

Are Our Feeding Programs Contributing to Environmental Contamination?

Deanne Meyer, PhD

Livestock Waste Management Specialist, Dept of Animal Science, Division of Agriculture and Natural Resources, University of California, Davis, CA 95616, dmeyer@ucdavis.edu

Abstract

New Federal regulations related to concentrated animal feeding operations will prompt many states to increase permitting of these facilities. Included in the permit process will be greater accountability of land application of manure nutrients. In areas where livestock producers do not have sufficient land available for crop production to utilize manure nutrients, alternative utilization methods will need to be identified. The first logical step is to evaluate the dietary nutrient concentrations and make source reductions by reducing these inputs. It is critical that least cost ration formulation include the cost of manure nutrient utilization. Practitioners can assist their clients: identify reliable sources of information, understand new regulations and associated critical control points, assist clients with compliance assistance programs, encourage clients to keep records, identify consultants with expertise in crop production, assist clients in checking references of potential consultants, and encourage clients to make direct contact with regulatory agency staff.

Résumé

Les nouvelles directives fédérales au niveau de l'agrégation des entreprises d'alimentation animale devraient permettre à plusieurs états d'en augmenter le nombre. Une plus grande responsabilité vis-à-vis l'épandage du fumier sera incluse dans le processus d'acquisition des permis. Dans les zones où les producteurs agricoles ne possèdent pas assez de superficie de terre cultivable nécessaire à l'épandage du fumier, il faudra penser à des méthodes alternatives d'utilisation du fumier. La première étape logique est d'évaluer la concentration des produits nutritifs dans les aliments et de faire des réductions à la source pour diminuer leur production. Il est impératif que le développement d'une ration à moindre coût prenne en

ligne de compte le coût de l'utilisation des produits nutritifs du fumier. Les intervenants peuvent aider leurs clients à identifier les sources fiables d'information, à comprendre les nouvelles directives et les points de contrôle critiques qui leurs sont associés, à s'accorder aux programmes de conformité, à développer un système d'enregistrement de leurs données, à identifier les consultants qui ont de l'expertise dans la production agricole, à vérifier les références des consultants candidats et à établir des contacts directs avec le personnel des agences de contrôle.

The Setting

Significant changes have occurred in both beef and dairy operations during the last few decades. Producers who used to focus their resources on maximum productivity, animal health and production of a quality product now must include concerns of animal welfare, food safety, emergency preparedness and environmental stewardship. What seem like ever changing local, state and federal water and air quality regulations have exhausted and frustrated dairy and beef producers.

In 1972, the Clean Water Act was amended to define Animal Feeding Operations (AFO) as facilities that supplemented feed for more than 45 days during the year. By 1974, the identification of point source operations was established with the definition of Concentrated Animal Feeding Operation (CAFO) and the establishment of Effluent Limitations Guidelines (ELG). The CAFO definitions defined large and medium facilities (1000 beef or 700 mature milking and dry dairy animals; 300 beef or 200 mature milking and dry dairy animals). The established ELG required that ZERO discharge occur except during a 25-yr, 24-hr or chronic storm event (be advised, some states do not acknowledge the chronic storm event). Industries defined as point source are obligated to obtain an NPDES

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(National Pollutant Discharge Elimination System) permit. Many facilities that are large may not have this permit if they have not had an illegal discharge, do not have a huge potential to discharge to a surface water, or if the state authority identifies that the state law is more restrictive. In this case they will not issue a discharge permit if state law prohibits discharge.

In 1989, the US Environmental Protection Agency (EPA) signed a consent decree to review and revise a handful of ELG conditions. Included in this review were the definitions of CAFO and associated ELG. In 1998 a Unified Animal Feeding Operation Strategy was published by USDA NRCS (Natural Resources Conservation Service) and US EPA. The Strategy was finalized March 9, 1999. This Strategy served as the roadmap for the potential revision of the Clean Water Act related to CAFO. The Strategy introduced the concept of a Comprehensive Nutrient Management Plan (CNMP). As presented, a CNMP would address feed management, manure handling and storage, land application of manure, land management, record keeping and other utilization options. As the public process proceeded, the components of a CNMP were rearranged and feed management slipped down the list. It did remain on the list.

The draft CAFO rule and associated ELG was published in December of 2000. Comments were due in July of 2001. The lengthy comment period was allowed because of the 285 pages of Federal Register documentation for comment. In an unusual act, US EPA issued a Notice of Data Availability (NODA) to provide information they received during the initial public comment period back to the public for comment. These comments were due January, 2002. A second NODA was released for comment due July, 2002. The final rule was published in the Federal Register on February 12, 2003.

In the meantime, NRCS has finalized its National CNMP Guidance (December, 2000) and many states are working on their state guidance for CNMP. Each state may have different attention to detail and requirements for documentation. The state NRCS office may have updated information for your state. Once information is available at the state office it will be transferred to the local offices. To contact your local county office point your web browser to http://offices.usda.gov/scripts/ndISAPI.dll/oip_public/USA_map.

State or local regulations

Each of the states and territories in the United States has the potential for additional requirements, and counties have the opportunity to have even more stringent requirements. Ask any California dairy producer about the California Environmental Quality Act (CEQA). If there is not immediate reaction, the odds

are fairly good that the individual has not gone through a county permitting process in the last few years to either expand their current dairy or relocate. Like the Clean Water Act and many state regulations, enforcement of the CEQA on agriculture and animal facilities has been almost non-existent during its first 25+ years. More recent attention from environmental groups has resulted in stronger enforcement of the CEQA. The end result is a much extended and highly public process associated with obtaining a permit. Once the permit is issued, the environmental groups then file suit against the issuing agency for not adequately addressing the CEQA. Many producers have been in the land of unknown territory as they try to get permitted. Other producers who have expanded their facilities and neglected to update use permits may end up in the same place.

Standard Feeding Practices

There are numerous methods to formulate diets. Three common practices are identified. One option is to assume feeds have standard nutrient content (no analyses of inputs) and formulate diets to NRC recommended concentrations or a multiple thereof. A second option is to analyze feedstuffs and supplement to NRC recommended concentrations or a multiple thereof. A third option is to assume the nutrients in feed are less than 100% available and supplement to NRC recommended concentrations or a multiple thereof.

CAFO clients should carefully consider dietary ingredients before finalizing diets. It is critical to carefully evaluate the environmental consequences of dietary supplements. Does the animal need the supplement? Does the supplement provide economic benefit to the facility? What is the consequence of having the supplement come through in the manure?

Feed Management Options

Feed management has regularly been an important component of livestock operations for decades. Optimization of nutrient input is beneficial for animal health and production. Now, there are increased opportunities for feed management to assist in environmental stewardship.

Both dairy replacement facilities and beef feedlots raise animals with the objective of attaining a specific average daily gain. Feeds are typically purchased and fed through least cost ration formulation while meeting specific nutrient criteria. The least cost formulation focuses on meeting the nutrient requirements of the animals. Although attention to some nutrients or ratios of nutrients occurs, little emphasis is placed on the overfeeding of nutrients.

Least cost ration formulation should consider the cost of manure nutrient utilization or disposal in areas where excess nutrients are a concern for water or air quality.

One common feed management practice is to group feed animals. Veterinarians and nutritionists have recommended this to have animals of similar nutrient requirements fed together. Phased or group feeding, feeding of different concentrations of nutrients on a dry matter (DM) basis, is an effective method to reduce nutrient intake and subsequent excretion. Erickson *et al*² reported that use of lower crude protein diets (13.4% vs 10.2 to 12.0%) and phase feeding can reduce nitrogen (N) excretion in yearling and fattening beef cattle from 389 to 339 lb (177 to 154 kg) N/yearling steer (132 day trial) and 491 to 389 lb (223 to 177 kg) N/steer calf (183 day trial), respectively. Feed N intake was reduced by 10 to 20% when using phase feeding and the NRC model to meet the metabolizable protein requirement of the animal. Reduction in N excretion ranged from 13 to 21%. This also reduced the runoff of N from the feedlots and reduced the estimated amount of N volatilization losses from the feedlot surface by 15 to 33%.

Erickson *et al*¹ also evaluated phosphorus (P) requirements and excretion in feedlot diets. They reported that yearling finisher diets have a P requirement as low as 0.14% of the diet (DM) and the P requirement for calves was as low as 0.16%. Cattle fed corn based finish diets typically consume a diet greater than 0.3% P, a two-fold excess of requirement. In other work, Erickson *et al*³ compared 0.40% P diets with 0.22 or 0.28% P diets. P excretion was reduced from 12.5 to 7.5 lb (5.0 to 2.4 kg) P/yearling steer 11 to 5.3 lb (132 day trial) and (5.7 to 3.4 kg) P/steer calf (183 day trial) when fed the control and low P diets, respectively. This decrease in P level in the diet reduced P intake by 33 to 45% and P excretion by 40 to 50%. Phosphorus efficiency was improved and there was no effect on animal performance. At present, the only logical way of formulating lower P diets for cattle fed in the nation's feedyards is to select low P containing ingredients. For diets containing corn grain as the energy source, supplemental soybean meal protein can be removed from the diet and replaced with non-protein N as a means of reducing total diet P.

A study in replacement heifers was conducted to determine the environmental benefit of reducing N intake. James *et al*⁴ reduced the crude protein from 11.0 to 9.6% in oatlage and concentrate diets (77:23 DM basis) with soybean meal serving as the protein source for heifers. The 14% reduction of N intake (DM basis) resulted in a 28.1% reduction in ammonia emissions and decreases in the urea N, total N, and percentage N excreted in the urine of 29.6, 19.8 and 7.4% respectively.

Economic evaluation of phased feeding should be conducted to include the cost of handling manure nutrients in areas where excess nutrients are present.

Assisting Your Clients

There will be more emphasis on environmental compliance. There will be a bit more equity in the existence of regulations with the new federal regulations. Dairy producers in the year 2020 will be keen managers of information and personnel. Start preparing now for your future. Be sure when you purchase equipment or expand your herd that you consider the ramifications on manure management and its associated record keeping requirements.

1. Identify reliable sources of information. In an era of bombardment by information by all sides, be sure you know who provides reliable and sound information. Work with your county agent or dairy advisor. These individuals have direct links to others in the Land Grant College system. They can get reliable information for you and potentially assist in conducting research. Research scientists at the Land Grant College are also potential resources for assisting in research projects. Work with your trade associations. The National Center for Manure and Animal Waste Management <http://www.cals.ncsu.edu/waste_mgt/natlcenter/center.htm> and the National Curriculum for Livestock and Poultry Environmental Stewardship <<http://www.lpes.org>> are starting points for information. Also, you can search the web on manure and animal waste management.
2. Understand regulations and identify critical control points. This requires time and energy. Reading regulations or articles on regulations is not exciting. However, it is essential for your clientele that you be informed. If you do not know the current importance or magnitude of potential changes your clients will view them as unimportant. Preparation and planning are the best tools to address changes.
3. Is there a compliance driven environmental management system available to assist your clients? If so, help your clients participate in this process. If not, identify a program available that can assist in this process. The process will help to identify what puts a client at risk for contaminating the environment and then make sound management decisions to reduce risk. If your clients are not in compliance now, the new regulations may find you with fewer clients.
4. Encourage clients to keep records of manure application and nutrient content of manure (frequency and application quantity). Producers with records

will be a step ahead of those without records when new regulations take effect.

5. Assist your clients to identify a certified crop adviser or someone knowledgeable in plant nutrient needs and manure practices. Retention of services now may help minimize costs in the future. Also, there are only so many people with the appropriate experience and knowledge. In many intensively farmed areas there will be more clients than consultants, and the early bird may get the qualified consultant, and a more reasonable price.
6. Work with your clients to check credentials before they hire a consultant. There will be plenty of people who will offer services to get you through the permitting hurdles. Be sure the person is knowledgeable about the dairy industry and the permitting process in YOUR state. You can check with the regulatory agency staff to see what the success rate is for the individual or company before you hire them.
7. Encourage your clients to develop a personal relationship with the regulatory agency staff. It is critical that they know regulatory agency staff, regardless of whom is hired, to assist with permit applications or annual reporting documents.

Addendum

The new Federal regulations were signed in December, 2002. They appeared in the Federal Register February 12, 2003. They are available through EPA's website at <http://cfpub.epa.gov/npdes/>. Follow the link to the CAFO rule. The preamble is very long. The actual changes are in the links related to Sections 122 and 412. The potential form operators will need to fill out is Form 2B, and it also has a link on the web. It is important to realize that states may need to pass legislation to implement the new rule. Implementation will be anywhere from 60 days to 3 years and 60 days after the rule is published in the Federal Register. The actual implementation timeline and details will be addressed at the state level for most states. The way the rule is written, producers have a "duty to apply" for the permit. If you have a client who currently is identified as a CAFO by a state or federal regulatory agency it is critical that you and your client understand the timeline for your state. If you have clients with more than 700 milking and dry cows or 1000 feedlot calves, heifers, or cow-calf pairs, they are now defined as CAFO by size alone and will have a "duty to apply" for a CAFO NPDES permit issued by the state or federal government.

References

1. Erickson GE, Klopfenstein TJ, Milton CT, Hansen D, Calkins C: Effect of dietary phosphorus on finishing steer performance bone status and carcass maturity. *J Anim Sci* 77:2832-2836, 1999.

2. Erickson GE, Milton CT, Klopfenstein TJ: Dietary protein effects on nitrogen excretion and volatilization in open-dirt feedlots. *Proc Inter Symp Anim Agr and Food Proc Wastes*. Des Moines, IA, 2000, pp 297-304.

3. Erickson GE, Milton CT, Klopfenstein TJ: Dietary phosphorus effects on performance and nutrient balance in feedlots. *Proc Inter Symp Anim Agr and Food Proc Wastes*. Des Moines, IA, 2000, pp 10-17.

4. James T, Meyer D, Esparza E, Depeters EJ, Perez-Monti H: Effects of dietary nitrogen manipulation on ammonia volatilization from manure from Holstein heifers. *J Dairy Sci* 82:2430-2439, 1999.

USDA NRCS websites of interest

NRCS website with links to CNMP guidance, interdepartmental site for Clean Water Action Plan, public comment letters on the AFO Strategy, text of the final Unified National Strategy for Animal Feeding Operations (in English and Spanish).

<http://www.nhq.nrcs.usda.gov/PROGRAMS/ahcwpd/AFO.html>

USDA Agricultural Waste Management Field Handbook

<http://www.ftw.nrcs.usda.gov/awmfh.html>

USDA NRCS National Planning Procedures Handbook (NPPH).

<http://policy.nrcs.usda.gov/scripts/lpsiis.dll/EDS/RTFList.html>

USDA NRCS Conservation Planning Course
<Http://www.ncg.nrcs.usda.gov/start.htm>

USDA NRCS Core4 Conservation Practices Training Guide
<http://www.nhq.nrcs.usda.gov/BCS/agro/CORE4.PDF>

USDA NRCS Agronomy Technical Notes.
Http://www.ncg.nrcs.usda.gov/tech_notes.html

USDA NRCS National Agronomy Manual establishes policy for agronomy activities and provides technical procedures for uniform implementation of agronomy tools and applications. Release due fall 2000.

General Manual Technical Guides
<http://policy.nrcs.usda.gov/national/gm/title450/part401/index.htm>

Nutrient Management homepage
<http://www.nhq.nrcs.usda.gov/BCS/nutri/manage.html#nm>

US EPA websites of interest

Federal Register document:

http://www.access.gpo.gov/su_docs/aces/aces140.html
Click 2003 for volume 68, click ON, enter 02/12/2003, use search terms national pollutant. The first item identified should be National Pollutant Discharge Elimination System Permit Regulation. This is the CAFO rule.

Home page for TMDL

<http://www.epa.gov/OWOW/tmdl/>

There are four factsheets available on the TMDL process.

<http://www.epa.gov/OWOW/tmdl/cleanfs4.html> (Type in 1 through 4)

Compendium of state programs

<http://www.epa.gov/owm/stcpfin.pdf>

Additional websites:

Copeland C, Zinn J: 1998. Congressional Research Service Report for Congress. Animal waste management and the environment: background for current issues. The Committee for the National Institute for the Environment, Washington, D.C. Updated May 12. <http://www.cnie.org/nle/ag-48.html>

National Resources Defense Council, Inc. 1998. Reports America's animal factories how states fail to prevent pollution from livestock waste.

<http://www.nrdc.org/water/pollution/factor/aafinx.asp>

US EPA. 1997. Animal waste disposal issues. EPA office of Inspector General #7100142. [Http://www.epa.gov/oigearth/hogexsm.htm](http://www.epa.gov/oigearth/hogexsm.htm) April 21.

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ABOUT THE AUTHOR: Thomas E. Catanzaro, DVM, MHA, FACHE, Diplomate of the ACHE, is founder and CEO of Catanzaro & Associates, Inc. He is an innovative, popular consultant and speaker who has "translated lessons learned from industry, human healthcare, and the business world to veterinary medical situations." Dr. Catanzaro has taught leadership courses to veterinary practitioners throughout the United States and Canada for more than 18 years and has consulted for the past 12 years, visiting more than 1,200 veterinary facilities. He previously was hospital services director for the American College of Hospital Association and is the first veterinarian to achieve board certification in the American College of Healthcare Executives (ACHE). Dr. Catanzaro is also the author of several books including the *Building the Successful Veterinary Practice* series published by ISU Press.

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