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UNL's Livestock Environmental Issues Committee
Includes representation from UNL, Nebraska Department of Environmental Quality, Natural Resources Conservation Service, Natural Resources Districts, Center for Rural Affairs, Nebraska Cattlemen, USDA Ag Research Services, and Nebraska Pork Producers Association.

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Alternative Treatment Systems

By John Sweeten, Texas A&M University, Ron Miner, Oregon State University; and Brent Auvermann, Texas A&M University

**Dr. J. Ronald Miner was a faculty member at Oregon State University for 31 years. He passed away on Tuesday, February 10, 2004. Dr. Miner was a expert in livestock waste management, odor control strategies for animal production facilities, non-point source pollution control and water quality. He was highly regarded by producer groups, fellow research and extension engineers, animal scientists, lawyers and regulatory officials. Ron will be greatly missed by his friends, colleagues and family.*

Overview of new EPA Regulations

The February 13, 2003 *Federal Register* revised the Environmental Protection Agency's (EPA's) "Part 412-Concentrated Animal Feeding Operations (CAFO) Point Source Category," which described the revised Effluent Limitations Guidelines (ELG) and New Source Performance Standards (NSPS) for concentrated animal feeding operations (CAFOs). The regulation applies to manure, litter, and/or process wastewater discharges resulting from CAFOs. Subpart C addresses dairy cows and cattle other than veal calves, which includes dairy operations and beef cattle feedlots. Subpart D addresses swine, poultry, and veal calves. Baseline ELGs in the revised rule prohibit discharge of process waste waters except when rainfall events cause an overflow from a facility designed, constructed. and operated to contain (a) all manure, litter and process waste waters plus (b) the runoff from a 25-year recurrence interval, 24-hour duration rainfall event. The baseline ELGs fall into four categories: 1) Best practicable control technology (BPT) currently available, 2) Best conventional pollutant control technology (BCT), 3) Best available technology (BAT) economically achievable, 4) New source performance standards (NSPS)

Voluntary Alternative Performance Standards (VAPS)

The revised CAFO rule provided an alternative avenue, VAPS, for managing manure, litter, and/or process wastewater discharges from CAFO's (Appendix A). The VAPS provisions are an alternative to the ELG in both Subpart C (i.e., dairy and beef cattle) and Subpart D (i.e, swine, poultry, and veal). In other words, the VAPS impose identical requirements on all CAFO operators who wish to move beyond the traditional, lagoon or holding-pond-based waste management systems that have been the outcome of the no-discharge ELG for the last thirty years.

Alternative Technologies: A Discussion

In revising the guidelines for the management of manure, wastewater, and other process water generated by CAFOs, the EPA is acknowledging several important changes that have occurred since the first guide-lines were released:

-A far greater proportion of livestock and poultry production in the United States takes place in CAFOs.
-CAFOs are generally larger and more technologically sophisticated than they were in 1970.
-Confined animal feeding is a more vertically integrated industry.
-Waste management technologies available to the CAFO industry have become more sophisticated and promise to become even more so in response to

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- Accelerated research and development.
- Increasing emphasis on holistic or media environmental protection.
- Greater immediate pressure for air pollution control.
- The need to achieve a higher level of production efficiency.

Traditional systems for management of CAFO runoff and manure have utilized earthen basins functioning as runoff control structures (RCS), manure storage basins, or anaerobic lagoons. These treatment or storage structures have made important contributions to cost-effective pollution control from livestock and poultry production facilities. As CAFO size and concentration have increased, however, it has become obvious that these earthen basins may not be adequate for all livestock and poultry enterprises. Among the situations in which they may have proven inadequate are those situations in which

-The number of animals confined produces nutrients (nitrogen and phosphorus) in amounts exceeding those needed for crop production on nearby agricultural land.
-Neighbors have been unwilling to tolerate odor and airborne pollutants associated with confined animal facilities, lagoon or RCS.

Traditional EPA and/or state regulatory approaches (i.e., the no-discharge approach) have encouraged most producers to use lagoons, earthen storage basins, (or RCS) and land application systems in lieu of adequate treatment to allow discharge (i.e., to public watercourses) or other uses. Moreover, the ELG-NSPS may have deterred innovators from developing scientifically sound technologies for potential markets because few incentives have existed for variance from the regulatory norm. The classical approach assumes that the increasing environmental stress associated with the increasing size of CAFOs can be met by increasing the size of storage (lagoons, storage basins, or RCS and disposal (land application, evaporation, or other) systems. Moreover, in some locations the threat to groundwater may actually be exacerbated by adding lagoons, earthen storage basins, or RCS. In addition, traditional systems for effluent capture, storage, treatment, and land application may not adequately control emissions of odor, ammonia, hydrogen sulfide, volatile organic compounds, or other odorants.

Although lagoon/irrigation systems may work well for many CAFOs, particularly in the southern United states, they may not be the most appropriate technology for all CAFOs. For instance, very large CAFOs may have economies of scale that could facilitate the development and adoption of higher-order treatment/utilization technologies that may be more cost effective than acquiring additional land or excavating and managing larger lagoons or RCS. Systems with smaller footprints are technologically possible and may address additional environmental concerns along with surface water quality.

Research has demonstrated that there may be alternatives to the use of large open basins for the management of CAFO wastes. Among these are basin covers, which may be either permeable or impermeable for odor reduction. Another alternative is a series of processes that concentrate and harvest nitrogen (N) and phosphorus (P) for transport to an alternate watershed where they can be used as fertilizer. In other systems, the biogas resulting from the anaerobic digestion of animal manures is collected and used to generate electricity. These systems may produce enough energy to be marketed to the local utility company, offsetting the systems' capital and start-up costs.

Greater reliance on designed and managed soil/water/plant systems may offer advantages commensurate with those of the high-tech innovations.

The new ELGs for CAFOs set the stage for the development, evaluation and eventual adoption of innovative technologies that could offer a higher level of environmental protection and greater conservation of our finite energy resources. More attractive economic returns to CAFO operators have not yet been demonstrated for many promising concepts.

Strategic Issues

EPA has opened the door to a more innovative CAFO industry through the VAPS approach. The concept remains somewhat general at present.

Land-grant universities (LGUs) allied with

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private and public technology and service providers can assist by taking a leadership role in strategic thinking that could set the couse for implementing the VAPS program through some well-chosen successful examples. In that process, LGUs will need to bring producers, policy makers, and citizens' groups together to

-Ratify a common base of scientific understanding to undergrid policy recommendations.
-Resolve the ironies of competing views of the same policy proposals, as in the debate over the adoption of EMS as alternatives to prescriptive permit programs.
-Harness competing agendas (e.g., economics, political, and environmental) in the context of a shared preference for performance-based standards.
-Exploit the synergy of parallel objectives where they exist among stakeholder groups.
-Develop, demonstrate, and transfer technology that will satisfy producers, environmental advocacy groups, and public concerns and increase the long-term sustainability of concentrated livestock and poultry production.

Several research and demonstration opportunities are suggested by the VAPS approach. These concepts include the following:

-Environmental nutrition methods and technologies to reduce nutrient excretion and/or dietary nutrient requirements.
-Designed grass filters, buffer strips, and infiltration areas, vegetative systems that reduce solids, nutrient and hydraulic loading.
-Air quality-process-based models (NRC 2003) to improve emissions estimates from covered lagoons, tanks, basins, open lots, and other sources.
-Constructed wetlands following pretreatment to polish pretreated wastewater to allow release to receiving water, seasonally or continually.
-Anaerobic digestion and thermal conversion-improving the cost effectiveness or systems to recover energy and reduce atmospheric emissions from agricultural biomass.
-By-product recovery schemes-N and P are harvestable and may have sufficient market value to justify costs.
-Industrial co-products-accelerating the recovery and value-added reuse of waste materials.

Summary

EPA's new CAFO rule provides for a performance-based, alternative technologies option to the no-discharge standard for CAFO waste management. The alternative technologies language in the new rule offers possibilities and potential flexibility for approving waste-management systems that discharge pollutants at a rate equivalent to or lower than nominal no-discharge systems.

The traditional no-discharge standard has been criticized for locking the CAFO industry into the earthen storage structure/land application paradigm. In recent years. environmental advocacy groups have intensified their call for the abolishment of lagoons and earthen storages. The VAPS language in the new CAFO rule provides the best policy opportunity yet to resolve that irony and adopt parallel objectives to the benefit of soil, water, and air resources, increasing the long-term sustainability of other animal feeding industry. ●

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