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November 20, 2008

The Honorable Shari Wilson
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230-1720

Dear Secretary Wilson,

This letter serves as the comment of record from the Harry R. Hughes Center for Agro-Ecology in regard to MDE's Revised Draft General Permit and Regulations for Animal Feeding Operations.

As a member of the Eastern Shore Agricultural Collaborative (ESAC), the Hughes Center for Agro-Ecology supports the recommendations made by the Poultry Litter Experts Science Forum. The forum was convened on October 29, 2008 by ESAC, the Chesapeake Research Consortium and the Environmental Finance Center and funded by the Keith Campbell Foundation for the Environment. A copy of the recommendations is attached.

Specifically, we would like to highlight the finding of the panel that water quality is most significantly impacted by improper storage and location of poultry litter stockpiles and not by the length of days a properly constructed and located pile is left in the field. This should be carefully considered in light of the proposed regulations that would limit the number of days a temporary stockpile may be stored. An unintended consequence of meeting this requirement is that litter could be land applied during times of high nutrient and sediment loss potential, resulting in far more damage to water quality than if the litter was properly stockpiled. In addition, the scientists concluded that there is no consistent difference between covered and uncovered stockpiles with regard to nutrients moving from the pile through surface runoff or through the pile into underlying and adjacent soils.

An important consideration from the scientific panel is the identification of areas in need of further research. These include understanding the loss of nitrogen through ammonia volatilization and the related impacts on volatilization from covering or not covering temporary stockpiles; identifying the most practical and effective materials for constructing temporary storage pads; and determining best management practices to minimize the impact of temporary stockpiles on the area directly beneath and adjacent to the pile (i.e., the footprint).

As noted in the proposed regulations, MDE will be funding a study to evaluate the effectiveness of best management practices at working poultry farms. It is essential that future research projects of this nature adopt protocols that simulate Eastern Shore conditions for potential nutrient transport from poultry litter stockpiles, similar to the approach of Binford (2008) in "Evaluating BMPs for Temporary Stockpiling of Poultry Litter: Preliminary Report."

The Center is a strong proponent of using science-based recommendations to inform agricultural and forestry policy decisions in Maryland. We suggest that as you consider changes to the proposed Animal Feeding Operations General Permit, please keep in mind the recommendations of the scientific panel that focus on practices that demonstrate the greatest opportunity for improving water quality in the Chesapeake Bay.

Sincerely,

Harry R. Hughes
President

Enclosure
Cc: Patsy Allen, General Permits Coordinator, MDE

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# Poultry Litter Experts Science Forum

"Can we reach consensus on storage times for chicken litter? Are there seasonal considerations for deriving storage times?"

Summary of Chesapeake Research Consortium-Maryland Environmental Finance Center Science Forum

October 29, 2008

Panel

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|---|---|
| Greg Binford, Univ. of Delaware | Jack Meisinger, USDA ARS- Beltsville |
| Tommy Daniel, Univ. of Arkansas | Tim Pilkowski, Maryland NRCS |
| Dave Hansen, Univ. of Delaware | Casey Ritz, Univ. of Georgia |
| Bud Malone, Univ. of Delaware | Jennifer Timmons, Univ. of Maryland |
| Josh McGrath, Univ. of Maryland | Allen Torbert, USDA ARS- Auburn Univ. |

Maryland's Department of the Environment is proposing its Animal Feeding Operation General Permit and Regulations that allows a 90 d temporary storage period for chicken litter storage piles, transitioning to 30 d or an alternative storage period pending results of new research. The permit is open for public comment beginning November 10, 2008. At the request of the Eastern Shore Agriculture Collaborative and the University of Maryland Environmental Finance Center, the Chesapeake Research Consortium conducted a review of pertinent scientific data to inform a response to the permit, ideally based on consensus of assembled national and regional experts in poultry waste management. Ten experts were assembled and provided relevant literature and data accumulated for discussion. The goal was to review available data and, based on the data and best professional judgment, derive consensus recommendations on poultry litter storage times and methods. A summary of the discussions and the resulting recommendations are given below.

**Sources of Information Used**

A relatively limited amount of published data exists that is directly relevant to temporary stockpiling of poultry litter (a list of the literature considered is attached). Of these, most studies have been conducted under conditions that do not represent those used in poultry production in this region. For example, studies that report nutrient losses in leaching and runoff from small amounts of saturated litter are not useful for predicting nutrient losses from litter stockpiled in such a way that more than 95% of the litter remains dry. The primary benefit of studies performed using saturated litter is that they illustrate the potential environmental loading that can occur when litter is not stockpiled correctly.

It is important to consider potential nutrient losses in the context of the practices actually in place on the landscape. Of studies considered, only the Delaware (DE) study of Binford was conducted under conditions commonly found in this region in terms of the size and shape of litter stockpiles. Although all studies were considered, the Panel gave additional weight to the results of this study.

**Assumptions and Context**

In this region, essentially all poultry houses (besides layer operations) utilize wood shavings or sawdust as bedding material. During bird production, this bedding material becomes mixed with urine and fecal material from the birds, and the resulting material is referred to as poultry litter. This litter is periodically removed from the poultry houses on a schedule which varies widely between integrators. For a variety of reasons (integrator schedules, availability of equipment, cost and availability of bedding material, etc.), this removal, referred to as a "total cleanout," occurs at times when there is no immediate use for the litter. Such uses include application to crop fields or transportation to alternative use facilities (e.g., pelletizing, combustion, etc). If there is no immediate use for the litter, it must be temporarily stored in stockpiles.

**Recommendation 1: To minimize the need for temporary storage, integrators, poultry farmers, and bedding suppliers should cooperate to schedule clean-outs as close to spring planting as possible, thereby providing a source of nutrients that is in phase with crop nutrient need.**

An associated issue considered by the Panel is ensuring adequate on-site storage of litter. The number of poultry houses per farm seems to be increasing, leading to an increasing quantity of litter per farm. Under such conditions, litter accumulations, particularly cake material, often exceed storage capacities for initial poultry house densities on these farms, thereby obliging more temporary storage on the land. This material is particularly susceptible to nutrient losses.

**Recommendation 2: Increases in poultry production units should coincide with proportional increases in permanent on-farm litter storage capacity, which protects cake material and expands options for alternative uses.**

There are three possible scenarios for stockpiled litter: 1) storage in a permanent structure such as a manure shed, 2) temporary storage at the production facility, and 3) temporary storage in agricultural fields. The consensus of the Panel was that losses of nutrients to the environment are minimized by the use of permanent, roofed structures. However, such structures currently are not designed to accommodate a total cleanout; they are designed to accommodate the smaller quantities of "cake" material that is generated between flocks. In addition, these structures are located at the poultry production facility, which limits their usefulness in litter relocation (i.e., to crop farms where litter is used as a fertilizer in crop production). The second scenario, stockpiling at the production facility, is a short-term practice, usually less than two weeks. Therefore, the method with which most litter is temporarily stockpiled is in agricultural fields.

Improperly stockpiled poultry litter dramatically increases the potential for nutrient loss to the environment. When stockpiles are constructed in such a way that they can become completely saturated, or when cake material is stockpiled outside, additional steps, such as covering, should be taken.

The following discussion, and recommendations, assumes that the field-stored litter is properly stockpiled in terms of both the physical structure of the stockpile and its location in the field. Proper stockpiling minimizes the "footprint" of the pile by windrowing the litter in an "A" shape as high as is practical. Current guidelines in DE and MD specify a minimum height of 6 ft. and located in the field to minimize nutrient loss, i.e., distant from any surface waters (the latter to minimize potential nutrient enrichment) and located on well-drained, level ground (to prevent down-slope flows).

**Recommendation 3: Stockpiles should be constructed to minimize the "footprint" of the pile by windrowing the litter in an "A" shape as high as is practical., and positioned in the field to minimize nutrient loss, i.e., distant from any surface waters (the latter to minimize potential nutrient enrichment) and located on well-drained, level ground (to prevent down-slope flows).**

The Panel focused primarily on two issues associated with field stockpiles: length of storage and covering. The available data suggests that while any stockpiled litter presents a potential for nutrient loss to the environment, the majority of this risk occurs within the first days of litter pile construction. In other words, there is little difference (in terms of nutrient losses to the surrounding soil) between litter stockpiled for 14 days and litter stockpiled for 190 days. Still, the impact is greater than zero, and minimizing the need for such stockpiles will reduce even these minimal loads.

**Recommendation 4: Temporary stockpiling of poultry litter should be encouraged when other immediate-use options (e.g., field application meeting seasonal planting schedules, or regional hydrological cycles, or alternative off-site uses) are not available, regardless of the length of time required, up to a maximum of 190 days based on documented research trials of 190 days in length.**

It is important to keep in mind that the "footprint" of properly stockpiled litter is quite small relative to the field on which it is (eventually) applied. Total losses from properly stockpiled manure over time are minimal, averaging (in the DE study) approximately 12 lbs. of total nitrogen over the length of the storage period from a 100-ton pile (100' by 18' footprint) which occupies about 1/25$^{th}$ of an acre. When applied to land, the final area receiving the 100-ton litter application would be about 33 acres, using a nitrogen-based rate of 3 tons per acre (equivalent to approximately 150 lbs. of nitrogen per acre). Potential losses from such land application increase dramatically if it occurs at times of the year (e.g., un-trafficable wet soils in winter, etc.), or cropping schedule, where there is no growing crop to absorb the nutrients. Therefore, during these times it is preferable to stockpile the litter until such time as it can most effectively be utilized by plants. In other words, 100 tons of litter stored in a properly constructed stockpile will lose far less nutrients than 100 tons of litter that is land applied when the potential for loss is high.

Even though the footprint from a stockpile is relatively small, it is greater than zero. The area directly beneath and immediately adjacent to the stockpile generally suppresses normal crop growth for up to 2 years after the stockpile is removed. This crop stress is most likely due to high salt concentrations and compaction due to vehicular traffic. Research suggests the eventual impact of this footprint on water quality is related to how effectively the area is utilized to accommodate a subsequent crop. Practices that have been used by farmers successfully producing crops the year after pile removal include site cleanup by removing the top several inches of soil beneath the pile and aggressive tillage before planting. Other opportunities could involve soil testing to quantify salt and nutrient concentrations, planting of the appropriate salt tolerant summer crop (such as barley), and early planting of a rye winter cover crop to capture any residual nitrate arising from the high ammonium levels.

**Recommendation 5: Land Grant University nutrient management specialists should develop a set of best management practices for remediation of the stockpile "footprint" based on relevant literature, farmer experience, and best professional judgment. Future research projects focused on this problem should be initiated if critical knowledge gaps exist.**

**Recommendation 6: Storage site locations should rotate across the farm to minimize cumulative downward migration of nitrogen and salts through time.**

For loss of volatiles such as ammonia, the literature data support the probability of smaller losses from covered vs. uncovered piles. However, data for litter stockpiled as recommended by this panel (and required by current regulations in MD and DE) do not exist. Therefore, further research is need on the effects of covers on ammonia volatilization, retention of ammonia in the pile, and plant nitrogen utilization following field application using best management practices.

Independent of the ammonia issue, the focus of this panel was on measured losses from stockpiled litter to surrounding soils (or water). Based on the available data, the Panel concluded that there are no consistent differences between covered and uncovered litter storage piles regarding the concentrations of nutrients moving from the pile as surface runoff or into underlying and adjacent soils. This is likely because covers are designed primarily to block water from entering a stockpile but nitrogen loading to soils beneath stockpiles occurs primarily from gas exchange. Numerous studies have documented that covered piles promote the conversion of organic phosphorus to plant-available phosphorus (orthophosphate), which is more susceptible to losses that could affect water quality.

**Recommendation 7: Due to a lack of consistent differences between covered and uncovered litter storage piles with regard to nutrient runoff, the Panel does not support mandatory covering of temporary field stockpiles as a technique to reduce nutrient loading to soils or water.**

The downward migration of nutrients, primarily nitrogen, is evident under stored litter piles. Previous work has demonstrated that materials such as plastics or concrete can reduce or eliminate this movement. However, this information does not translate easily to temporary storage in an agricultural field, the nature of which precludes a permanent pad. In addition, although many materials have been tested, conclusive data were not found to define the optimal temporary storage pad materials or the best management practices for constructing temporary storage pads that could reduce nutrient enrichment below litter piles. This is another area needing further research.

**Recommendation 8: Research is needed on storage pad effectiveness in reducing nutrient migration into underlying and surrounding soils and groundwater**

A critical environmental issue considered by the panel is the link between management of temporary storage piles and ammonia volatilization and runoff losses from land application of the stockpiled litter. There is good literature data and panel agreement that ammonia losses and runoff losses do occur following land application and that these losses are exacerbated when litter remains on the soil surface (e.g., in no-till grain systems), with alternating wetting and drying conditions, and with warm temperatures. Such losses are minimized when application includes consideration of the seasonal hydrologic cycle and includes shallow soil incorporation.

**Recommendation 9: Application of stored litter to row or annual crop field acres should avoid application in high-loss hydrologic conditions and should include shallow soil incorporation, through light disking, chisel plow, or in the future, soil injection.**

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