Poultry Litter Subcommittee Update

Summary and Recommendations

Agriculture Workgroup (AgWG) Meeting

March 21, 2013

Joe Macknis Memorial Conference Room

Annapolis, Maryland

Outline

- Committee Membership
- Motivation
- Data Review – Delmarva, VA, WVA
- Summary and Recommendations

Committee Membership

Jim Glancey	UD
Mark Dubin	UM
Emma Giese	CBPO
Mark Davis	DDA
Tom Basden	WVU
Bill Brown	UD
Glenn Carpenter	USDA NRCS
Frank Coale	UM
Jason Dalrymple	WVDA
Doug Goodlander	PA DEP
Matt Johnston	CBPO
Bobby Long	VA DCR

Jen Nelson	USDA NRCS
Jerry Ours	WVDA
Paul Patterson	Penn State
Jim Pease	VT
Royden Powell	MDA
Tim Sexton	VA DCR
Kelly Shenk	EPA
Trish Steinhilber	UM
Jeff Sweeney	EPA
Jennifer Timmons	UM
Jennifer Weld	PSU
Hank Zygumnt	Keith Campbell

Motivation

- EPA is using the 2003 ASAE Standard to estimate Nitrogen and Phosphorous generation from animal agriculture.
- The Standard is based on data from the late 1980's and early 1990's.
- Sub-Committee Charge:
  - Collect data that better reflects modern N and P generation from animal agriculture
  - Make recommendations to AgWG for better modeling N and P generation within the watershed
  - Focus on poultry production

Delmarva

Nutrient Content and Volume Generated - *Chickens*

Parameter	Value
Time Range	2005 to 2011
No. of Data	4152
Avg. N Concentration	57 lbs/ton
N Range*	55 to 60 lbs/ton
Avg. P Concentration	20 lbs/ton
P Range*	18 to 21 lbs/ton
Moisture Content	30 % w.b.
Moisture Content Range*	28 to 32 % w.b.
Manure Generation	1.5 tons/1000 birds
Manure Generation Range	0.5 to 4.6 tons/1000 birds

* Based on annual averages

Comments

- All manure samples analyzed by the DDA laboratory
- Bird sizes: 60% roasters, 40% broilers
- Manure generation based on a total of 702 poultry house cleanouts or crustouts
- Also have some data back to 1997

Virginia

Nutrient Content and Volume Generated - *Chickens*

Parameter	Value
Time Range	2001-2012
No. of Data	3293
Avg. N Concentration	68 lbs/ton
N Range*	19 – 83 lbs/ton
Avg. P Concentration	39 lbs/ton
P Range*	24 – 71 lbs/ton
Avg. Moisture Content	27 % w.b.
Moisture Content Range*	8 - 45 % w.b.
Manure Generation	1.25 tons/1000 birds
Manure Generation Range	0.8 – 1.5 tons/1000 birds

* Based on annual averages

Comments

- All Samples analyzed by DCR contracted labs
- Bird type: 82% broiler, 18% layer/breeder
- Manure generation based on calibrations, load counts, and observed integrator differences

Virginia

Nutrient Content and Volume Generated - *Turkeys*

Parameter	Value
Time Range	2001-2012
No. of Data	1497
Avg. N Concentration	71 lbs/ton
N Range*	38 – 132 lbs/ton
Avg. P Concentration	40 lbs/ton
P Range*	11 – 78 lbs/ton
Avg. Moisture Content	28% w.b.
Moisture Content Range*	11 – 79% w.b.
Manure Generation	8 tons/1000 birds
Manure Generation Range	6 -10 tons/1000 birds

* Based on annual averages

Comments

- All Samples analyzed by DCR contracted labs
- Bird Type: 90% finishing turkeys, 10% Breeding turkeys
- Manure generation based on calibrations, load counts, and observed integrator and gender differences
- 6 tons for hens and 10 tons for toms

West Virginia

Nutrient Content and Volume Generated - Broiler

Parameter	Value
Time Range	1995 – 2012
No. of Data	1167
Avg. N Concentration	60 lbs/ton
N Range*	46-75 lbs/ton
Avg. P Concentration	52 lbs/ton
P Range*	40-65 lbs/ton
Avg. Moisture Content	30 % w.b.
Moisture Content Range*	26-40 % w.b.
Manure Generation	1 ton/1000 birds
Manure Range	.75-1.25 tons/1000 birds

* Based on annual averages

Comments

- All manure analyzed by the WVDA Laboratory
- Average 4lbs.
- Past fiscal year showed a 32% P205 reduction from pre-phytase years (95-99)

West Virginia

Nutrient Content and Volume Generated - Layers

Parameter	Value
Time Range	1995 – 2012
No. of Data	526
Avg. N Concentration	49 lbs/ton
N Range*	36-58 lbs/ton
Avg. P Concentration	64 lbs/ton
P Range*	51-71 lbs/ton
Avg. Moisture Content	32 % w.b.
Moisture Content Range*	24-42 % w.b.
Manure Generation	11 tons/1000 birds
Manure Range	10-12 tons/1000 birds

* Based on annual averages

Comments

- All manure analyzed by the WVDA Laboratory
- Average 7 lbs.
- Past fiscal year showed a 23% P205 reduction from pre-phytase years (95-99)

West Virginia

Nutrient Content and Volume Generated - Pullets

Parameter	Value
Time Range	1995 – 2012
No. of Data	90
Avg. N Concentration	45 lbs/ton
N Range*	31-54 lbs/ton
Avg. P Concentration	68 lbs/ton
P Range*	37-99 lbs/ton
Avg. Moisture Content	29 % w.b.
Moisture Content Range*	18-33 % w.b.
Manure Generation	2.75 tons/1000 birds

* Based on annual averages

Comments

- All manure analyzed by the WVDA Laboratory
- Past fiscal year showed a 20% P205 reduction from pre-phytase years (95-99)

West Virginia

Nutrient Content and Volume Generated - Turkeys

Parameter	Value
Time Range	1994 – 2012
No. of Data	548
Avg. N Concentration	57 lbs/ton
N Range*	44-85 lbs/ton
Avg. P Concentration	63 lbs/ton
P Range*	43-146 lbs/ton
Avg. Moisture Content	33 % w.b.
Moisture Content Range*	23-36 % w.b.
Manure Generation	9 tons/1000 birds
Manure range	6-13 tons/1000 birds

* Based on annual averages

Comments

- All manure analyzed by the WVDA Laboratory
- Weight ranges differ with different types of turkey operations
- Past fiscal year showed a 12% P205 reduction from pre-phytase years (94-99)

Summary

- PLS committee has summarized regional poultry litter nutrient and volume data.
- Sub-committee recommendations are based on more than 8,000 data within the watershed.
- Differences exist between states/regions for both N and P concentrations as well as manure generation volumes.
- These differences are likely due to several things including different grow-out practices, genetics, feed technologies, preferred bird sizes, etc.

Draft Recommendations

For the Current Model

- Data suggests a state/regional approach.
- All states excepting PA and NY have databases in place to track and report average N and P concentration data by bird type on an annual basis. PA is investigating data sources.
- PLS recommends to allow each state to report annual average N and P manure concentrations and manure generation volumes for their state/region.

Draft Recommendations cont.

- PLS recommends to directly insert annual average N and P concentration data with manure volume data where available (where not available, the existing model data analysis would remain).
- The new annual concentration data would sub-plant the current model data and analysis assumptions for excreted values, feed additives (Phytase), and litter amendments.
- PLS recommends to directly insert the new manure volume data per 1k birds and apply to USDA-NASS Agriculture Census projected livestock populations to sub-plant current manure volume data.

Draft Recommendations

For the Next (v6.x) Model

- Develop new model data and analysis methods for representing poultry litter nutrient generation and volumes to calculate mass nutrients.
- Implement capacity in NEIEN for data reporting on annual average N and P concentrations by bird type by state/region.
- States responsible for collecting and reporting annual NEIEN data updates along with annual progress data.
- Update manure volume numbers as new data becomes available.

Questions?

Comments?

ASAE Standard, 2003

Table 2 – Fresh manure production and characteristics per 1,000 lb live animal mass per day

Parameter	Units*		Animal Type†										
			Dairy	Beef	Veal	Swine	Sheep	Goat	Horse	Layer	Broiler	Turkey	Duck
Total manure‡	lb	mean§	86	58	62	84	40	41	51	64	85	47	110
		std. deviation	17	17	24	24	11	8.6	7.2	19	13	13	**
Urine	lb	mean	26	18	**	39	15	**	10	**	**	**	**
		std. deviation	4.3	4.2	**	4.8	3.6	**	0.74	**	**	**	**
Density	lb/ft^3	mean	62	63	62	62	64	63	63	60	63	63	**
		std. deviation	4.0	4.7	**	1.5	4.0	**	5.8	2.4	**	**	**
Total solids	lb	mean	12	8.5	5.2	11	11	13	15	16	22	12	31
		std. deviation	2.7	2.6	2.1	6.3	3.5	1.0	4.4	4.3	1.4	3.4	15
Volatile solids	lb	mean	10	7.2	2.3	8.5	9.2	**	10	12	17	9.1	19
		std. deviation	0.79	0.57	**	0.66	0.31	**	3.7	0.84	1.2	1.3	**
Biochemical oxygen demand, 5-day	lb	mean	1.6	1.6	1.7	3.1	1.2	**	1.7	3.3	**	2.1	4.5
		std. deviation	0.48	0.75	**	0.72	0.47	**	0.23	0.91	**	0.46	**
Chemical oxygen demand	lb	mean	11	7.8	5.3	8.4	11	**	**	11	16	9.3	27
		std. deviation	2.4	2.7	**	5.3	2.5	**	**	2.7	18	1.2	**
pH		mean	7.0	7.0	8.1	7.5	**	**	7.2	6.9	**	**	**
		std. deviation	0.45	0.34	**	0.57	**	**	**	0.56	**	**	**
Total Kjeldahl nitrogen‖	lb	mean	0.45	0.34	0.27	0.52	0.42	0.45	0.30	0.84	1.1	0.62	1.5
		std. deviation	0.096	0.073	0.045	0.21	0.11	0.12	0.063	0.22	0.24	0.13	0.54
Ammonia nitrogen	lb	mean	0.079	0.086	0.12	0.29	**	**	**	0.21	**	0.080	**
		std. deviation	0.083	0.052	0.016	0.10	**	**	**	0.18	**	0.018	**
Total phosphorus	lb	mean	0.094	0.092	0.066	0.18	0.087	0.11	0.071	0.30	0.30	0.23	0.54
		std. deviation	0.024	0.027	0.011	0.10	0.030	0.016	0.026	0.081	0.053	0.093	0.21

ASAE Standard, 2003 (cont')

*All values wet basis.

†Differences within species according to usage exist, but sufficient fresh manure data to list these differences was not found. Typical live animal masses for which manure values represent are: dairy, 1400 lb; beef, 800 lb; veal, 200 lb; swine, 135 lb; sheep, 60 lb; goat, 140 lb; horse, 1000 lb; layer, 4 lb; broiler, 2 lb; turkey, 15 lb; and duck, 3 lb.

‡Feces and urine as voided.

§Parameter means within each animal species are comprised of varying populations of data. Maximum numbers of data points for each species are: dairy, 85; beef, 50; veal, 5; swine, 58; sheep, 39; goat, 3; horse, 31; layer, 74; broiler, 14; turkey, 18; and duck, 6.

‖All nutrients and metals values are given in elemental form.

#Mean bacteria colonies per 1,000 lb animal mass multiplied by 10^{10}. Colonies per 1,000 lb animal mass divided by lb total manure per 1,000 lb animal mass multiplied by density (lb/ft^3) equals colonies per ft^3 of manure.

**Data not found.

Case Study: *Sussex County, Delaware*

	EPA/ASAE Approach	units
Bird Inventory	43,620,576	# of birds on any given day (2007 Census)
Animal Unit Definition	455	# of birds per 1000 lbs of animal mass
Total Animal Unit Inventory	95,869	animal units on any given day
Manure Production	85	lbs of manure per animal unit per day
Total Manure Produced	1,487,174	tons wet excretion per year
Nitrogen Concentration	0.0129	lbs TKN per lb of manure
Phosphorous Concentration	0.0035	lbs Total P per lb of manure
Total Nitrogen Produced	38,491,563	lbs Total N per year
Total Nitrogen Not Volatized	35,332,221	lbs Total N per year
Total Phosphorous Produced	10,497,699	lbs Total P per year
Total Phosphorous Produced with 16% phytase credit	8,818,067	lbs Total P per year

	UD/DDA/UMD Approach	units
No of Birds	43,620,576	# of birds
No of Flocks per Year	4.8	flock per year
Total Number of Birds Produced	209,378,765	birds per year
Manure Production	1.25	tons per 1000 birds
Total Manure Produced	261,723	tons per year
Nitrogen Concentration	56.80	lbs Total N per ton
Phosphorous Concentration	19.50	lbs Total P per ton
Total Nitrogen Produced	14,839,720	lbs Total N per year
Total Phosphorous Produced	5,103,607	lbs Total P per year