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2003

Manure Matters, Volume 9, Number 2

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Koelsch, Richard K. and Powers, Wendy, "Manure Matters, Volume 9, Number 2" (2003). *Manure Matters (newsletter)*. 36.
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UNL's Livestock Environmental Issues Committee
Includes representation from UNL, Nebraska Department of Environmental Quality, Natural Resources Conservation Service, Natural Resources Districts, Center for Rural Affairs, Nebraska Cattlemen, USDA Ag Research Services, and Nebraska Pork Producers Association.

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Integrating Animal Feeding Decisions into CNMP Processes: Part 2

Rick Koelsch, University of Nebraska and Wendy Powers, Iowa State University

This is part 2 of a two part series, part one was discussed in Volume 9, Number 1.

Changing Current Standards

To improve the current procedures for estimating nutrient excretion, a joint ASAE/FASS 1 committee of agricultural engineers and animal scientists have been assembled to review and rewrite the current ASAE Standard on Manure Production and Characteristics. Several NRCS representatives are actively involved in these discussions with the potential for revising NRCS standard estimates based upon ASAE changes. This committee is currently addressing the following three topics:

1. As Excreted–Feed Intake Summary: Characteristics of excreted manure will be defined based upon a mass balance approach illustrated in Figure 1. Predictive equations for excretion estimates will be developed.

2. As Excreted–Average Summary: Existing average ASAE standard values of excreted manure will be redefined based upon estimates from Topic #1 for current average feed programs.

3. As Removed–Average Summary: An estimate of average as-removed manure characteristics for common animal housing and manure storage systems would be assembled, based in part on the MWPS-18, Manure Characteristics handbook.

Summary

Opportunities exist to improve our estimates of nutrient excretion using an animal nutrient balance model. The attached tool (see Table 1) provides one method of estimating nutrient excretion based upon current feeding practices and evaluating the impact of changes in the feed program on the overall nutrient management program. Such procedures will also be of value to producers adopting animal feeding programs designed to reduce nutrient excretion and achieve compliance with public policy goals for nutrient management planning. NRCS and ASAE standards for nutrient excretion will need to reflect these alternative procedures.

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Figure 1. Animal nutrient balance model for estimating nutrient excretion.

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Table 1. Nutrient balance estimate of manure nutrient excretion.

I. Feed Nutrient Intake

a. Animal Group	b. Group Daily Feed Intake (lbs/day)	Feed Nutrient Concentration (%)			Total Nutrient in Feed (lbs/day)	
		c. Crude Protein	d. N[1] (c ÷ 6.25)	e. P	f. Daily N Fed (b x d ÷ 100)	g. Daily P Fed (b x e ÷ 100)
Example: *1,000 beef finishers*	*27,000 lbs DM/day*	*13.5%*	*13.5 ÷ 6.25 = 2.16%*	*0.35%*	*27,000 x 2.16 ÷ 100 = 583 lbs/day*	*27,000 x 0.35 ÷ 100 = 94.5 lbs/day*

II. Nutrients Retained by Animal

a. Animal Group	h. Maximum One-time Capacity (# of animals)	i. Average Daily Gain/Animal (lbs/day)	Live Weight Nutrient Concentration		Daily Nutrients Retained by Animal (lbs/day)	
			j. N	k. P	l. N (h x i x j)	m. P (h x i x k)
Example: Beef	*1,000*	*4.1 lbs/day*	0.026	0.0070	*1,000 x 4.1 x 0.026 = 107 lbs/day*	*1,000 x 4.1 x 0.0070 = 28.7 lbs/day*
Beef			0.026	0.0070		
Dairy			0.027	0.0075		
Pork			0.024	0.0050		
Hens			0.028	0.0058		
Broilers			0.028	0.0058		
Turkeys			0.028	0.0059		

III. Nutrients Retained by Animal Products

a. Animal Product	n. Daily Production (lbs/day)	Nutrient Concentration of Animal Products		Nutrients Retained by Animal Products (lbs/day)	
		o. N (lbN/lb prod.)	p. P (lb P/lb prod.)	q. N (n x o)	r. P (n x p)
Milk[1]		0.0050	0.0010		
Eggs[1]		0.0166	0.0021		

IV. Nutrient Excretion by Animals

a. Animal Group/Product	s. Days Fed Per Year (days/yr)	Annual Nutrient Excretion		
		t. **N** [s x (f – l)] or [s x (f – q)] (lbs/yr)	u. **P** [s x (g – m)] or [s x (g – r)] (lbs/yr)	v. $\mathbf{P_2O_5}$[2] (u x 2.3) (lbs/yr)
Example: Beef finisher	*350 days/yr*	*350 x (583 – 107) = 167,000 lbs/yr*	*350 x (94.5 – 28.7) = 23,000 lbs/yr*	*23,000 x 2.3 = 53,000 lbs P_2O_5/yr*
Total	----------	w.	----------	x.

1. N in feed = Protein ÷ 6.25, N in milk = Protein ÷ 6.38. Nitrogen content of 0.0050 assumes 3.2% protein in milk, N in eggs = Protein ÷ 6.25. Nitrogen content of 0.0166 assumes 10.4% protein in eggs. Lbs P_2O_5 = lbs *x* 2.3

Part 1 and Part 2 of this newsletter was published in the October 2002 version of the LPES (Livestock and Poultry Environmental Stewardship) curriculum project. For more information contact Diane Huntrods (huntrods@iastate.edu) or visit the website (www.lpes.org).

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperative with the U.S. Department of Agriculture. Elbert Dickey, Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.
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