

# Recommendations to Estimate Poultry Nutrient Production in the Phase 6 Watershed Model

Report of the Agricultural Modeling Subcommittee to the Water Quality GIT

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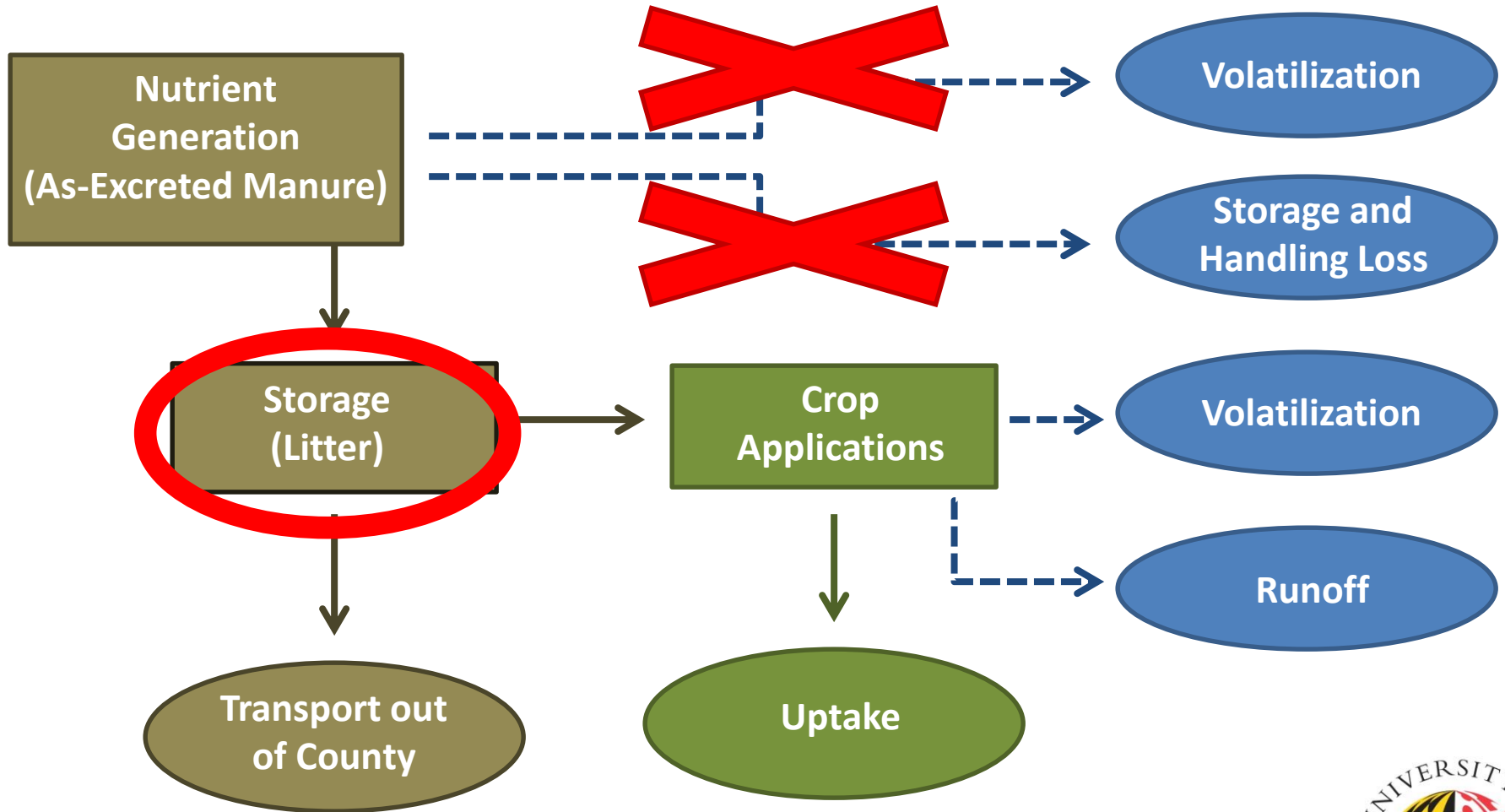


# Data Sources

- **ASABE, 2003.** ASABE D384.1: Manure Production and Characteristics. February, 2003. American Society of Agricultural Engineers. St. Joseph, MI.
- **ASABE, 2005.** ASABE D384.2: Manure Production and Characteristics. March, 2005. American Society of Agricultural Engineers. St. Joseph, MI.
- **Malone, G.W. 2007.** Delmarva Poultry Litter Production Estimates. University of Delaware, Georgetown, DE. ([http://extension.udel.edu/ag/files/2012/12/LitterQEst\\_MultiYear-as-of-2010.xls](http://extension.udel.edu/ag/files/2012/12/LitterQEst_MultiYear-as-of-2010.xls))
- **NASS, 2014.** Poultry Production and Value. United States Department of Agriculture's National Agricultural Statistics Service. Updated, April, 2014.  
<http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1130>
- **NASS, Multiple Years.** Census of Agriculture. United States Department of Agriculture's National Agricultural Statistics Service. <http://www.agcensus.usda.gov/>.
- **NRCS, 2003.** Costs Associated with Development and Implementation of Comprehensive Nutrient Management Plans. United States Department of Agriculture's Natural Resources Conservation Service. June, 2003.
- **Gollehon, N., 2014.** Personal Communications re: Unpublished. 2014 Update to: Manure Nutrients Relative to the Capacity of Cropland and Pastureland to Assimilate Nutrients (published December, 2000). USDA NRCS Economic Research Service. August, 2014.



# Estimating Poultry Nutrients



# Difference between As-Excreted Manure and Poultry Litter

- “...Recoverability can be interpreted as the amount of as-excreted manure or nutrients left in litter to be made available to crops after all storage and handling losses and volatilization has occurred. As-excreted manure values cannot be compared to litter values without first applying estimates of recoverability...”



# *Equation 1. Poultry Phosphorus Production Based on Litter*

*(Used for Broilers)*

$$\begin{aligned} \text{Lbs of P/Year} = & (\text{Lbs of Litter/Bird Produced}) \\ & \times (\text{Lbs of Dry Matter/Lb of Litter}) \\ & \times (\text{Lbs of P/Lb of Dry Matter}) \\ & \times (\text{Birds Produced/Year}) \end{aligned}$$

- Multiply:
  - Litter Production
  - Dry Matter Fraction
  - Litter Nutrient Concentration
  - Birds Produced



# *Equation 2. Poultry Phosphorus Production Based on As-Excreted Manure*

*(Used for Pullets)*

$$\begin{aligned} \text{Lbs of P/Year} = & (\text{Lbs of As-Excreted Manure/Bird Produced}) \\ & \times (\text{Lbs of Manure Recovered/Lbs of As-Excreted Manure}) \\ & \times (\text{Lbs of Dry Matter/Lb of Manure Recovered}) \\ & \times (\text{Lbs of P/Lb of Dry Matter Manure}) \\ & \times (\text{Lbs of Recoverable P/Lb of P}) \\ & \times (\text{Birds Produced/Year}) \end{aligned}$$

- Multiply:
  - ~~Litter Production~~ **As-Excreted Manure**
  - **Manure Recoverability Fraction**
  - Dry Matter Fraction
  - ~~Litter Nutrient Concentration~~ **Manure Nutrient Concentration**
  - **Nutrient Recoverability Fraction**
  - Birds Produced



## *Equation 3. Poultry Phosphorus Production Based on As-Excreted Manure with Litter Concentrations*

*(Used for Turkeys and Layers)*

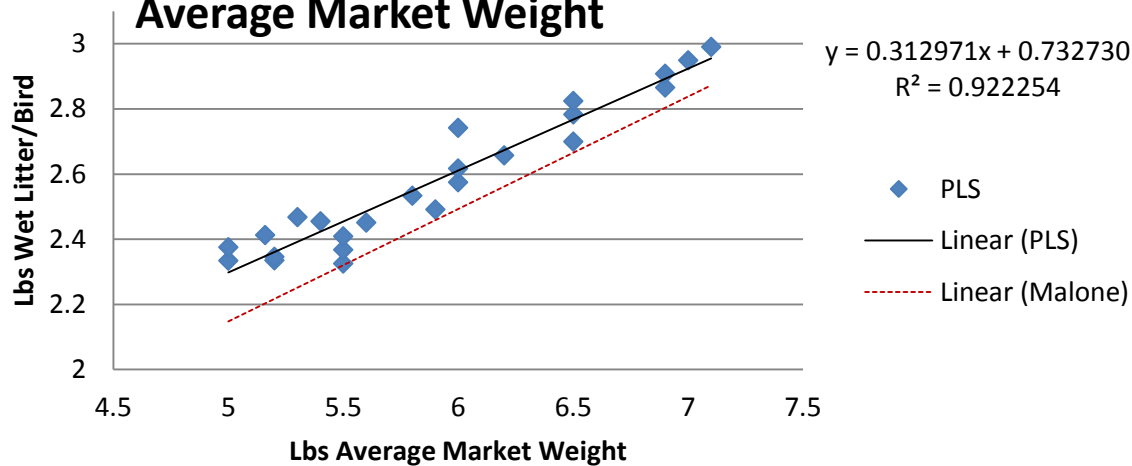
$$\begin{aligned} \text{Lbs of P/Year} = & (\text{Lbs of As-Excreted Manure/Bird Produced}) \\ & \times (\text{Lbs of Manure Recovered/Lbs of As-Excreted Manure}) \\ & \times (\text{Lbs of Dry Matter/Lb of Manure Recovered}) \\ & \times (\text{Lbs of P/Lb of Dry Matter}) \\ & \times (\text{Birds Produced/Year}) \end{aligned}$$

- Multiply:
  - ~~Litter Production~~ **As-Excreted Manure**
  - **Manure Recoverability Fraction**
  - Dry Matter Fractions
  - Litter Nutrient Concentration
  - Birds Produced



# Litter (or Manure) Produced

**Relationship of Broiler Litter Production to Average Market Weight**



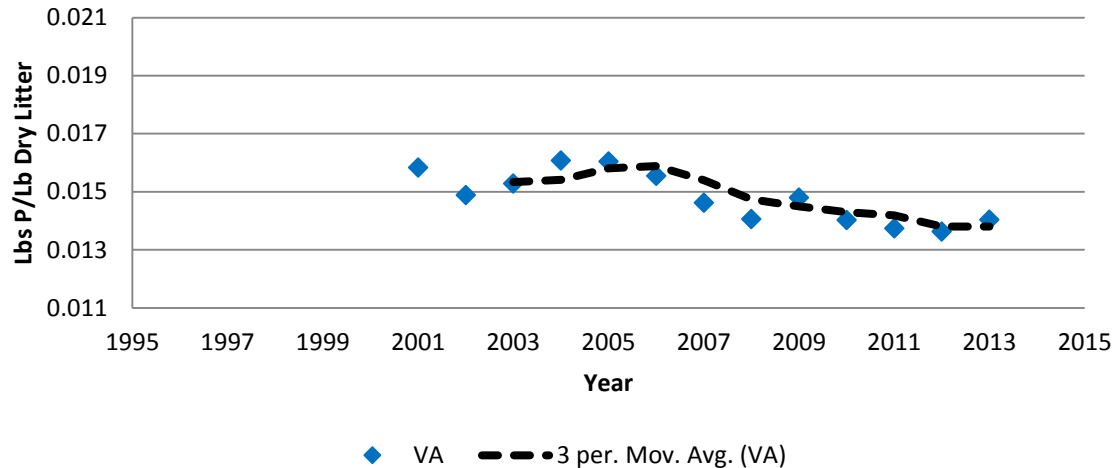
- Broiler litter production can be estimated based upon average market weight.

- Turkey, Pullet and Layer as-excreted manure production was taken from ASABE sources.
- These as-excreted values must be combined with estimates of manure lost in the barnyard prior to storage using recoverability factors from USDA.
- Recoverability factors will be subject to change for all livestock based upon recommendations from the AMS and the AWMS expert panel.

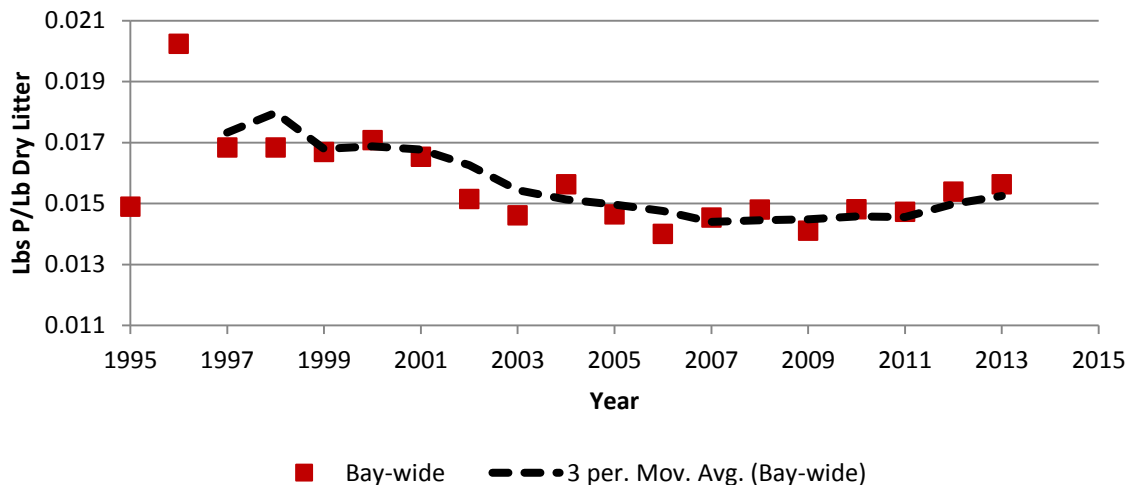


# Nutrient Concentrations

## VA Lbs P/Lb Dry Litter for Broilers



## Bay-Wide Lbs P/Lb Dry Litter for Broilers (to be used by NY, PA)



- Sample years: Use 3-year moving average
- 1985 through first sample year: Use first moving average point
- Last sample year forward: Use last moving average point
- States should submit sample data each year
- If no sample data is collected, state receives Bay-wide average

# Populations

## Broiler Production and Value – States, United States, and 19 State Total: 2013

[Annual estimates cover the period December 1 previous year through November 30. Broiler production including other domestic meat-type strains. Excludes States producing less than 500,000 broilers]

State	Number produced (1,000 head)	Pounds produced (1,000 pounds)	Value of production (1,000 dollars)
Alabama .....	1,048,600	5,872,200	3,558,553
Arkansas .....	996,400	5,978,400	3,622,910
Delaware .....	215,600	1,530,800	927,665
Florida .....	64,400	392,800	238,037
Georgia .....	1,334,600	7,607,200	4,609,963
Kentucky .....	309,000	1,668,600	1,011,172
Maryland .....	305,200	1,617,600	980,266
Minnesota .....	48,100	283,800	171,983
Mississippi .....	734,000	4,477,400	2,713,304
Missouri .....	277,400	1,331,500	806,889
North Carolina .....	785,500	5,891,300	3,570,128
Ohio .....	70,100	406,600	246,400
Oklahoma .....	206,200	1,360,900	824,705
Pennsylvania .....	168,800	945,300	572,852
South Carolina .....	226,500	1,585,500	960,813
Tennessee .....	172,800	898,600	544,552
Texas .....	610,100	3,599,600	2,181,358
Virginia .....	249,600	1,347,800	816,767
West Virginia .....	96,800	387,200	234,643
Wisconsin .....	53,100	223,000	135,138
Other States <sup>1</sup> .....	552,000	3,220,600	1,951,683
United States .....	8,524,800	50,626,700	30,679,781
19 State Total <sup>2</sup> .....	8,222,700	49,008,600	29,699,212

<sup>1</sup> California, Illinois, Indiana, Iowa, Louisiana, Michigan, Nebraska, New York, Oregon, and Washington combined to avoid disclosing individual operations.

<sup>2</sup> States in the 19 State Total include Alabama, Arkansas, California, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Missouri, Mississippi, North Carolina, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

- NASS provides yearly production values for turkeys and broilers. Production can be assumed to represent total population.

## USDA Bird Production Estimates

$$\text{Birds Produced/Year} = (\text{Year-End Inventoried Birds} \times 1/\text{Cycles of Birds per Year}) + [(\text{Annual Birds Sold}/\text{Cycles of Birds per Year}) \times ((\text{Cycles of Birds per Year}-1)/\text{Cycles of Birds per Year})]$$

- USDA estimates 1 cycle of layers produced per operator per year; this means that inventory from Ag Census can be used to estimate population.
- USDA estimates that 2.25 cycles of pullets are produced per operator per year.

# Results and Updates

## Appendix B. Nutrients Produced Per Bird

### Broilers

DE	Average Lbs Market Weight/Bird	Wet Lbs Litter/Bird	Dry Lbs/Lb Wet Litter	Dry Lbs Litter/Bird	Lbs P/Dry Lb of Litter	Lbs P/Bird	Lbs N/Dry Lb Litter	Lbs N/Bird
1985	4.799999	2.267338	0.713500	1.617745	0.018336	0.029663	0.046215	0.074765
1986	4.799998	2.267337	0.713500	1.617745	0.018336	0.029663	0.046215	0.074765
1987	4.997618	2.330518	0.713500	1.662825	0.018336	0.030489	0.046215	0.076848
1988	5.000000	2.331280	0.713500	1.663368	0.018336	0.030499	0.046215	0.076873
1989	5.000000	2.331280	0.713500	1.663368	0.018336	0.030499	0.046215	0.076873
1990	5.000000	2.331280	0.713500	1.663368	0.018336	0.030499	0.046215	0.076873
1991	5.100000	2.363251	0.713500	1.686180	0.018336	0.030918	0.046215	0.077927
1992	5.100000	2.363251	0.713500	1.686180	0.018336	0.030918	0.046215	0.077927
1993	5.100000	2.363251	0.713500	1.686180	0.018336	0.030918	0.046215	0.077927
1994	5.300039	2.427205	0.713500	1.731811	0.018336	0.031754	0.046215	0.080036
1995	5.299886	2.427157	0.713500	1.731776	0.018336	0.031754	0.046215	0.080036
1996	5.500000	2.491135	0.713500	1.777425	0.018336	0.032591	0.046215	0.082144
1997	5.500195	2.491197	0.713500	1.777469	0.018336	0.032592	0.046215	0.082146
1998	5.500000	2.491135	0.713500	1.777425	0.018336	0.032591	0.046215	0.082144
1999	5.599921	2.523081	0.713500	1.800218	0.018336	0.033009	0.046215	0.083198
2000	5.899879	2.618980	0.713500	1.868642	0.018336	0.034263	0.046215	0.086360
2001	5.800155	2.587098	0.713500	1.845894	0.018354	0.033879	0.044284	0.081744
2002	6.000000	2.650990	0.713500	1.891481	0.017213	0.032559	0.042818	0.080990
2003	6.000000	2.650990	0.713500	1.891481	0.015728	0.029749	0.043513	0.082305
2004	6.199834	2.714879	0.713500	1.937066	0.014412	0.027918	0.041786	0.080942
2005	6.500000	2.810845	0.713500	2.005538	0.013724	0.027524	0.041782	0.083795
2006	6.600000	2.842816	0.713500	2.028349	0.013538	0.027461	0.040294	0.081730
2007	6.500000	2.810845	0.713500	2.005538	0.013689	0.027454	0.040669	0.081564
2008	6.500206	2.810911	0.713500	2.005585	0.014122	0.028324	0.040363	0.080952
2009	6.905832	2.940593	0.713500	2.098113	0.014346	0.030100	0.039897	0.083709
2010	6.939795	2.951452	0.713500	2.105861	0.014744	0.031048	0.040236	0.084731
2011	7.000000	2.970700	0.713500	2.119594	0.014830	0.031435	0.040236	0.085284
2012	7.100000	3.002671	0.713500	2.142406	0.015704	0.033643	0.041000	0.087839
2013	7.100186	3.002730	0.713500	2.142448	0.015826	0.033907	0.042545	0.091150

- Appendix B has results by bird type, state and year.
- Results will be used in initial, October, 2015 Phase 6 calibration.
- Results will replace automatic phytase BMP in Phase 6. BMP will still be available for planning.
- New data can be collected to update tables prior to September, 2015.
- New data can be collected prior to final Phase 6 calibration in Fall, 2016.

# Submitting New Data

- “... The AMS recommends that raw sample data for each parameter be submitted to the Bay Program using standardized templates... Ultimately, the Partnership will need to determine both the method and frequency of collecting and updating these values...”
- These standardized templates should be provided by Ag Workgroup.



# Questions?

