

Economic Impacts of Changes in Phosphorus Regulation

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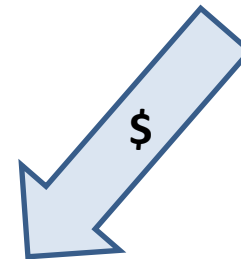
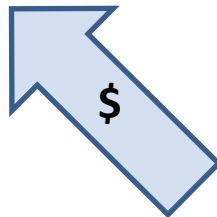
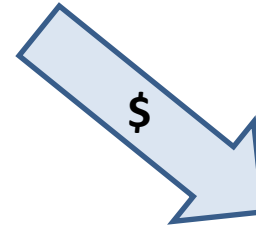
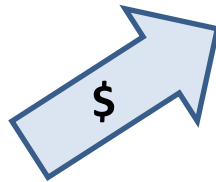
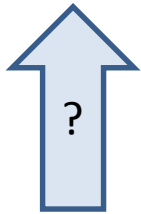
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Background: Cropland application as highest value use of poultry litter
(Lichtenberg, Parker and Lynch 2002)

- Value estimated at \$11-25/ton, compared to \$8.50/ton for pelletized product, \$3-4/ton for compost, negative values as energy feedstock.
- More than enough cropland available for application at (previously estimated) environmentally sustainable rates.
- Emergence of market for poultry litter with prices \$15-25/ton and reports of shortages supports analysis.

Intuition: Delmarva as an Integrated Broiler Production System



Caveat: Cropland absorption capacity may have been overestimated.

- Allowable application rates may have continued to be excessive, leading to continued P buildup in soils.
 - Delmarva may be a net importer of P (imports in corn likely > exports in meat and eggs).
- Past practice may have led to oversaturation of P in more soils than previously acknowledged.
- Coale/McGrath analysis as corrective: conservative estimates of P status (err on the high side) and allowable application rates (err on the low side).

Implications of Coale/McGrath for Cropland Application Rates

Class	Share of Land		Application Rate	
	PSI	PMT	PSI	PMT
<i>Upper Shore Maryland</i>				
Low	85%	35%	5	3.5
Medium	12%	24%	2.667	1.5
High	3%	41%	1.5	0
Very High	0%		0	
Weighted Average			4.615	1.585
% Difference				-66%
<i>Lower Shore Maryland</i>				
Low	70%	5%	5	3.5
Medium	28%	14%	2.667	1.5
High	2%	81%	1.5	0
Very High	0%		0	
Weighted Average			4.277	0.385
% Difference				-91%

Implications of Coale/McGrath Estimates for Cropland Application

	PSI	PMT
<i>Upper Shore Maryland</i>		
Corn Acreage	196,000	196,000
Average Litter Application Rate (Tons/Acre)	4.615	1.585
Potential Litter Usage on Corn	904,540	310,660
Total Litter Produced (Tons)	124,800	124,800
Poultry Litter Surplus (Deficit) Usage Capacity (Tons)	779,740	185,860
<i>Lower Shore Maryland</i>		
Corn Acreage	105,000	105,000
Average Litter Application Rate (Tons/Acre)	4.277	0.385
Potential Litter Usage on Corn	449,050	40,425
Total Litter Produced (Tons)	271,847	271,847
Poultry Litter Surplus (Deficit) Usage Capacity (Tons)	177,203	(231,422)
<i>Maryland Eastern Shore Total</i>		
Potential Litter Usage on Corn	1,353,590	351,085
Total Litter Produced (Tons)	396,647	396,647
Poultry Litter Surplus (Deficit) Usage Capacity (Tons)	956,943	(45,562)
Surplus (Deficit) as Percentage of Total Produced	241%	-11%

Implication: Stricter Regulation Unlikely to Require Much Export or Alternative Use of Poultry Litter

- Preceding analysis: deficit cropland application capacity in Maryland Eastern Shore as a whole amounts to only 11% of total litter produced.
- Coale/McGrath estimates may overstate phosphorus in soils, understate allowable application rates.
 - Caveat: Phosphorus may continue to build up in soils, reducing future absorption capacity.
- Perdue AgriRecycle takes ~80,000 tons of poultry litter annually, reducing supply available for cropland allocation by more than total estimated deficit.

Value of Poultry Litter as Fertilizer

	Application Rate (Tons/Acre)			
	1.5	3.5	2.667	5
N Value	\$ 34.01	\$ 79.37	\$ 60.48	\$ 113.38
P Value				
K Value	\$ 25.90	\$ 25.90	\$ 25.90	\$ 25.90
Hauling and Application Cost	\$ 25.51	\$ 25.51	\$ 25.51	\$ 25.51
Manure Test	\$ 0.12	\$ 0.05	\$ 0.07	\$ 0.04
Replacement Cost (Total)	\$ 34.28	\$ 79.71	\$ 60.80	\$ 113.74
Net Nutrient Value per Ton	\$ 22.86	\$ 22.77	\$ 22.80	\$ 22.75

Replacement Cost of Poultry Litter Nutrients

Maryland Region	Nutrient Value per Acre		Difference	Relative Increase in Production Expenses
	PSI	PMT		
Upper Shore	\$ 105.00	\$ 36.12	\$ 68.87	11%
Lower Shore	\$ 97.32	\$ 8.78	\$ 88.54	15%

Per-acre corn production expenses estimated at \$600 (Maryland Crop Budgets 2015).

Conclusions

- Stricter regulation of poultry litter cropland allocation likely to have modest effects on
 - Need to export or find alternative uses of poultry litter.
 - Corn production costs.
- Caveat: Long run restrictions may need to be tighter if phosphorus continues to build up in soils.

Appendix: Assumptions Used to Calculate Nutrient Value of Poultry Litter

N Price	\$ 0.52		
P Price	\$ 0.59	per pound	Maryland Field Crop Budgets
K Price	\$ 0.37	per pound	Maryland Field Crop Budgets
N Content	60	pounds per ton	Glancey, Udel Phosphorus in Poultry Litter Guidelines
P2O5 Content	40	pounds per ton	Glancey, Udel Phosphorus in Poultry Litter Guidelines
K Content	46.86	pounds per ton	MCE Manure Summary Report for 1995-2001, Solid with Litter
P2O5 Uptake-Corn	50	pounds per acre	
P2O5 Uptake-Soybeans	60	pounds per acre	
P2O5 Uptake-Wheat	60	pounds per acre	
K Uptake-Corn	70	pounds per acre	
K Uptake-Soybeans	50	pounds per acre	
K Uptake-Wheat	60	pounds per acre	
Poultry Litter Hauling	\$ 8.69	per ton	MD Crop Budget Inputs worksheet
Poultry Litter Loading	\$ 9.00	per ton	MD Crop Budget Inputs worksheet
Poultry Litter Spreading	\$ 7.82	per ton	MD Crop Budget Inputs worksheet
Manure Test Cost	\$40.00	per test	AgroLab (Delaware) Standard plus Water Extractable Phosphorus
Manure Test Cost	\$60.00	per test	AgroLab (Delaware) NPK Plus Manure Nutrient Test
Average Corn Acres per Farm	221		Census of Agriculture 2012, Mid-Atlantic Lower Chesapeake Watershed
Nitrogen Availability Year 1	50.0%		30
Nitrogen Availability Year 2	20.0%		12
Nitrogen Availability Year 3	5.0%		3
Discount Rate	8.5%		MD Crop Budget Inputs worksheet