

THE RURAL SOUTH: Preparing for the Challenges of the

Sponsored by the Southern Rural Development Center, the Farm Foundation, the TVA Rural Studies Program at the University of Kentucky, the USDA Economic Research Service, and the 29 Southern land-grant institutions.

Animal waste management in the rural South

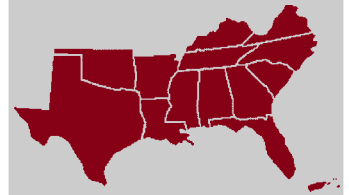
Saqib Mukhtar, Sam Feagley, and B.L. Harris
Texas Agricultural Extension Service, Texas A&M University

Introduction

Southern states now account for 80 percent of all the broilers, 37 percent of all the beef cattle, 26 percent of all the swine, 22 percent of all the sheep and lambs, and 18 percent of all the milk cow production in the United States [6]. What this means is the South generates a fair share of an estimated 1.37 billion tons of animal manure per year. Since the late 1980s, animal agriculture in the rural South has gradually shifted from small animal feeding operations (AFOs) to highly concentrated confined animal feeding operations (CAFOs). Many of these operations contracted out to farmers by integrators are located around feed mills and meat processing plants. This is particularly true of poultry, beef cattle, and swine operations.

The Issues

Animal wastes include liquid and solid manure, process-generated wastewater, composts, spilled feed, bedding materials, and mortality. Normally, waste from swine confinements is collected and stored as liquid manure while broiler house waste is handled as solid manure. Waste from dairy, beef and laying hens may be handled as solid, liquid, or both. Currently, land application of animal wastes to supply nutrients for plant growth or as an organic amendment to the soil is the most common practice. When managed and applied properly, they can be an excellent resource of all essential plant nutrients and can help producers and ranchers offset the cost of commercial fertilizer. The added organic matter from manure helps promote soil aggregation and increases soil structure, water holding capacity, plant available water, aeration, water infiltration, and nutrient cycling. All of these attributes promote plant growth and reduce soil erosion. Composts from animal manures also are used in gardens and nursery potting mixes. However,



21ST CENTURY



much crop and pasture acreage has repeatedly received amounts of animal manure in quantities much larger than crop agronomic rates. For example, manure application rates meeting the nitrogen crop agronomic rate often over apply P_2O_5 by two to four times its requirements, depending on the manure source and crop and yield goal. Also, large concentrated facilities have been reported to have accidental spills, overflowing, and dike breaching of lagoons or other waste holding structures due to human errors or catastrophic weather. As a result, the following animal waste management issues have emerged: (1) water and air quality; (2) socioeconomic issues; and (3) rules and regulations.

The U.S. Environmental Protection Agency (EPA) has identified agriculture as the leading source of water quality impairments in rivers and lakes [4]. The leading pollutants in lakes and estuaries are nitrogen and phosphorus. As their concentrations increase, the stage for eutrophication is set. Eutrophication is a condition where a water body ceases to sustain a diverse ecosystem

Table 1. Southern States' (excluding Puerto Rico and the U.S. Virgin Islands) Environmental Agencies and Agriculture and Waste-Related Information

State	State Environmental Agency Website for Animal Waste	Search Option	CAFO-AFO	Agricultural Waste ¹	Water ²	Waste ²	Air ²
AL	Dept. of Environmental Management http://www.adem.state.al.us	No	/caforep.html	No	Yes	Yes	Yes
AR	Dept. of Environmental Quality http://www.adeq.state.ar.us	Yes	Animal Waste	No	Yes	Yes	Yes
FL	Dept. of Environmental Protection http://www.dep.state.fl.us	Yes	Yes	Yes	Yes	Yes	Yes
GA	Dept. of Natural Resources http://www.dnr.state.ga.us	Yes	No	Yes	Yes	Yes	Yes
KY	Environmental Quality Commission http://www.kyeqc.net	Yes	Yes	Yes	Yes	Yes	Yes
LA	Dept. of Environmental Quality http://www.deq.state.la.us	Yes	No	No	Yes	Yes	Yes
MS	Department of Environmental Quality http://www.deq.state.ms.us	Yes	No	No	Yes	Yes	Yes
NC	Dept. of Environment and Natural Resources http://www.enr.state.nc.us	No	No	No	Yes	Yes	Yes
OK	Dept. of Agriculture http://www.state.ok.us/~okag/water/wqhome.html	No	No	No	Yes	Yes	Yes
SC	Dept. of Health and Environmental Control http://www.state.sc.us/dhec	Yes	Yes	Yes	Yes	Yes	Yes
TN	Dept. of Environment and Conservation http://www.state.tn.us	Yes	Yes	No	Yes	Yes	Yes
TX	Natural Resource Conservation Commission http://www.tnrcc.state.tx.us	Yes	Yes	Yes	Yes	Yes	Yes
VA	Dept. of Environmental Quality http://www.deq.state.va.us	Navigation Menu	No	No	Yes	Yes	Yes

¹ May include animal waste, as well as rules and opportunities for disposing of pesticides, spent oil, etc.

² Water-water quality and quantity; waste-municipal waste; air-air quality

due to high concentrations of nutrients, especially phosphorous and nitrogen. This promotes algal blooms and reduces dissolved oxygen causing “smelly” water and/or fish kills. Last year, flooding in North Carolina due to severe hurricane activity resulted in spills and overflowing of lagoons and other waste impoundments. As a result, concerns over pollution of surface and groundwater, as well as human infections from pathogens in animal fecal material, have increased.

In recent years, degradation of surface water quality in the South due to elevated levels of phosphorus from animal waste and other sources such as municipal storm water, municipal sewage treatment plants, and commercial fertilizers has received tremendous attention from news media, environmental groups, and government and regulatory agencies. There are numerous water body segments throughout the South that are on the 303d list (a biannually updated inventory of impaired streams and water bodies according to section 303d of the Clean Water Act, passed in 1972) as nutrient impaired. Some are targeting inorganic fertilizers, but most are targeting animal manures. A series of symposium papers from the 1998 annual meeting of the American Society of Agronomy were published in the *Journal of Environmental Quality* discussing agriculture’s contribution to nutrient impairment of surface water body segments [1, 2, 3, 5]. Many other papers have been published since this symposium. Tables 1 and 2 are listings of Southern states and selected EPA Websites with information related to CAFO/AFO rules and regulations and current state issues.

The Issues

- ♦ The South generates a fair share of an estimated 1.37 billion tons of animal waste annually.
- ♦ Environmental organizations, citizens’ groups, and others claim large integrators are affecting the livelihood of small farms by riding out the seasonal price decline or high costs of production. They also suggest that highly concentrated animal feeding operations are causing environmental pollution risks due to large amounts of waste production, handling, storage, and disposal.
- ♦ The over application of animal waste, containing too much phosphorus, causes concern in regard to pollution of surface water.
- ♦ Concerns over human infections from pathogens in surface and groundwater due to animal waste spills have increased.

The Response

- ♦ Animal waste can be an asset and not a liability, if utilized properly.
- ♦ Alternative and efficient uses of manure need to be discovered.
- ♦ Proper management of manure applications on crops has to be encouraged and enforced.
- ♦ Rules and regulations regarding animal manure and wastewater management issues in relation to live-stock and poultry production are being addressed.

Table 2. Selected EPA and CAFO/AFO Information Sites

Website Title	Website Address
EPA Office of Wastewater Management–Animal Feeding Operations (AFOs)	http://www.epa.gov/owm/afo.htm
EPA Compliance Assurance Implementation Plan for Concentrated Animal Feeding Operations	http://es.epa.gov/oeca/strategy.html
EPA Office of Enforcement and Compliance Assurance–Agriculture Sector Contacts	http://es.epa.gov/oeca/ccsmd/cac/agri.html
EPA Region 6–Water Enforcement Branch–Concentrated Animal Feeding Operations	http://www.epa.gov/earth1r6/6en/w/cafo/home.htm
Clean Water Act Compliance Audit Program for Pork Producers Fact Sheet	http://es.epa.gov/oeca/ore/porkcap/factsh.html
EPA National Agriculture Assistance Center: Animals, Livestock, and Aquaculture Producers	http://es.epa.gov/oeca/ag/animals.html
1998 National Survey of Animal Confinement Policies	http://cherokee.agecon.clemson.edu/confine.htm

“An increase in urban sprawl, coupled with loss of agriculture lands, has increased complaints of malodors, dust, and noxious gases associated with CAFOs and poultry operations.”

Over the years, research related to commercial phosphorus fertilizer application on soils has shown that it was not very mobile in the soil and only 20-30 percent of the total phosphorus applied was taken up by plants. Most of the rest remained in the soil and became unavailable for plant uptake due to chemical reactions with calcium and magnesium in neutral to calcareous soils and aluminum and iron in acid soils. However, research within the last five years across the U.S., especially in the Southern states, indicates that phosphorus in surface application of animal wastes, biosolids, and commercial fertilizers is more mobile and contributing to phosphorus in surface runoff. Also, unpublished data from lagoon effluent treated fields in Texas are demonstrating that when organic phosphorus is over applied, it is transported into and through the soil profile to depths of at least three feet. High concentration of soil test phosphorus raises issues such as: what soil parameters best indicate the mobility of phosphorus, how much phosphorus can be in the runoff before eutrophication takes place, and does the high soil test phosphorus cause any plant nutrient imbalances? Information about some of these studies and issues can be found through Websites listed in Table 3.

Table 3. Land-Grant Institution Websites Related to Animal Waste

University	Website Address
University of Arkansas	http://www.uark.edu
University of Georgia	http://www.bae.uga.edu/outreach/aware/index.html
Mississippi State University	nmtaskforce@abe.msstate.edu
North Carolina State University	http://www.cals.ncsu.edu/waste_mgmt/
Oklahoma State University	http://clay.agr.okstate.edu/animalwaste
Texas A&M University	http://tammi.tamu.edu

Managing proper disposal of animal mortality is an emerging water and air quality issue in the South. With diminished numbers of rendering services and new regulations against direct burial, alternatives such as composting of carcasses are being promoted.

Population growth in the South has outpaced the rest of the country and current data point to the continuation of this trend in the future. An increase in the urban sprawl, coupled with loss of agricultural lands, has increased complaints of malodors, dust, and noxious gases associated with CAFOs and poultry operations. Other concerns publicized include confinement workers’ health, neighbors’ property values, and enjoyment of life. Therefore, the medical community in some states has begun studying the effect of odorants and dust on human health.

Vertical integration of livestock and poultry industries in the South also has created some socioeconomic issues. Environmental organizations, citizens’ groups, and others call these production systems “factory farms.” They feel these farms may affect the livelihood of small producers whose operations may not sustain seasonal price declines or higher cost of production. It is often the contention of these groups that the factory farms are driving the family farms out of business. They also claim substantial quantities of wastes produced by large integrators pose greater risks of environmental pollution due to accidental spills or failure of waste handling, treatment, or storage systems.

During the last 10 years, several Southern states have adopted new rules to regulate CAFOs (Table 1). These are the AFOs that confine more than 1,000 animal units (AUs), a measure that is equivalent to 1,000 beef cattle, 700 dairy cows, 2,500 hogs or 30,000 laying hens or broilers. In some instances, states have required permitting AFOs with as few as 300 AUs (200 dairy cows) if the watershed is declared to have nutrient impaired water quality. State (Table 1) and/or Federal (Table 2) permits are often required to operate, construct, or expand these CAFOs. The intent of these regulations is to minimize the impact of operations and land application of animal waste on water and air quality. Some states require training that consists of education and certification or registration of the CAFO owner or operator or anyone who land applies waste from these CAFOs. Increasingly, these trainings emphasize comprehensive nutrient and waste management planning with some form of odor control training.

Although there are no federal standards or rules for odors from animal production systems, they are regulated as a nuisance. Several Southern states have requirements of setbacks, or buffers between the odor source at a CAFO and the nearest neighbor's residence. Setbacks vary from 50 feet to three miles based on species and state regulations. Some states and local governments have a temporary moratorium on construction and expansion of new and existing swine facilities and are moving toward eliminating construction of lagoons as an effluent storage and treatment option. There is also some consideration to require covering of waste storage structures to minimize odor emissions. Environmental groups contend many of these rules and regulations are not going far enough and are generally in favor of the large integrators, while many in the agricultural community are of the opinion the increased cost of compliance is driving animal industry out of the region.

Scientists in the public and private sectors of the South are discovering alternative and efficient uses of manure. Poultry litter is used as supplemental feed for cattle in some states. Poultry litter and cattle feedyard manure is currently being studied as a co-combustion substance with coal to produce electricity. Demonstrations of composted dairy manure mixed with grass seed applied on roadside rights-of-way and ditches are being carried out. Also, trials are currently under way to look at the feasibility of composted dairy or poultry litter mixed with bottom ash, a coal combustion by-product, as a soil amendment. Markets for the alternative uses of manure will be governed either by transportation distances from source to use site or by stricter regulations on land application of manure.

Summary

An increase in the number and concentration of livestock and poultry operations in the Southern states presents a greater challenge of efficient and environmentally sound management of animal wastes. Repeated application of manure to meet the nitrogen need of crops has increased concentrations of phosphorus and other nutrients in many southern soils raising water quality concerns. New and existing facilities should be encouraged to work with surrounding farmers and ranchers to spread the manure at rates equal to less than two times the phosphorus requirement of the crop. Waste handling, storage and treatment

“Scientists in the public and private sectors of the South are discovering alternative and efficient uses of manure.”

21ST CENTURY

facilities, as well as application of manures and lagoon effluent, must be managed properly to address water quality and odor concerns.

A certain level of odors will be present with animal industries. More and more scientists in private and public sectors are investigating different technologies and management practices to control these odors. There are still many unanswered questions, and many questions are yet to be asked, about managing animal wastes to reduce air, water, and soil contamination. Properly managed animal wastes are an asset and not a liability. It is the responsibility of producers, the scientific community, environmental groups, and state and federal regulatory agencies to collectively find and implement the best management practices.

References

- [1] Correll, David L. 1998. "The role of phosphorus in the eutrophication of receiving waters: A review." *J. Environ. Qual.* 27:261-266.
- [2] Daniel, T.C., A.N. Sharpley, and J.L. Lemunyon. 1998. "Agricultural phosphorus and eutrophication: A symposium overview." *J. Environ. Qual.* 27:251-257.
- [3] Gburek, William J., and Andrew N. Sharpley. 1998. "Hydrologic controls on phosphorus loss from upland agricultural watersheds." *J. Environ. Qual.* 27:267-277.
- [4] Parry, Roberta. 1998. "Agricultural phosphorus and water quality: A U.S. Environmental Protection Agency perspective." *J. Environ. Qual.* 27:258-261.
- [5] Sims, J.T., R.R. Simard, and B.C. Joern. 1998. "Phosphorus loss in agricultural drainage: Historical perspective and current research." *J. Environ. Qual.* 27:277-293.
- [6] USDA-National Agricultural Statistics Survey. 1998. Published estimated data for livestock and poultry. Available online at <http://www.usda.gov/nass/>.

Saqib Mukhtar is an Agricultural Engineering assistant professor with the Texas Agricultural Extension Service located at Texas A&M University. Sam Feagley is a Soil and Crop Science professor with the Texas Agricultural Extension Service, and B.L. Harris is the associate director for Agricultural Sciences with the Texas Agricultural Extension Service. For additional information about this topic, contact Sam Feagley at College Station Soil and Crop Science, Mail Stop 2474, College Station, TX 77843, 979-845-1460, s-feagley@tamu.edu.

Published by
Southern Rural Development Center
Box 9656
Mississippi State, MS 39762
662-325-3207
662-325-8915 (fax)
<http://ext.msstate.edu/srdc>

For more information, contact:
Lionel J. Beaulieu, Director
(ljb@srdc.msstate.edu) or
Sally Garriga, Editor
(sallyg@srdc.msstate.edu).

The Southern Rural Development Center does not discriminate on the basis of race, color, religion, national origin, sex, age, disability, or veteran status.

NONPROFIT ORG.
U.S. Postage
PAID
Permit No. 39
Mississippi State, MS

Southern Rural
Development Center
Box 9656
Mississippi State, MS 39762

