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Mid-Atlantic
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MAWP 0601

Poultry Litter Use and Transport in Caroline, Queen Anne's, Somerset and Wicomico Counties in Maryland: A Summary Report

Doug Parker, Associate Professor
Qing Li, Graduate Research Assistant
Agricultural and Resource Economics
University of Maryland

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INTRODUCTION

Poultry growers on Maryland's Eastern Shore produce over 285 million broilers per year. This results in the annual creation of almost 350,000 tons of poultry litter. Poultry litter is high in nitrogen (N), phosphorus (P) and potassium (K). Traditionally, poultry litter has been used as a nutrient source on local cropland. Using poultry litter allows crop growers to eliminate or significantly cut back on commercial fertilizer use, resulting in substantial cost savings (Lichtenberg, Parker and Lynch, 2002).

Concerns over water quality in the Chesapeake Bay led the Maryland legislature to pass the Water Quality Improvement Act of 1998. This act requires virtually all agricultural land in Maryland to obtain and follow a nutrient management plan. When following these plans, growers must balance the nutrients applied to cropland (whether from poultry litter, other animal manures or from commercial fertilizer) with the crop's nutrient needs. This requirement has led to concerns that there may be local imbalances between nutrients available from animal manures or poultry litter and local crop needs.

A recent analysis of nutrient balances shows that some counties may have more nutrients available from poultry litter and other animal manures than local cropland can use (www.mawaterquality.org). Poultry litter may need to be transported out of these counties or alternative uses will need to be found. Litter transport is a commonly utilized strategy to address nutrient excesses. State governments in Maryland, Virginia, and West Virginia have utilized transport subsidy programs to stimulate adoption of poultry litter by new users. This study is based on a mail survey that documents the use and movement of litter within two primary poultry producing counties (Somerset and Wicomico) and two secondary poultry producing counties (Caroline and Queen Anne's) in Maryland. This research was coordinated with similar surveys in West Virginia and Virginia in order to develop a regional information base on litter use and transport.

METHODS

A mail survey was jointly developed by researchers at the University of Maryland, West Virginia University and Virginia Tech University. Previous surveys (Norwood, 2005; Basden, Ritz, and Collins, 2000) were also used to assist survey development. Survey questions were targeted towards farmers who had never used poultry litter, farmers who have used litter in the past and poultry growers.

Surveys were sent to farmers (both poultry growers and non-poultry growers) in two primary poultry producing counties (Somerset and Wicomico) and two secondary poultry producing counties (Caroline and Queen Anne's). The two primary poultry producing counties represent 47% of Maryland's poultry production, while the two secondary poultry producing counties represent 17%. To improve response rates, cover letters were signed by the Dean of the College of Agriculture and Natural Resources at the University of Maryland. The survey was initially sent out in February 2005, with a follow-up in April 2005.

All computations of survey responses were made using STATA. Responses were analyzed and summarized according to the three farmer groups: (1) Non-poultry growers who have never used poultry litter, (2) Non-poultry growers who have used poultry litter, and (3) Poultry growers.

The population of farmers was 1,018 (291 in Wicomico, 168 in Somerset, 314 in Caroline and 245 in Queen Anne's). The response rate was 51.9% (53.6% in Wicomico, 54.2% in Somerset, 50% in Caroline and 51% in Queen Anne's). The number of respondents by county type and farmer type are shown in Table 1. In the primary poultry producing counties, 58% of the farmers surveyed owned poultry houses, while in the secondary poultry producing counties, only 21% of farmers surveyed owned poultry houses. Of those farmers who were not poultry growers, 60% in the primary poultry producing counties use or have used poultry litter, while only 34% in the secondary poultry producing counties use or have used poultry litter.

Table 1. Farmer Respondents by County Type and Farmer Type

County	**Non-Poultry Growers**		**Poultry Growers**
	No Litter Use	**Litter Use**	
Primary Poultry Producing Counties (Somerset and Wicomico)	36	54	122
Secondary Poultry Producing Counties (Caroline and Queen Anne's)	132	69	54
Total	168	123	176

There were 83,433 acres of owned cropland reported in this survey, 20% in primary poultry producing counties and 80% in secondary poultry producing counties (Table 2). The average amount of cropland owned was 184 acres per farm. There were 57,102 acres of rented cropland reported, 28% in primary poultry producing counties and 72% in secondary poultry producing counties. The average amount of cropland rented was 147 acres per farm.

Table 2. Owned and Rented Cropland by County Type

	Primary Poultry Producing Counties		Secondary Poultry Producing Counties		Total	
	Total	**Average per farm**	**Total**	**Average per farm**	**Total**	**Average per farm**
Owned Acres of Cropland	16,418	80	67,016	271	83,433	184
Rented Acres of Cropland	15,817	90	41,285	195	57,102	147

RESULTS

Non-Poultry Growers Who Have Never Used Poultry Litter

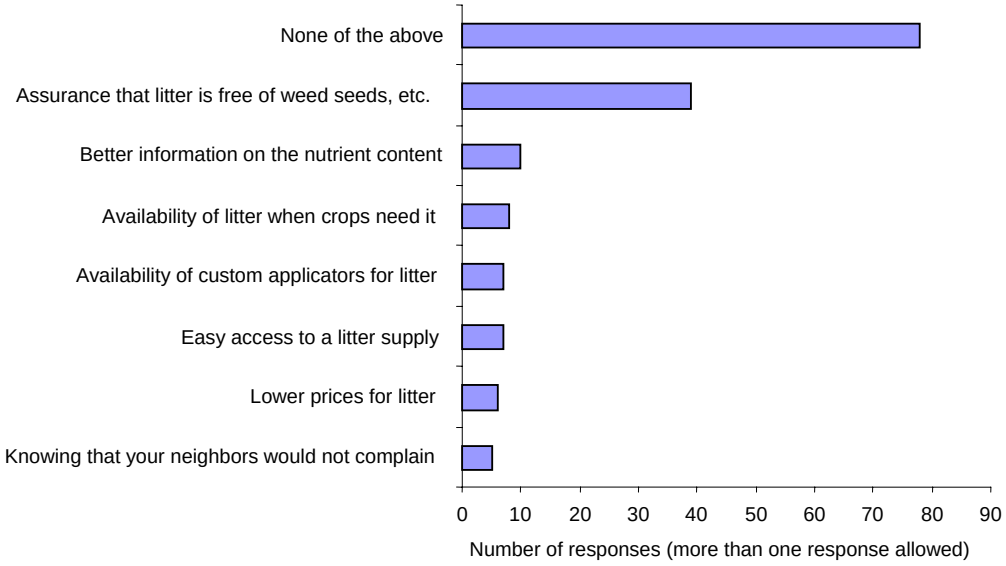
Non-poultry growers who have never used poultry litter were asked what would increase their interest in using poultry litter. For 24% of respondents, an assurance that litter is free of weed seeds, garbage, and other contaminants would increase their interest in applying poultry litter to land on their own farm (Figure 1). Between three and six percent of respondents report that a) Better information on the nutrient content, b) Availability of litter when crops need it, c) Availability of custom applicators for litter, d) Easy access to a litter supply, e) Lower prices for litter, or f) Knowing that our neighbors would not complain would increase their interest in using poultry litter. The majority, or 47 percent of respondents in this group, would either not apply poultry litter on their own land or would apply it for reasons other than those listed here.

In order to understand farmers' perception of using poultry litter as a substitute for commercial fertilizers, farmers who have never used poultry litter were asked about their maximum willingness-to-pay (WTP) for litter and their certainty about this response on a scale of 1 to 10. About 35% of respondents were very uncertain (3 and below) and about 30% of respondents were very certain (8 and above). The average WTP was higher in the secondary poultry producing counties, $11.81 per ton, than in the primary poultry producing counties, $6.35 per ton (Figure 2 and Figure 3). For farmers who were very certain about their response, average WTP was about $13.70 per ton.

Farmers who responded that they would pay nothing for poultry litter and that they would not consider applying poultry litter on their cropland were asked to explain why

they would not use poultry litter. Approximately 22% of respondents indicated that they were concerned about odor issues. Just over 15% of respondents stated that they would need to be paid to have litter applied. Approximately 12% of respondents stated that litter application is either too costly, too time consuming or that the timing of litter availability limited their ability to use poultry litter.

Figure 1. Reasons Why Non Poultry Litter Users Would be Interested in Applying Litter to Land



Note: 160 out of a total of 168 respondents in this group replied to this question.

Figure 2. Maximum Willingness-To-Pay for Poultry Litter by Growers in the Primary Poultry Producing Counties

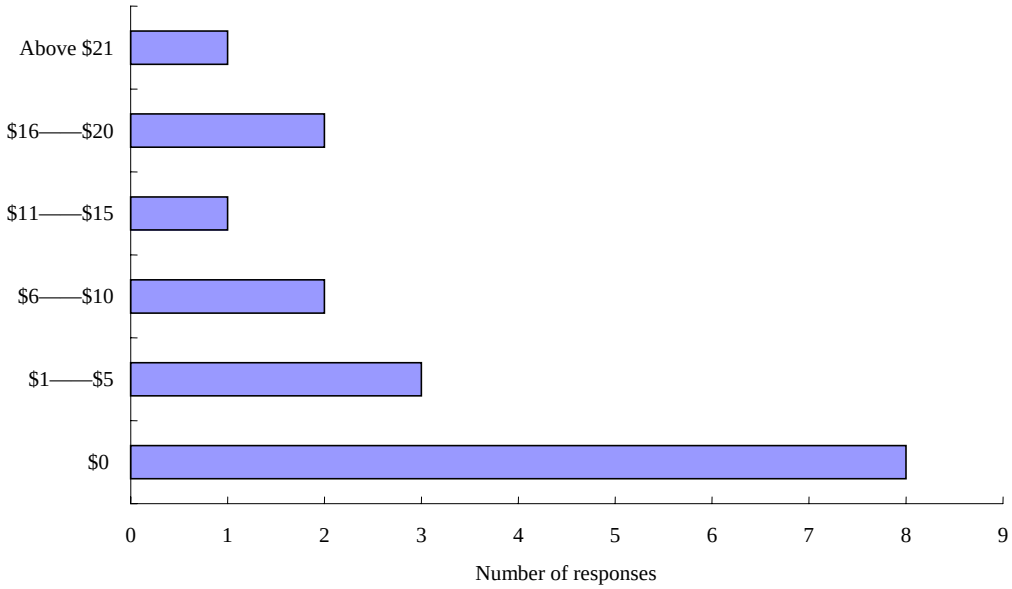
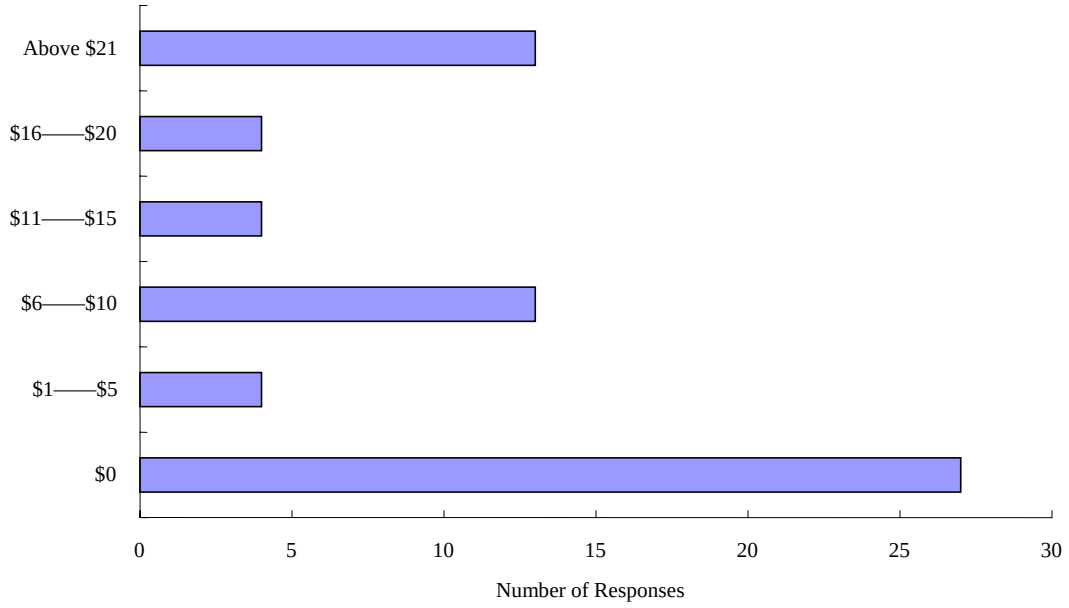


Figure 3. Maximum Willingness-To-Pay for Poultry Litter by Growers in the Secondary Poultry Producing Counties



Notes: Three outliers with willingness-to-pay for litter of over $100 per ton are excluded.

Non-Poultry Growers Who Have Used Poultry Litter

Over 70 percent of the farmers in the group of non-poultry growers who have used poultry litter, have used it between 2000 and 2005. Most farmers applied litter to crop land (87 percent), while 10 percent applied it to hay and 7 to pasture land. Some farmers applied poultry litter to more than one type of land.

When respondents were asked where they obtained the poultry litter, the majority responded that they got the litter from a farmer in their county (Figure 4 and Figure 5). Farmers in the secondary poultry producing counties were more likely than those in the primary poultry producing counties to receive poultry litter from a farm outside their county or from a poultry litter broker. Non-poultry growers who reported using poultry litter from their own houses were found to have grown poultry previously and used poultry litter from their own houses. Since these farmers are no longer growing poultry, they are classified as non-poultry growers in this report. Though farmers received poultry litter from a variety of sources, most of the poultry litter, 86%, came from within the farmers' own county and 4% of farmers received litter from both in-county and out-of-county poultry growers.

Figure 4. Source of Poultry Litter Obtained by Non Poultry Growers in Primary Poultry Producing Counties

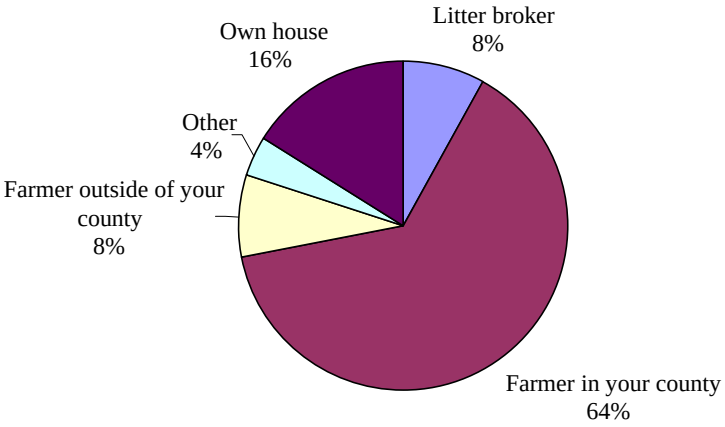
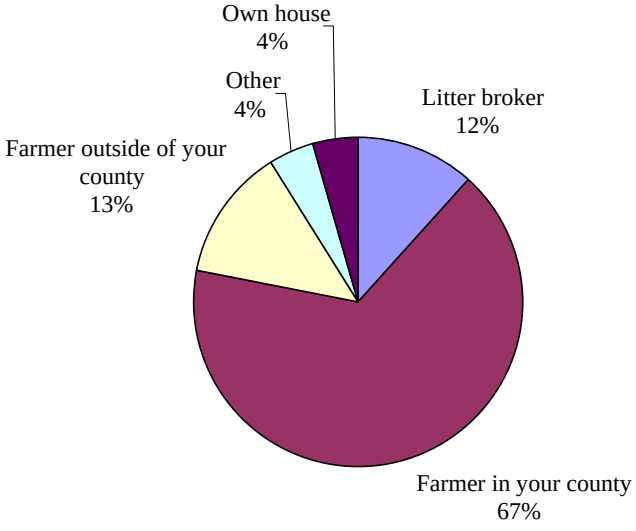


Figure 5. Source of Poultry Litter Obtained by Non Poultry Growers in Secondary Poultry Producing Counties



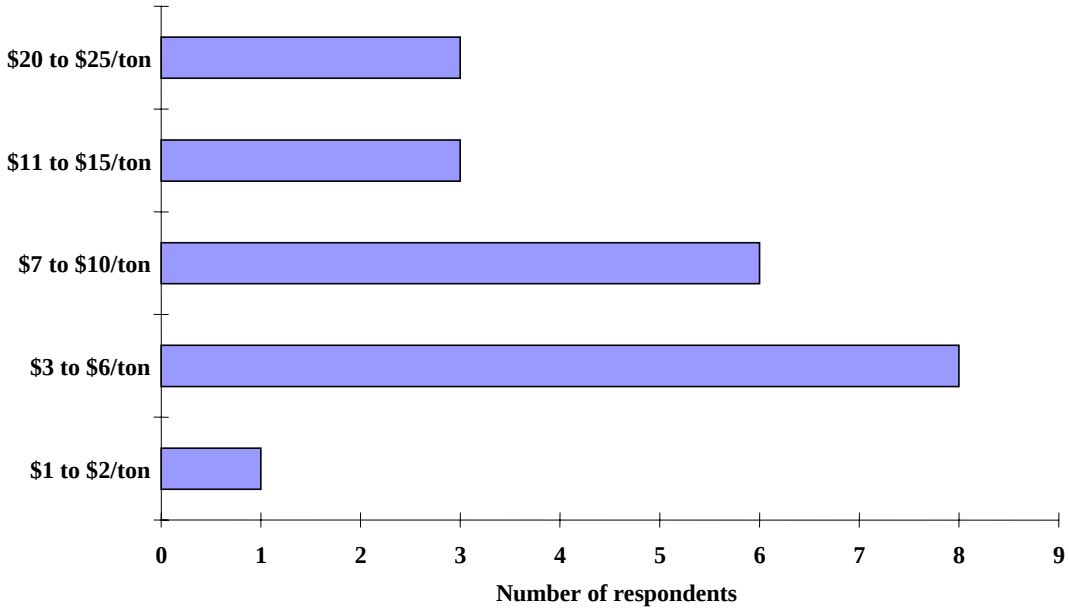
Respondents were asked how much litter they obtained for their most recent use. There were 18,112 tons of litter obtained, 27% in the primary poultry producing counties and 73% in the secondary poultry producing counties (Table 3). The median amount of litter acquired was 77 tons in the primary poultry producing counties and 128 tons in the secondary poultry producing counties. The average amount of poultry litter obtained was 140 tons per farm in the primary poultry producing counties and 240 tons per farm in the secondary poultry producing counties. These averages, expressed in terms of the mean, are sensitive to the presence of several large farms who report acquiring around 1,000 tons of litter. Reported quantities range from 1 to 1,300 tons. Total land to which the poultry litter was applied was 9,988 acres, 38% in the primary poultry producing counties and 62% in the secondary poultry producing counties. On average, farmers applied poultry litter to about 100 acres (or a median of 50 acres), with a range from 1 to 950 acres. The average application rate of poultry litter was 1.7 tons per acre in the primary poultry producing counties and 2.1 tons per acre in the secondary poultry producing counties. The average application rate of poultry litter varied from 0 to 5.0 tons per acre in the primary poultry producing counties and from 0 to 4.6 tons per acre in the secondary poultry producing counties

Table 3. Poultry Litter Obtained and Cropland Application

	Litter Obtained (tons)		Cropland Used for Application (acres)		Poultry Litter Application Rate (tons per acre)
County Type	**Total**	**Average per farm**	**Total**	**Average per farm**	**Average**
Primary Poultry Producing Counties	4,893	140	3,802	93	1.7
Secondary Poultry Producing Counties	13,219	240	6,186	105	2.1
Total	18,112	199	9,988	100	1.9

The survey revealed that 30**%** of farmers paid some cash, 19% of farmers provided some services, 4% of farmers answered "other" and 49% of farms provided no compensation for poultry litter received (some farmers provided more than one type of payment). For the farmers who provided some services, 50% of them traded for clean-out, 5% traded for labor, 5% answered "we work together" and 40% didn't specify their answers. Cash prices for litter on a per ton basis ranged from $2 per ton to $25 per ton, with an average price of $9.58 per ton (Figure 6). The average price per ton in the primary poultry producing counties ($8.00/ton) was less than in the secondary poultry producing counties ($9.65/ton). These numbers exclude the purchase of pelletized poultry litter from AgriRecycle.

Figure 6. Compensation Provided for Poultry Litter by Non Poultry Growers



Poultry Growers

Most poultry growers raised broiler chickens, with less than 10 percent of respondents raising pullets, broiler breeders, layers or other types of chicken. Respondents were asked questions related to their recent production levels. Broiler growers in the primary poultry producing counties had more houses and slightly more birds per house than growers in the secondary poultry producing counties (Table 4). Growers in the secondary poultry producing counties had more flocks per year.

Table 4. Average 2004 Poultry Production

	Broiler Growers	
	Primary Poultry Producing Counties	**Secondary Poultry Producing Counties**
Number of bird houses (n=178)	3.5	3.1
Number of birds per house (n=160)	21,816	21,654
Number of flocks per house (n=168)	4.7	5.2

Note: 5 missing responses

When asked about crust-out, 95% of the poultry growers reported that they performed it after each flock. Complete clean-out of bird houses was performed less often than once every two years by 57% of growers, once every two years by 41% of growers, and once per year by 1% of growers. No growers reported performing more frequent complete clean-outs.

Growers were asked what they did with their poultry litter after their last complete clean-out (Table 5). Only about one-fourth, 23%, of growers used all of their own poultry litter. The majority, 77%, transferred at least some of the poultry litter off-farm, with a large number, 61%, transferring all of their poultry litter off-farm. This indicates the magnitude at which litter transfer is taking place in the state of Maryland. Almost twice as many poultry growers in the primary poultry producing counties used all of their poultry litter on-farm than did growers in the secondary poultry producing counties. Of the poultry litter that was transported off-farm, 68% of farmers indicated that all of it stayed within the farmers' own county, 28% indicated that all of it was transported out of the farmers' county and 4% indicted that some stayed in-county and some was transported out of the county. More poultry litter from the primary poultry producing counties (32%) was moved out of the county than from the secondary poultry producing counties (21%).

Table 5. Disposition of Poultry Litter by Poultry Growers

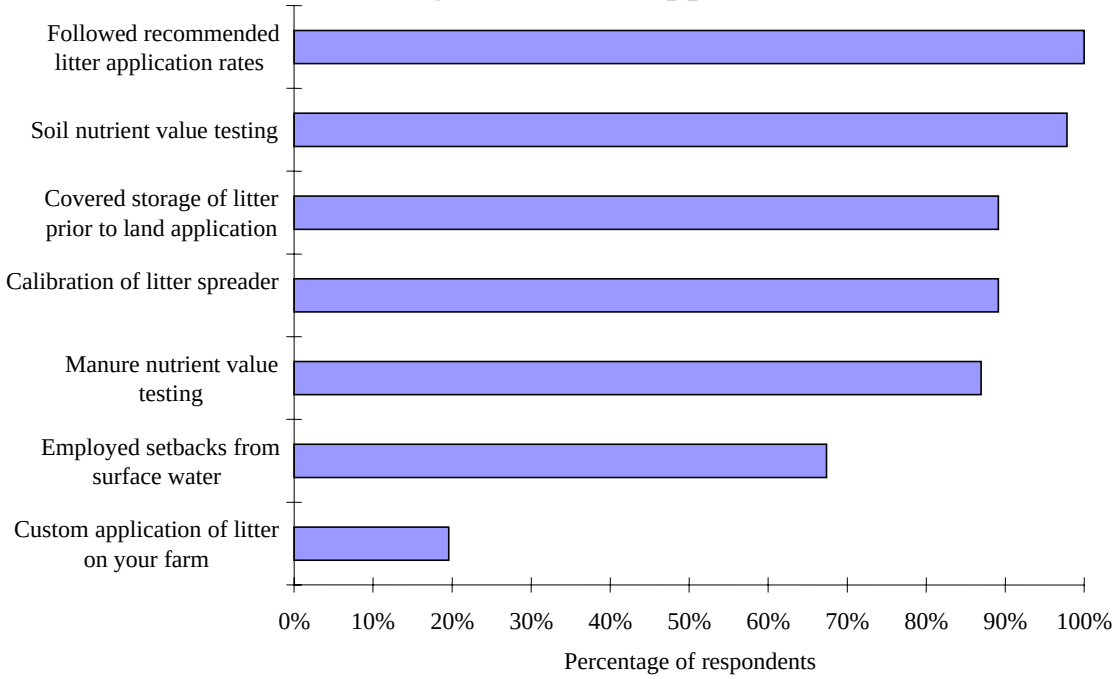
	Applied 100% of Poultry Litter to Own Farm	Applied Some Poultry Litter to Own Farm and Transferred Some Off-Farm	Transferred 100% of Poultry Litter Off-Farm
Primary Poultry Producing Counties	27%	13%	60%
Secondary Poultry Producing Counties	15%	21%	64%
Total	23%	16%	61%

The survey revealed that 13**%** of farmers received some cash, 35% of farmers received some services, 5% of farmers answered "other" and 48% of farms received no compensation for poultry litter that was transferred off-farm. For the farmers who received some services, 81% of them traded for clean-out, 5% traded for service, and 14% didn't specify their answers. Cash prices for litter ranged from $1 per ton to $7 per ton, with an average price of $4.29 per ton. The average price in the primary poultry producing counties ($3.67/ton) was less than in the secondary poultry producing counties ($4.75/ton).

Respondents were asked about their soil and litter management activities prior to and during their last poultry litter application. Respondents were allowed to answer yes to more than one practice. Every respondent reported following the recommended litter application rates and almost all respondents (over 95%) performed soil nutrient tests

(Figure 7). Between 85% and 95% of respondents covered the poultry litter prior to application, calibrated their manure spreaders and/or performed manure nutrient tests. About 65% of growers employed setbacks from surface waters, while only about 20% of growers used a custom litter application service.

Figure 7. Soil and Litter Management Activities Prior to and During Last Litter Application



Poultry growers in the primary poultry producing counties had more poultry litter per cleanout and applied more of that poultry litter to their own field (Table 6). These farmers also had higher poultry litter application rates, 5.0 tons per acre, than poultry growers in the secondary poultry producing counties, 3.0 tons per acre.

Table 6. Manure Production and Application Rates on Farms Controlled by Poultry Producers

County type	Average amount of poultry litter in last clean-out (tons)	Percent poultry litter applied to own farm	Average application rate (tons per acre)
Primary poultry producing counties	1,018	31%	5.0
Secondary poultry producing counties	941	20%	3.0
Total	995	28%	4.4

In the primary poultry producing counties, there were 22 poultry farms with poultry litter use of more than 3 tons per acre, representing about 40% of the total farms and about 15% of the total land. In the secondary poultry producing counties, there were 7 poultry farms with poultry litter use of more than 3 tons per acre, representing about 13% of the total farms and about 2% of the total land.

CONCLUSIONS

Poultry litter use and transport are of particular concern in the Chesapeake Bay region. The high mail survey response rate of over 50% is indicative of the farm community's interest. The study presented here assessed poultry litter use and transport in two primary poultry producing counties and two secondary poultry producing counties.

This study found that poultry litter is a valued commodity in the farm sector. Crop growers use poultry litter as a commercial fertilizer substitute. In the primary (secondary) poultry producing counties, 60% (34%) of non-poultry growers use or have used poultry litter.

The majority of the poultry litter transferred (75%) stays within the county of origin and most of the litter transfers are direct exchanges between farmers. Thus, there currently exists a robust market for poultry litter, though this market is limited geographically.

The lower supply of poultry litter in the secondary poultry producing counties leads crop growers to be more likely to use poultry litter from a farmer in another county or from a poultry litter broker. Farmers in the secondary poultry producing counties are willing to pay higher prices, $11.81 per ton, than farmers in the primary poultry producing counties, $6.35 per ton. Furthermore, the average price received by poultry growers who transferred litter off-farm in the primary poultry producing counties ($3.67/ton) was less than in the secondary poultry producing counties ($4.75/ton). This suggests that the market in these counties is strong and that it is accounting for increased transportation costs.

Average poultry litter application rates are lower for non-poultry growers in both the primary poultry producing counties (1.7 tons per acre) and the secondary poultry producing counties (2.1 tons per acre) than they are for the poultry growers in those counties (5.0 tons per acre and 3.0 tons per acre). Lower application rates for non-poultry growers in both the primary and secondary poultry producing counties suggest that the market continues to undervalue poultry litter. A well-functioning market for poultry litter should equalize poultry litter application rates across similar farms.

While this survey demonstrates that grower attitudes towards poultry litter have created a market for poultry litter, some of our results suggest that this market faces obstacles. Transaction costs increase as the market grows geographically. This survey suggests that some of these costs may be too high and that programs to reduce these costs (through better information) may increase the value of this market.

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Land grant universities and USDA's Cooperative State Research, Education, and Extension Service (CSREES), working with U.S. EPA Region 3, have formed a partnership to advance water quality protection and restoration efforts in the Mid-Atlantic by providing water quality science support, training, and education.

To learn more about the Mid-Atlantic Regional Water Program visit our web site at **http://www.mawaterquality.org.**

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