NEW HORIZONS IN SOIL SCIENCE

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Manure Analysis Update: 1998-2010

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Introduction

There are a number of essential pieces of information required to determine the proper application rates and nutrient credits for livestock waste to meet crop needs. These include the acreage of the field, capacity of the spreader and nutrient value of the manure. Nutrient value can be assigned by using estimated "book" or average available N, P_2O_5, and K_2O contents. However, testing manure may better indicate how animal management and other factors actually affect nutrient content. Manure testing has been on the increase in recent years, which is a reflection of increasing nutrient costs and the requirement for manure testing in certain situations.

Manure analysis results for this summary were provided by the following laboratories. The cooperation of these laboratories in providing their data for this summary is greatly appreciated.

AgSource Laboratory
Dairyland Laboratory
Rock River Laboratory
UW Soil and Forage Laboratory

Laboratory vs. Book Value

Data in the livestock waste facilities handbook (MWPS, 2007) provide "typical" or average nutrient contents for manures of several animal types. These values probably give an acceptable estimate for the "typical" producers, especially if sampling methods do not represent the pit, pack or gutter adequately. However, an analysis of a well-sampled system may give a better estimate of nutrient value for individual farms especially if herd and manure management is not

"typical." In Table 1, the MWPS total nutrient estimates are compared to actual manure analysis of 27,391 samples analyzed by Wisconsin based laboratories between 1998 and June 2010 as well as compared to the "Wisconsin book" values currently being used in UW-Extension Publication A2809. In most cases, especially where the sample numbers are very large, the summary values compare quite well with the established norms. In some situations where new categories were recently created such as the various liquid swine categories as well as chicken manure, the summary values may be quite different than the "book" values. There are not a large number of samples in some of these categories at this time, so these values may come closer together over time.

Even though on average the actual farm values compare well to the MWPS estimates in most cases, the actual analysis values can range widely from the MWPS estimates (Table 2). This could be the result of different management practices on farms or other on farm differences, or improper sampling techniques. Taking multiple samples over time and averaging these values will help reduce the potential for using a single anomalous laboratory result as the basis for crediting nutrients on a farm.

Changes in Dairy Manure Nutrient Content Over Time

In studying the long-term trends in nutrient content over time, there has been a decline in the liquid dairy manure N content and a very slight increase in the N content of solid dairy manure. There has been a decrease in liquid dairy manure P content and a slight increase in solid dairy manure P levels. There has also been a slight increase in solid dairy manure K content and a very small decrease in liquid dairy manure K levels. With the tremendous amount of emphasis being placed on closely monitoring and reducing, if appropriate, the dietary P levels for dairy cattle it is not surprising to see a decline in manure P levels. This trend is much more evident in the liquid manure samples. This is important as there are more the twice the number of liquid dairy manure as compared to solid dairy manure samples in this data set. It could also be assumed that samples of liquid manure will likely represent more animals per sample than solid manure samples as most large dairies use a liquid system.

Comparison of Dairy TMR Total P Levels with Manure P Content

For the past 9 years, the UW Soil and Forage Analysis Laboratory has been conducting a program to thoroughly evaluate TMRs for dairies. One of the outcomes of this has been the ability to monitor total P levels in these TMR rations. During this same time period, there has been a tremendous amount of extension effort put into getting information to dairy farmers as to the appropriate levels of total dietary P in rations. In general, most dairy rations originally contained significantly more P than was necessary for herd health and proper milk production at that time. Over the past 9 years or so, there has been a steady decline in the average total P content of dairy TMRs. There has been a similar downward trend in liquid dairy manure P levels over this same time period (Fig. 1). Beginning in the last few years, there has been a similar decrease in solid dairy manure P levels as well (Fig. 2).

Table 2. Variability in analyzed manure total nutrient values.

Animal tType System	Nutrient	Wisconsin † Avg.	s.d.	Range	MWPS ‡
		----------lb/1000 gal----------			
Dairy Liquid	N	21	11	1-125	31
	P_2O_5	8	12	1-170	15
	K_2O	19	10	1-95	19
		----------lb/ton ----------			
Dairy Solid	N	11	8	0.1-68	10
	P_2O_5	6	8	0.1-98	13
	K_2O	10	23	0.1-132	6
		----------lb/1000 gal----------			
Swine Liquid	N	34	21	1-203	28
Farrow-Finish	P_2O_5	18	16	1-163	24
	K_2O	21	11	1-81	23

† Nutrient levels in 6371 solid/semi-solid dairy, 14676 liquid dairy and 1568 liquid swine manure samples submitted to Wisconsin-based laboratories 1998-2010.
‡ Livestock Waste Facilities Handbook (MWPS, 2007).

Summary

The number of manure samples tested by public and private labs has increased greatly from 1998 to their current levels in 2010. This information on nutrient content is extremely valuable for use in extension programming as well as by other agricultural professionals. However, many producers still do not sample manure properly. Using book values is one way to attempt to properly credit applied nutrients from manure. However, if your manure varies from the norm, using a standard value may be inappropriate. By following recommended sampling guidelines and keeping long-term records, the appropriate manure nutrient content values can be obtained for a farm.

References

Laboski, C.A.M., J.B. Peters, and L.G. Bundy. 2006. Nutrient application guidelines for field, vegetable and fruit crops. UWEX Pub. A2809. Univ. off Wisconsin-Extension, Madison, WI.

Peters, J.B. (ed.). 2003. Recommended methods of manure analysis." UWEX Pub. A3769 (web based). Univ. of Wisconsin-Extension, Madison, WI. http://uwlab.soils.wisc.edu/pubs/A3769.pdf

MWPS. 2007. Livestock waste facilities handbook. Handbook no. 18, 2nd ed. Midwest Plan Service. Ames, IA.

Fig. 1. Long-term trends in P levels in liquid dairy manure vs. TMRs.

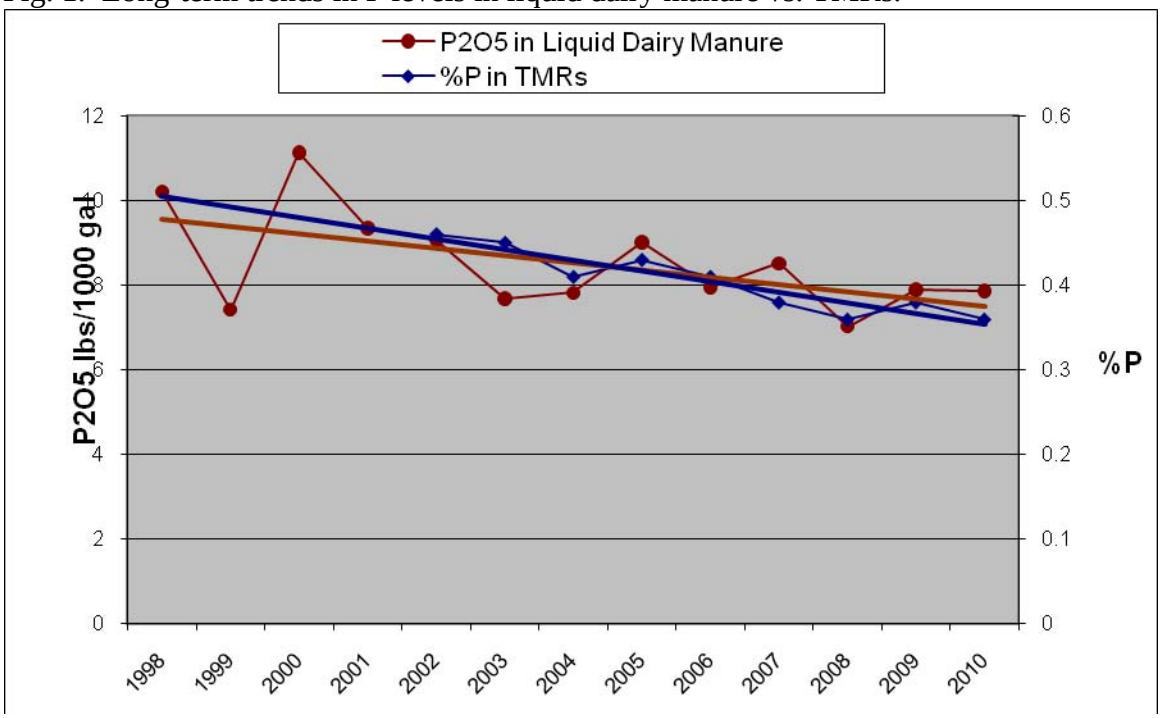

Fig. 2. Long-term trends in P levels in solid dairy manure vs. TMRs.

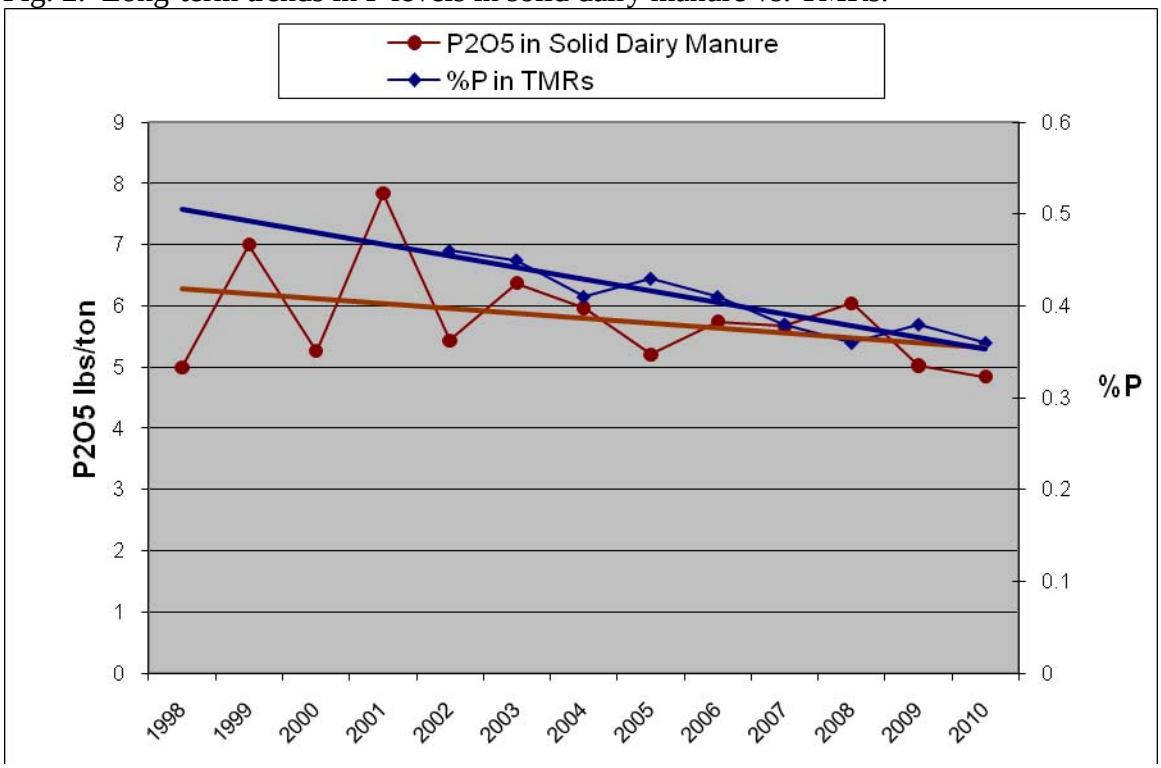

Table 1 - Wisconsin Manure Analysis Summary (1998-2010) †

	1998-2010	A2809	1998-2010	A2809	MWPS	1998-2010	A2809	MWPS	1998-2010	A2809	MWPS
Solid (lb/ton)	**DM %**	**DM %**	**N**	**N**	**N**	**P2O5**	**P2O5**	**P2O5**	**K2O**	**K2O**	**K2O**
Dairy	33	24	11	10	10	6	5	3	10	9	6
Beef	33	35	14	14	7	9	9	4	14	11	7
Swine (all)	29	20	19	14	14	19	10	8	13	9	5
Chicken-broiler	79		64		46	79		53	47		36
Chicken-layer	51		49		34	47		51	29		26
Turkey	60	60	51	40	40	46	40	50	31	30	30
Duck	37	35	13	17	17	16	21	21	9	30	30
Horse	36	45	10	10		6	6		9	10	
Sheep	36	45	20	26		11	18		32	40	
Poultry (general)	58		45			43			32		
Liquid (lb/1000 gal)											
Dairy	7	6	21	24	31	8	9	15	19	20	19
Beef	5	5	20	20	20	10	9	16	16	20	24
Swine-finish (indoor pit)	6	7	43	50	50	22	42	42	24	30	30
Swine-finish (outdoor pit)	4	4	28	34	32	17	16	22	15	20	20
Swine (farrow-nursery)	2	3	20	25	25	10	23	19	12	22	22
Swine (all combined)	4		34		28	18		24	21		23
Poultry (all)	4	3	21	16		14	10		14	12	
Veal	3	2	19	15	26	7	10	22	17	25	40
Duck	3		14		22	12		15	10		8

† new - 1998-2010 long term summary
current - value currently used in A2809
MWPS - book value from Midwest Plan Service publication 18 (2007)