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Improving Waste Management Strategies for Small Livestock Farms

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In recent years, there has been growing public concern over the environmental and human health issues associated with livestock production. In particular, water quality is typically considered the issue of greatest concern because of potential impacts on drinking water, as well as aquatic ecosystems. Contaminants from animal waste generated from livestock operations can be transported into surface and groundwater through various routes, such as leaking storage lagoons, runoff from land application, and flooding.¹ These contaminants include nutrients, pathogens, heavy metals, pharmaceuticals, and natural/synthetic hormones. Although large regulated livestock farms dominate national discussions and debates, smaller unregulated livestock farms may also contribute to potential adverse impacts on water quality, particularly at the local and regional scale. Therefore, we argue that incentives and programs for smaller farms are needed to improve waste management and enhance water quality.

Animal feeding operations (AFOs) have become the norm for producing livestock. AFOs are defined by the United States Environmental Protection Agency (U.S. EPA) as operations that are 1) “stabled or confined and fed or maintained for a total of 45 days or more in any 12-month period” and 2) have no vegetation grown within the operation lot during a normal growing season.² Concentrated animal feeding operations (CAFOs) are AFOs defined as medium or large operations by species-specific animal capacity thresholds or small operations when pollutant discharge exceeds criteria established by the Clean Water Act. Any CAFO that has potential to release waste is required to obtain a permit through the

National Pollution Discharge Elimination System (NPDES) and develop a Nutrient Management Plan (NMP). Similar to historic trends in U.S. crop production, from the 1980s to late 1990s livestock operations were increasingly consolidated to greater numbers of larger operations.¹ However, this trend toward an increase in large CAFOs halted and, over the past decade, the number of large livestock operations has remained steady.³ CAFOs account for only ~15% of AFOs, with the remainder (~85%) represented by small, unregulated AFOs across all species of livestock. For example, ~97% of cattle farms have less than 500 head and, for beef alone, the majority of production (>50%) occurs within small AFOs.⁴ However, these small operations often lack the resources to efficiently manage animal waste, leading to greater potential for unintended adverse impacts on environmental health.

While there is a recognized need for better understanding CAFO-induced water quality impacts and improving CAFO regulations, currently there is little attention paid to the potential impact of smaller, unregulated livestock farms. When CAFO-generated animal waste is stored and land-applied under controlled conditions, it can be utilized as an efficient fertilizer for nearby agricultural fields. Although the farming community generally values environmental stewardship, smaller livestock operations face many challenges when managing animal waste, including a lack of (1) sufficient land for fertilizer application, (2) adequate storage capacity for animal waste, (3) transportation for excess waste, and (4) advanced technology to effectively assess and monitor soil nutrient levels and demands. As smaller AFOs are not required to develop NMPs and apply for NPDES permits, these operations likely have practices that impair water quality and are noncompliant with CAFO regulations, such as animals grazing directly in adjacent bodies of water, overapplication of animal waste to crop fields, and inadequate protection of manure piles.⁵ While there is a public perception that large “factory” farms adversely impact water quality, the reality is that larger CAFOs, unlike smaller, unregulated AFOs, have more available resources and financial incentives to develop and comply with efficient NMPs. For this reason, improved incentives and programs are needed to encourage smaller AFOs, those not regulated by the U.S. EPA, to improve waste management, especially given that these farms contribute the large majority of livestock production.

Although some financial support is available to smaller AFOs via the United States Department of Agriculture’s Environmental Quality Incentives Program (EQIP), there is a need for more structured support and incentives for small livestock farms to use best management practices (BMPs). In our opinion, two potential solutions may encourage better management of waste among small livestock farms. First, tax

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incentives could be directly offered to small AFOs to develop and comply with NMPs, an option that would be similar to financial support offered by EQIP, but specifically focused on the use of BMPs. Second, tax incentives could be used to establish a cooperative among small livestock farms, local growers, and wastewater treatment plants (WWTP) and, as a result, promote proper use and disposal of animal waste. This latter option not only encourages BMPs for waste management on livestock farms, but also strengthens ties among stakeholders within the local community. Moreover, as small AFOs often lack the ability to properly distribute and dispose of waste, WWTPs could play a key role in handling and transporting waste from small AFOs to local crop growers.

Implementing biodigesters can be an effective way to reduce organic content of animal waste while harnessing methane that can be used or sold for electricity. However, this technology is not necessarily cost-effective for small-scale farms due to the expense of building initial infrastructure. Establishing cooperatives in farm-intensive communities could ease the financial burden from individual small farms and allow for building of infrastructure, such as waste pipelines for more efficient transport of waste to treatment/storage facilities. While building cooperatives would be financially cumbersome for the WWTPs, this cost could be relieved through tax incentives or federal subsidies. In addition, these incentives or subsidies could be used to help build the infrastructure needed to accommodate large volumes of animal waste and incorporate sustainable, revenue-generating biodigester technology within WWTPs. Although the use of cooperative groups and biodigesters are not new to larger CAFOs, more work is needed to ensure that these waste management approaches and technologies are appropriately accessible and affordable for smaller livestock producers. As small AFOs continue to play a major role in livestock production, new environmental-friendly programs for efficient waste management could lead to increased business opportunities while, at the same time, improving water quality within areas containing high densities of small unregulated AFOs.

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Notes

The authors declare no competing financial interest.

REFERENCES

- (1) *Risk Assessment Evaluation for Concentrated Animal Feeding Operations*; EPA/600/R-04/042; United States Environmental Protection Agency, National Risk Management Research Laboratory: Cincinnati, OH, 2004; <http://nepis.epa.gov/Adobe/PDF/901V0100.pdf>.
- (2) *Producers' Compliance Guide for CAFOs: Revised Clean Water Act Regulations for Concentrated Animal Feeding Operations (CAFOs)*; EPA 821-R-03-010; United States Environmental Protection Agency, Office of Water: Washington, DC, 2003; http://ndep.nv.gov/bwpc/docs/epa_cafoproducerscomplianceguidelines.pdf.
- (3) *The 2012 Statistical Abstract*; United States Census Bureau: Washington, DC, 2012; <http://www.census.gov/prod/2011pubs/12statab/agricult.pdf>.
- (4) *Farms, Land in Farms, and Livestock Operations 2012 Summary*; United States Department of Agriculture, National Agriculture Statistics Services: Washington, DC, 2013; <http://usda01.library.cornell.edu/usda/current/FarmLandIn/FarmLandIn-02-19-2013.pdf>.

- (5) *Guide to Providing Manure Management Education to Small Farm and Livestock Operations*; Northeast Recycling Council: Brattleboro, VT, 2009; http://www.nerc.org/documents/manure_management/guide_to_providing_manure_management_ed.pdf.