes	No
<p>2. I have identified all of my production areas. Production areas include open lots, free-stall barns, swine and poultry barns, winter feeding areas, milking barns, drip sheds, cattle alleys, and any other areas where animals, manure, feed, or bedding may contact drinking water, process water, or precipitation. They also include lagoons, holding ponds, and conveyances used to transport or store liquid manure and wastewater. You need to be sure that all of your operation’s production areas meet the wastewater containment and visual inspection requirements in the rules.</p>	Yes	No
<p>3a. EXISTING SWINE CAFOs: All of my operation’s production areas and liquid manure or wastewater impoundments have been designed, built, maintained, and operated to contain all of the manure, litter, and process wastewater including storm water, plus runoff from a 25-year, 24-hour rainfall event for my site. The 25-year, 24-hour precipitation event should be used to size lagoons, runoff holding ponds, and any conveyances (ditches, berms, channels, terraces, or pipelines) whose failure could result in a discharge of wastewater outside the containment area. The magnitude of these precipitation events varies by geographic location.</p>	Yes	No
<p>3b. NEW SWINE CAFOs: All of my operation’s production areas and liquid manure or wastewater impoundments have been designed, built, maintained, and operated to contain all process wastewater generated by my operation AND from the direct precipitation and runoff from 24-hour precipitation events that occur, on average, every 100 years. The 100-year, 24-hour precipitation event should be the minimum design storm used to size lagoons, runoff holding ponds, and any conveyances on new swine CAFO construction (i.e., after adoption of the rule on April 14, 2003) whose failure could result in a discharge of wastewater outside the containment area.</p>	Yes	No
<p>4. A responsible employee conducts a weekly inspection of all of the wastewater and runoff conveyances. This inspection helps identify structural problems, leaks, or other evidence that the conveyances may fail and discharge wastewater or rainfall runoff.</p>	Yes	No
<p>5. A responsible employee inspects all of the depth markers at least once a week. Electronic instrumentation is available to automate depth measurements, operate emergency signals, and notify key employees, but it is not a substitute for weekly visual inspections. For more information on the installation and use of depth markers, see <i>Fact Sheet #15: Liquid Level Markers for Uncovered Manure Storages and Lagoons.</i></p>	Yes	No
<p>6. A responsible employee inspects all wastewater holding ponds, lagoons, and other retention structures at least once a week.</p>	Yes	No
<p>7. A responsible employee daily inspects all water lines in the production areas. This inspection includes water lines used for both drinking and cooling water. Leaks in these water lines place an extra load on wastewater conveyances and the retention structures.</p>	Yes	No

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Compliance Checklist (continued)

<p>8. Animal mortalities are removed promptly from the production area and disposed of in an acceptable way. They are NOT placed in wastewater impoundments, other liquid manure storage facilities, or process wastewater systems (unless approved and designed specifically to treat mortalities). Proper mortality disposal is important to protect biosecurity and water quality as well as to maintain good community and neighbor relations.</p>	Yes	No
<p>9. Any deficiencies noted in any of the daily and weekly inspections of the production area, water lines, and wastewater impoundments and conveyances are responded to as soon as possible. Deficiencies in any of these systems increase the risk of illegal discharge and should have a high priority.</p>	Yes	No
<p>10. An up-to-date record of all inspections, storage depths, mortalities, and corrective actions pertaining to the production area is maintained on the CAFO property. According to the federal rules, you are required to keep these records onsite for at least five years from the time they are created.</p>	Yes	No
<p>11. Records are maintained that document the design of all manure, wastewater storage, and conveyance systems, including volumes of solids accumulation, treatment and storm water capacity; number of days of storage capacity; and records of any overflows that occur from any of the wastewater storage structures or conveyances, including the date, time, and estimated volume of wastewater released.</p>	Yes	No
<p>12. Where appropriate, clean water is diverted away from the production area. This water includes rainwater and snowmelt from roofs, parking lots, and other areas outside where the animals are produced, fed, or processed and where manure and wastewater are stored or conveyed.</p>	Yes	No

Is Cost Sharing Available?

Through the 2002 Farm Bill, each state NRCS was allocated money to assist producers in implementing best management practices (BMPs) to properly handle animal manure. Check with your local NRCS or state Environmental agency to see if you qualify for funds.

Time Line for Compliance with Production Area Provisions of the New CAFO Rule

The time line for compliance with the new rules is fairly complex. Some provisions take effect upon adoption of the rule on April 14, 2003; others do not take effect until the year 2006. *CAFO Fact Sheet #3: How Soon Must I Apply for an NPDES Permit?* details these compliance deadlines and should help you determine what deadlines your CAFO operation faces. However, state deadlines vary and yours may be earlier than the federal deadlines. Contact your

state permitting authority to determine which deadlines apply to your operation.

Supporting Sections

40 CFR Part 412.30-47 Effluent Limitations Guidelines—Concentrated Animal Feeding Operations (CAFO) Point Source Category.

- Subpart D: Swine, Poultry and Veal Calves.

Summary

New rules that are being implemented at the state or federal level now require larger producers and those who may potentially contaminate water to apply for a permit and implement an NMP by December 31, 2006 in order to continue operating (see *CAFO Fact Sheet #2*). This fact sheet outlines the issues that swine producers should consider to minimize the likelihood of environmental problems. ●

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Definition of Terms

BMPs—Best Management Practices. Practices that help prevent pollution. Each state has a list of BMP standards developed by the NRCS.

CAFO—Concentrated Animal Feeding Operation.

NMP—Nutrient Management Plan. A plan that considers the source and fate of farm nutrients and is designed to minimize nutrient losses to the environment.

Drip trench—A system of channels and berms that collects roof water at the base of the roof, preventing clean water from entering a barnyard and preventing polluted water from the barnyard from mixing with the clean roof runoff.

Lagoon—A large earthen basin designed to biologically treat and store manure from livestock production units. Treatment is normally anaerobic, and odors can be severe if not managed properly.

Settling basins—These units are often used to remove larger, heavier solids from manure, making it easier to handle and improving lagoon performance.

Authors

Don Jones, an agricultural and biological engineering professor at Purdue University, can be reached at jonesd@purdue.edu; Glenn Carpenter, an agricultural economist at USDA-NRCS, can be reached at glenn.carpenter@usda.gov; and Karl VanDevender, an extension engineer at the University of Arkansas, can be reached at kvan@uaex.edu. Peter Wright, a manure management specialist at Cornell University, can be reached at pew2@cornell.edu.

Reviewers

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For More Information

Environmental Regulations Related Resources

EPA CAFO Phone Line–202-564-0766

<http://www.epa.gov/npdes/caforule/>–To obtain copy of regulations

<http://www.epa.gov/npdes/afo/statecontacts/>–To obtain state environmental agency contacts

<http://www.epa.gov/agriculture/animals.html/>–To obtain compliance assistance information from EPA

http://cfpub.epa.gov/npdes/contacts.cfm?program_id=7&type=REGION/–To obtain EPA Region Animal Feeding Operation contacts

Land-Grant University Resources

The local contact for your land-grant university Cooperative Extension program is listed in the phone book under “Cooperative Extension” or “(county name) County Cooperative Extension.”

<http://www.reeusda.gov/1700/statepartners/usa.htm/>–To obtain state Cooperative Extension contacts

<http://www.lpes.org/>–To view the Livestock and Poultry Environmental Stewardship (LPES) curriculum resources

USDA Farm Bill Resources

To obtain more information about the Farm Bill 2002, see the USDA-NRCS website at <http://www.nrcs.usda.gov/programs/farmbill/2002/>. You can also contact your local USDA Service Center, listed in the phone book under “U.S. Department of Agriculture,” or your local conservation district.



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MidWest Plan Service
122 Davidson Hall, ISU
Ames, IA 50011-3080

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