

Environmentally Sound Uses for Poultry Litter

Doug Parker

Erik Lichtenberg

Lori Lynch

Agricultural and Resource Economics

University of Maryland

Contact: dparker@arec.umd.edu



Non-Point Water Pollution

The past six years have seen an increasing concern that poultry litter on the Delmarva Peninsula (Delaware, Maryland and Virginia) has been causing nutrient pollution to the Chesapeake Bay. Current poultry production on the Delmarva Peninsula produces slightly over 700,000 tons of poultry litter per year.



Regulatory Response

Federal CAFO Rules for Large Operations

Updated CAFO rules require all CAFOs to create and implement a nutrient management plan. Because only broiler operations that exceed 125,000 birds are regulated, few poultry operations are required to participate. The CAFO rule does not regulate manure and commercial fertilizer use on farms that are not CAFOs, nor does it regulate the use of exported manures.

State Rules

Virginia and Delaware require nutrient management plans for nearly all poultry operations. In 1998, Maryland passed one of the nation's most comprehensive laws regulating agriculture's use of manure and fertilizer.



Regulatory Response:

Maryland's Water Quality Improvement Act of 1998

All Crop Growers

Maryland requires all crop growers to have and implement a nutrient management plan. Soil test and P-Index data determine whether the nutrient management plan must be nitrogen based (N-Based) or phosphorus based (P-Based). Maryland's regulations control the use of all nutrients (animal manure and commercial fertilizer).

Animal Producers and Users of Animal Manures

The Maryland act requires all animal producers to have nutrient management plans, regardless of where and how their manure is used. Furthermore, Maryland requires all users of animal manures to use manure in an environmentally sound manner.

Poultry Integrators

Maryland requires that poultry integrators incorporate phytase or other feed additives to reduce phosphorus in litter. Integrators also contribute to the state's Manure Transport Program.



Industry Concerns

Poultry growers are worried that poultry litter use restrictions inherent in N-based and P-based nutrient management planning will restrict poultry litter use on crop land, leading to an excess of poultry litter on the Delmarva Peninsula. Growers are concerned that there will be few profitable alternatives for poultry litter use.





Doug Parker
University of Maryland

Impacts of Federal and State Regulations

The impact of these regulations on poultry growers is dependent upon the market for poultry litter.

The market for poultry litter is dependent upon the possible uses for poultry litter. The set of uses considered here are:

- Land Application as a Fertilizer for Crop Production,
- Pelletizing,
- Composting,
- Land Application as a Fertilizer for Forest Production,
- Cogeneration, and
- Electricity Production.





Research to Assess Poultry Litter Use Alternatives

Researchers at the University of Maryland's Department of Agricultural and Resource Economics were asked to study alternative uses for poultry litter.

The project looks at the economic potential of current and alternative uses for poultry litter. Research was performed to assess the potential supply and demand for poultry litter on the Delmarva Peninsula.

Through literature review and in-person interviews the authors analyzed the economic potential of various poultry litter uses; including land application as crop fertilizer (the traditional, or base, use), pelletizing and shipment out of the region, composting, land application as forest fertilizer, energy conversion for electricity and steam in broiler processing plants (cogeneration), and energy conversion for electricity production.





Land Application as a Crop Fertilizer

Currently, the predominant use of poultry litter is land application as a crop nutrient source. Increased regulation of poultry litter may reduce per acre application rates and, thus, require greater transportation distances.

To determine potential transportation distances, this study considers two scenarios for poultry and crop farm locations.

- 1) Assume poultry houses and crop lands are spaced evenly throughout county (hauling distance 1 mile)**
- 2) Assume poultry houses are placed in center of county and crop lands are spaced evenly throughout county (hauling distance 9 miles)**

Transportation costs for in-county use are approximately \$0/ton - \$4.55/ton. Transportation costs for out-of-county use are approximately \$10/ton

The net value of poultry litter less the transportation costs is between \$4/ton and \$23/ton (net clean out, testing and application costs). This value varies depending upon crop type and nutrient management plan recommendations.





Land Application for Crop Fertilizer: 1998 Poultry Litter Nutrient Values

Manure nutrient content is determined from 1998 data (pre-phytase).

University of Maryland data on soil testing and P-index values are used to determine crop land availability and legal application rates. Some crop land requires poultry litter rates to be determined by N-based nutrient management planning, some crop land requires poultry litter rates to be determined by P-based nutrient management planning, and some crop land (a very small percentage) is prohibited from receiving any poultry litter.

Using current cropping patterns, it is estimated that enough corn land exists in all but five Delmarva counties to absorb that county's own poultry litter production. The five counties with excess poultry litter are Caroline, Somerset, Wicomico, Worcester and Sussex counties.



Land Application for Crop Fertilize: 1998 Poultry Litter Nutrient Values

Poultry Litter Production and Crop Land Capacity

County	Total Poultry Litter Generated (tons)	Surplus Capacity (tons)	Excess Poultry Litter (tons)
Maryland			
<i>Upper Eastern Shore</i>			
Caroline	46,247		5,533
Kent	4,745	66,352	
Queen Anne's	13,668	71,182	
Talbot	15,940	46,932	
<i>Lower Eastern Shore</i>			
Dorchester	26,192	12,182	
Somerset	55,795		35,749
Wicomico	101,134		60,469
Worcester	74,960		8,902
Delaware			
Kent	52,680	18,039	
Sussex	288,120		107,843
Virginia			
Accomack	26,919	15,233	
Total Delmarva	706,399	218,496	229,921



Land Application for Crop Fertilizer: Estimated 2010 Poultry Litter Nutrient Values

Current changes in feed content (requiring the addition of phytase) have already reduced phosphorus in poultry litter by nearly 20%. It is estimated that by 2010, industry efforts could reduce phosphorus levels an additional 25%, leading to a combined reduction of phosphorus in poultry litter of 40% compared to levels in the late 1990s.

The land application scenarios were repeated under the assumption that feed changes reduce the phosphorus content of poultry litter by 40%. In addition, it is assumed that all crop land requires P-Based nutrient management. This represents a potentially restrictive long term land application equilibrium

Using current cropping patterns, it is estimated that enough corn land exists in all but five Delmarva counties to absorb that county's own poultry litter production. The five counties with excess poultry litter are Caroline, Somerset, Wicomico, Worcester and Sussex counties.



Land Application for Crop Fertilizer: Estimated 2010 Poultry Litter Nutrient Values

Poultry Litter Production and Crop Land Capacity

County	Total Poultry Litter Generated (tons)	Surplus Capacity (tons)	Excess Poultry Litter (tons)
Maryland			
<i>Upper Eastern Shore</i>			
Caroline	46,247		8,504
Kent	4,745	58,936	
Queen Anne's	13,668	64,991	
Talbot	15,940	42,345	
<i>Lower Eastern Shore</i>			
Dorchester	26,192	11,076	
Somerset	55,795		36,327
Wicomico	101,134		61,640
Worcester	74,960		10,806
Delaware			
Kent	52,680	18,963	
Sussex	288,120		105,488
Virginia			
Accomack	26,919	12,299	
Total Delmarva	706,399	222,764	208,610



Pelletization of Poultry Litter

Poultry litter is currently pelletized at the Perdue/AgriRecycle Plant in Seaford, Delaware. The pelletized product is shipped via railcar to mid-western markets. Since pelletized poultry litter is back hauled in grain cars that are bringing grain from the mid-west to Delmarva's poultry integrators, shipping rates are discounted.

Though it only has permits to produce about 80,000 tons/year, the pelletizing plant's capacity is approximately 150,000 tons/year.

Currently, pellet production consumes about 60,000 tons of poultry litter per year.

The value of poultry litter at the farm gate is \$8.50/ton.



Composting Poultry Litter

Poultry litter can be composted for the bulk market and composted and bagged for the retail market. Uniformity of product is an important constraint in the retail sector. Large scale production for retail is not considered viable at this time.

The bulk compost market is geographically limited by high transportation costs. A small portion of composted poultry litter is bagged and sold on-site as a retail product.

The estimated potential for the bulk market is 15,000 tons/year.

Currently, bulk compost production consumes slightly less than 10,000 tons of poultry litter per year

The value of poultry litter at the farm gate is \$1/ton - \$4.40/ton, depending upon whether it is for the local bulk market or the local retail market.



Land Application for Forest Production

Poultry litter can be applied at planting and thinning to increase forest growth rates.

The potential for forest application is limited by local forest replantation rates.

The potential for forest application on the Delmarva Peninsula is 23,750 tons/year.

Currently, no measurable amount of poultry litter is used on forest lands.

The value of poultry litter at the farm gate from increased forest production is \$6/ton - \$13/ton.



Cogeneration Using Poultry Litter

Poultry litter can be burned to produce electricity and steam for broiler processing plants.

A local broiler processing plant is considering installation of cogeneration facilities. This facility could use up to 80,000 tons of poultry litter per year. There is a potential for up to four facilities to be built on the Delmarva Peninsula.

No poultry litter is currently used for cogeneration on the Delmarva Peninsula.

The value of poultry litter at the farm gate is estimated to be \$0/ton, but the value could rise to \$5.70/ton if sought after energy tax credits are secured.





Electricity Production Using Poultry Litter

Plans have been floated for a large scale energy production facility that would burn poultry litter. The capacity of such a facility could reach 500,000 tons/year.

Currently no poultry litter is burned to produce electricity.

The value of poultry litter at the farm gate is negative, even with substantial energy tax credits





Doug Parker
University of Maryland

Findings

The highest value use of poultry litter is application to nearby crop land. The value ranking of other poultry litter uses, in order of declining value, is forest fertilization, pelletization, compost, co-generation, and electricity generation (the last being negative in value).

Using data on the soil phosphorus status of Delmarva soils, we found that there is more than enough crop land on the Delmarva Peninsula to absorb all of the poultry litter generated when applied at recommended rates. Thus, long distance transport off the Peninsula does not appear to be necessary.





Findings

Poultry litter is a valuable resource to crop growers. Used properly, it can replace commercial fertilizer inputs while maintaining environmental quality. While the Delmarva Peninsula has enough crop land to use all of the poultry litter currently generated, it may be unreasonable to expect that all growers will use poultry litter. Thus, alternative uses for poultry litter will be important for balancing nutrient needs in the area.

Currently, about 10% of the poultry litter produced on the Delmarva Peninsula is used in alternative uses. The ability of alternative uses to absorb large quantities of poultry litter may be limited.





Doug Parker
University of Maryland

Where to Find the Report

Authors: Erik Lichtenberg, Doug Parker and Lori Lynch

Title: Economic Value of Poultry Litter Supplies in Alternative Uses

Sponsor: Maryland Department of Business and Economic Development

Goal: Assess Supply and Demand for Poultry Litter on Eastern Shore

Publication: Available at
<http://www.arec.umd.edu/PolicyCenter>

