

House Agriculture Committee
Testimony in support of Senate Bill 405
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February 12, 2018

Good afternoon Chairman Hoffman and members of the House Agriculture committee, my name is Peter Tomlinson and I am an Assistant Professor and Extension Specialist for Environmental Quality at Kansas State University. I am here to testify in support of SB 405. The recent interest expressed by the poultry industry to expand broiler chicken production to Kansas has highlighted that our current animal unit designations for poultry do not accurately reflect current production practices. The following information was developed to provide an over view of broiler chicken growth, and an assessment of the manure production and nutrient content expected per animal unit per day for broiler chicken production utilizing a dry manure system. The animal unit of 0.003 or 333 broilers per animal unit proposed in SB405 is more conservative than the animal units used by Midwest Plan Service (MWPS) of 0.002 or 500 broilers and the Natural Resource Conservation Service (NRCS) - Agricultural Waste Management Field Handbook of 0.0026 or 385 broilers. The projected annual daily manure and nutrient production per animal unit is 52-63 pounds of manure, 0.58-0.69 pounds of nitrogen (N) and 0.17 to 0.20 pounds of phosphorus (P).

Broiler chicken production

- During the past 5 years, United States broiler chickens had an average market age of 47 days with a market weight of 6.01 pounds (range from 5.85 to 6.16 pounds). Source: National Chicken Council, <http://www.nationalchickencouncil.org/about-the-industry/statistics/u-s-broiler-performance/>
- Broiler chicken growth (Fig. 1) is relatively uniform over the production period with an average daily gain of 0.11 to 0.14 pounds per day.

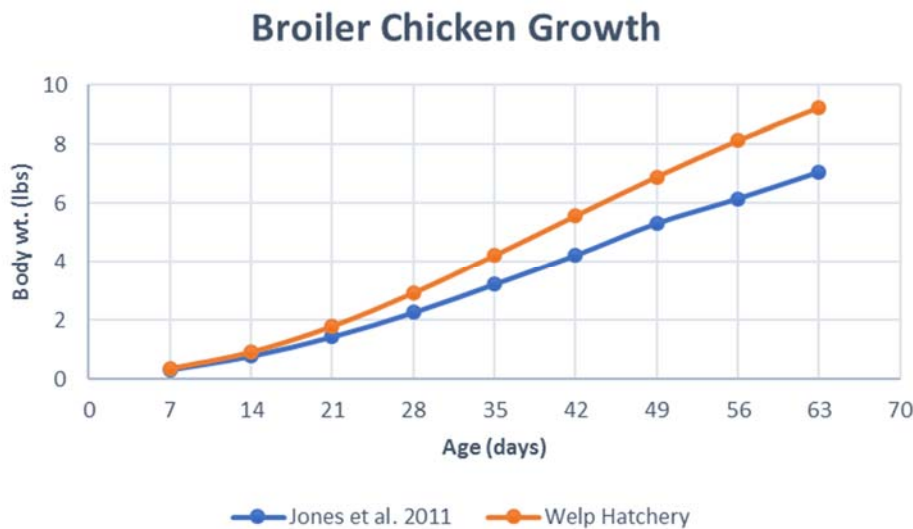


Figure 1. The growth rate of modern broiler chickens adapted from Jacob et al. (2011). How much will my chickens eat? ASC-191, Cooperative Extension Service, University of Kentucky (<http://www2.ca.uky.edu/agcomm/pubs/ASC/ASC191/ASC191.pdf>), and Welp Hatchery, Bancroft, IA (https://www.welphatchery.com/cornish_rock_care).

- Final market weight will not be achieved until the final week of growth and for 50% of the growth period the body weight will be less than half of the final market weight. Thus, supporting the calculation of the animal unit based on the average body weight (50% of market weight) rather than the final market weight.
 - Kellogg et al. (2000) used the average weight from birth to market for broilers to calculate the number of birds per animal unit, in preparing the publication “Manure nutrients relative to the capacity of cropland and pastureland to assimilate nutrients: Spatial and temporal trend for the United States.” Source: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_012133.pdf
- Justification for an animal unit of 0.003, based on average bird weight:
 - At a weight of 6 pounds, the average weight over the growth period would be approximately 3 pounds.
 - 3 pounds/1000 pounds per animal unit = 0.003 animal units
 - Midwest Plan Service (MWPS) uses an animal unit of 0.002 or 500 broilers
 - Natural Resource Conservation Service (NRCS) - Agricultural Waste Management Field Handbook uses an animal unit of 0.0026 or 385 broilers.

Broiler chicken manure and nutrient output:

- Estimates of daily manure production and nutrient characteristics of broiler manure (urine and feces) for a single bird from two sources are summarized (Table 1).

Table 1. Daily manure production and nutrient content for a broiler chicken¹.

Reference	Manure output (lbs.)	Nitrogen (lbs.)	Phosphorus (lbs.)
MWPS ²	0.19	0.0021	0.00061
NRCS ³	0.23	0.0025	0.00073

¹ Actual manure production and nutrient characteristics may differ depending on actual feed and animal performance.

² Midwest Plan Service – Manure Characteristics Table 6. Daily manure production and characteristics, as-excreted (per head per day). This source is a paid access publication (<https://www-mwps.sws.iastate.edu/catalog/manure-management/manure-characteristics-pdf>). The phosphorus value in Table 6 was converted from P₂O₅ (fertilizer notation) to P (P₂O₅ value multiplied by 0.4364) to standardize with the NRCS values presented.

³ NRCS Agricultural Waste Management Field Handbook, Chapter 4 – Agricultural Waste Characteristics, Table 4-11d, page 4-20 <https://www.wcc.nrcs.usda.gov/ftpref/wntsc/AWM/handbook/ch4.pdf>. To standardize numbers with the MWPS values the “units per day per 1000 lbs. animal unit” were divided by the number of broilers per animal unit (385 broilers) used in the NRCS calculations.

- When an appropriate animal unit, as proposed in SB405 for broiler chickens, is used to determine the number of birds to use as the multiplier the manure and nutrient production per day for one animal unit equivalent of broiler chickens (Table 2) is within the range of other livestock species (Table 3).
- Broiler production is unique in comparison to other livestock species because every 47 days the birds reach market weight and there will be a 7- to 14-day period (avg. of 10 days) when no birds are present in the broiler house.
- Thus, from a manure production stand point, every production cycle, has on average, a 10-day period with no manure generated. When this is accounted for in the manure production calculation, the manure and nutrients generated per animal unit of broiler chickens is further reduced and reflective of average daily production for the entire year (Table 4).

Table 2. Comparison of estimated pounds of Nitrogen (N), Phosphorus (P), and Manure generated by broiler chicken production at different animal units.

Broiler animal unit	No. of birds /animal unit	Lbs./day of N/1000 lbs. of animal weight (1 AU)		Lbs./day of P/1000 lbs. of animal weight (1 AU)		Lbs. of manure/day/1000 lbs. of animal weight (1 AU)	
		MWPS*	NRCS**	MWPS	NRCS	MWPS	NRCS
0.003 (SB405)	333	0.70	0.83	0.20	0.24	63	77
0.002 (MWPS)	500	1.05	1.25	0.31	0.37	95	115
0.0026 (NRCS)	385	0.81	0.96	0.23	0.28	73	88

* Calculated based on Midwest Plan Services (MWPS) estimated daily broiler chicken manure production and nutrient content summarized in Table 1 multiplied by the number of birds per animal unit.

** Calculated based on Natural Resource Conservation Service (NRCS) estimated daily broiler chicken manure production and nutrient content summarized in Table 1 multiplied by the number of birds per animal unit.

Table 3. Estimated pounds of Nitrogen (N), Phosphorus (P), and Manure generated by different livestock types per animal unit per day.

Animal unit	No. of animals /animal unit	Lbs. N/day/1000 lbs. of animal weight (1 AU)		Lbs. P/day/1000 lbs. of animal weight (1 AU)		Lbs. of manure /day/1000 lbs. of animal weight (1 AU)	
		MWPS*	NRCS**	MWPS	NRCS	MWPS	NRCS
Dairy heifer (1000 lbs.)	1.00	0.30	0.27	0.04	0.05	60	56
Dairy lactating (1400 lbs.)	0.71	0.72	0.76	0.16	0.14	110	119
Dairy dry (1400 lbs.)	0.71	0.30	0.30	0.05	0.04	50	51
Beef finishing (1100 lbs.)	0.91	0.36	0.36 – 0.50	0.05	0.06 – 0.07	49	65
Swine finishing (150 lbs.)	6.67	0.60	0.54	0.09	0.09	49	65
Swine nursery (25 lbs.)	40	0.80	0.92	0.17	0.15	76	88

* Calculated based on Midwest Plan Services (MWPS) estimated daily manure production and nutrient content multiplied by the number of animals per animal unit.

** Based on Natural Resource Conservation Service (NRCS) - Agricultural Waste Management Field Handbook, Chapter 4 – Agricultural Waste Characteristics, <https://www.wcc.nrcs.usda.gov/ftpref/wntsc/AWM/handbook/ch4.pdf>."

Table 4. Comparison of estimated pounds of Nitrogen (N), Phosphorus (P), and Manure generated by broiler chickens at different animal units accounting for 10 days of no birds (no manure) per production cycle.

Broiler animal unit	No. of birds /animal unit	Lbs. N/day/1000 lbs. of animal weight (1 AU)		Lbs. P/day/1000 lbs. of animal weight (1 AU)		Lbs. of manure/day/1000 lbs. of animal weight (1 AU)	
		MWPS*	NRCS**	MWPS	NRCS	MWPS	NRCS
0.003 (SB405)	333	0.58	0.69	0.17	0.20	52	63
0.002 (MWPS)	500	0.87	1.03	0.25	0.30	78	95
0.0026 (NRCS)	385	0.67	0.79	0.19	0.23	60	73

* Calculated based on Midwest Plan Services (MWPS) estimated daily broiler chicken manure production and nutrient content summarized in Table 1 multiplied by the number of birds per animal unit and an adjustment factor of 0.825 (47 days/57 days) to account for 10 days of no manure production per broiler production cycle.

** Calculated based on Natural Resource Conservation Service (NRCS) estimated daily broiler chicken manure production and nutrient content summarized in Table 1 multiplied by the number of birds per animal unit and an adjustment factor of 0.825 (47 days/57 days) to account for 10 days of no manure production per broiler production cycle.

Broiler house bedding/manure (litter) management and utilization

- Birds (broilers, broiler breeder pullets) are raised on the floor of the house that has a bedding layer called litter. The litter remains under cover of the house roof and there are no lagoons as litter is a dry material (Fig. 2).



Figure 2. Broiler litter with visible bedding material, feces, and waste feed.

- Poultry litter composition:
 - Bedding material (wood shavings, sawdust, rice hulls, etc.), feces, feathers, and waste feed.
 - Moisture content range of 20 to 30%.
 - Nutrient content:

Reference	Nutrient Content as received (lb/ton)		
	N	P ₂ O ₅	K ₂ O
K-State MF2562 ¹	56	45	34
K-State eUpdate ²	56	53	46
Univ. of George ³	64	54	48
Clemson ⁴	72	69	46

¹ www.bookstore.ksre.k-state.edu/pubs/MF2562.pdf

² https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=1635

³ <http://extension.uga.edu/publications/detail.html?number=B1245>

⁴ www.clemson.edu/extension/camm/manuals/poultry_toc.html

- Contains additional essential plant nutrients including calcium (Ca), magnesium (Mg), sulfur (S), manganese (Mn), copper (Cu), zinc (Zn), chlorine (Cl), boron (B), iron (Fe), and molybdenum (Mo). Source: https://www.clemson.edu/extension/camm/manuals/poultry/pch3b_00.pdf
- Typically, six or more flocks of birds are raised before either a partial (50% removal) or full (100% removal) cleanout of the litter.
- Broiler operations with a capacity greater than 125,000 birds and sufficient covered storage for a full clean out of the litter will have a large confined animal feeding operation (Large CAFO) designation according to federal Environmental Protection Agency guidelines and will be required to obtain all

required permits including a nutrient management plan. Source:

https://www.epa.gov/sites/production/files/2015-08/documents/cafo_permitmanual_chapter2.pdf

- If the facility does not have sufficient covered storage it could be designated as having “liquid manure” because the litter would be stored outside exposing it to precipitation resulting in runoff; thus, lowering the threshold to 30,000 birds.
- The permitting process will also require a nutrient management plan that ensure the appropriate agricultural utilization of nutrients and/or a plan for transferring the litter to a third party.
- Source: https://www.epa.gov/sites/production/files/2015-08/documents/cafo_implementation_guidance.pdf
- A 50 x 500 ft broiler house (25,000 square feet) with a capacity of 20,000 to 30,000 birds will produce an estimated 150 tons of litter per year (6 flocks) assuming a full cleanout is performed.
- The estimated 150 tons of litter generated from a broiler house when used as a phosphorus source to fertilize crop ground (assuming an application rate of 53 lbs. P₂O₅ per acre (estimate grain P₂O₅ removal for 160-bushel corn) and a litter phosphorus content of 53 lbs. P₂O₅ per ton) will meet the phosphorus need for 150 acres.
- Poultry litter best management practices for utilization as a source of fertilizer for crop production include:
 - Obtain current soil and poultry litter nutrient analyses to enable accurate application rate calculations.
 - Calculate application rates based on soil fertilizer P recommendations, crop removal rates, and expected yield.
 - When appropriate, incorporate manure.
 - Maintain appropriate setbacks from the edge of field and tile outlets when applying poultry litter.

Thank you for the opportunity to speak with you today. I will stand for questions at the appropriate time.

Respectfully,



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