



Discoveries on headland-stacked poultry manure

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Poultry litter (manure and bedding) is a valuable by-product of the broiler and egg industry. At today's fertilizer prices (February 2009), a ton of poultry litter is worth \$42 to

\$58 per ton, depending on nutrient needs. Poultry litter is a dry material that is easily handled and most often applied to fields as a source of nutrients. There are times when litter needs to be removed from barns when land is not available due to growing crops. At these times it is common for producers to stack litter on field edges, waiting until crops are harvested or the season changes to accommodate manure application. This is referred to as "headland stacking." Recently, questions have been raised concerning the environmental impact of this practice.

Pastures or cropland are the first choice for spreading poultry litter. With proper nutrient crediting and the use of best application strategies, poultry litter can supply a significant amount of nitrogen, phosphorus, potassium, micro-nutrients and organic matter for crop production and can improve soil quality. Timing can be a key limitation to field application because poultry litter is generated year-round, while fields and pastures are only available for spreading on a seasonal basis.

Field study

The UW Discovery Farms Program conducted a five-year field study to better understand poultry manure and determine whether headland stacking posed a significant risk to surface or groundwater. The study objectives were: 1) Characterize poultry manure relative to nutrient content, percent dry matter, water holding capacity and infiltration rates; 2) Evaluate

potential environmental impacts to surface water by monitoring runoff from headland stacks; and 3) Evaluate potential environmental impacts to groundwater by monitoring nutrient movement from the stack into the groundwater.

Study methods

The study was done in three phases, beginning with an evaluation of the nutrient concentrations in poultry manure. Laboratory analysis for 600 manure samples were compiled, summarized and compared to standard livestock manure book values to determine if the general recommendations adequately described poultry manure. The range of nutrient concentration was compared to manure from other species to determine if poultry manure had greater variations. Another part of this study was to determine the water holding capacity and water infiltration rate of poultry litter. These values were determined by running water through 4-inch PVC columns packed with poultry litter.

To determine the potential for headland stacks to negatively impact surface water quality, a 100-ton "typical stack" was created (4-6 feet high X 10-20 feet wide X 50-100 feet long) in a field with soils acceptable for stacking. The stack was put in place perpendicular to the slope so that runoff water would flow in one direction. A plywood perimeter was constructed around the stack to channel runoff toward a flume that measured the amount of water running off the pile. The headland stack remained in place for one year, which is longer than normal, but represents the highest risk condition that headland stacks could have in Wisconsin.

The final phase of the project was to determine the potential impacts of headland stacks on groundwater. Site selection was biased toward sites that had the highest potential for nutrient losses to groundwater. (In other words, we selected the soils with the highest infiltration rates and shallow depths to groundwater.) The study design utilized a set of six well nests at each location. Three sets of wells were placed up-gradient

of the manure pile to represent water samples not influenced by the stack. Three more sets of wells were placed down-gradient of the pile, representing wells that may be influenced by the manure. Well water was sampled and analyzed on a routine basis.

Results

Characteristics

- Poultry manure has less variation in nutrient content than most other types of livestock manure.
- Season has little effect on nutrient content for manure coming out of poultry barns.
- Poultry manure absorbs and holds tremendous amounts of water: 37 percent of its weight as water.

Surface Water Study

- No surface water runoff occurred: Precipitation soaked into the monitored manure stack.
- However, stacked manure produces plant-toxic levels of soluble salts in the soil directly beneath the pile, explaining why producers have issues establishing vegetation after piles are removed.

Groundwater Study

- Groundwater nitrate N levels did not change as a result of headland-stacked poultry manure on coarse textured soil with groundwater at 24 feet deep, even after a 25-year/24-hour storm event.
- Groundwater nitrate N levels rose and fluctuated as a result of headland-stacked poultry manure on coarse textured soil with groundwater at 12 feet deep. This was a direct result of a 10.5-inch rain, which is more than twice as much as a 100-year/24-hour storm event.

Conclusion and recommendations

Poultry manure (or manure with similar dry matter content) can absorb and hold large amounts of water, suggesting that headland stacks have limited potential to pollute surface or groundwater if stacked in the proper manner and on proper sites. The emphasis should remain on choosing proper stack locations, as well as proper stack construction.

There are a few simple management practices that producers can adopt to reduce the potential impacts of headland stacks of poultry manure on water quality. These practices include:

- Stacks should be located with the appropriate distance from wells, sinkholes, areas of concentrated flow, streams, wetlands and water bodies. (Review NRCS 313 standard.)
- Site stacks on soils with low leaching potential and as great a distance to bedrock and groundwater as possible.
- Stack manure as deep as possible to minimize the potential for rain to saturate the pile. Bales or other products could be used to hold the manure.
- Avoid creating pockets on top of the stack that would collect and hold precipitation.
- Remove the stack and apply manure as soon as the field is available and the ground is fit.
- Determine the nutrient content of poultry manure and credit toward crop nutrient needs.



This brief is a summary of a five-year project evaluating the potential impacts of headland-stacked poultry manure. This project resulted in four factsheets, which are summarized in four additional Discovery Farms briefs. The series includes: Characterization of poultry manure – 1; Potential runoff of headland-stacked poultry manure – 2; Stockpiling manure and soluble salts: Site remediation for crop production – 3; and Effect of headland stacking of poultry manure on groundwater – 4. All briefs, as well as four more detailed factsheets, are available from the UW Discovery Farms office, PO Box 429, Pigeon Falls, WI 54760, and 715-983-5668 or at our website: <http://www.uwdiscoveryfarms.org>.