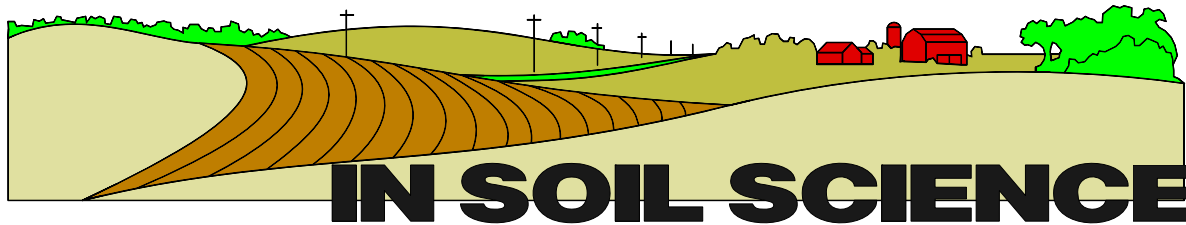


NEW HORIZONS



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What's New with Manure: Long-term Trends

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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, P₂O₅, and K₂O contents. However, testing manure may better indicate how animal management and other factors actually affect nutrient content. In recent years testing manure has become much more common place. This is the result of sky-rocketing nutrient costs and the requirement for manure testing in certain situations.

Manure analysis results for this paper 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”. The MWPS total nutrient estimates are compared in Table 1 to actual manure analysis of nearly 18,000 samples analyzed by Wisconsin-based laboratories between 1998 and October 2008 as

well as compared to the “Wisconsin book” values currently being used in UW Extension publication A2809 (Laboski et al., 2006). 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 and duck manure, the summary values are quite different than the “book” values. There are not a large number of samples in some of these categories at this time, but data will continue to be collected in the future to help enhance this data base.

Even though on average the actual farm values compare well to the MWPS estimates, 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.

Table 2. Variability in analyzed manure total nutrient values.

Animal type	System	Nutrient	Wisconsin †			
			Average	s.d.	Range	MWPS ‡
			----- lb/1000 gal -----			
Dairy	Liquid	N	22	10	1 to 125	31
		P ₂ O ₅	8	6	1 to 149	15
		K ₂ O	19	10	1 to 195	19
			----- lb/ton -----			
Dairy	Solid	N	11	7	0.1 to 67	10
		P ₂ O ₅	6	6	0.1 to 71	3
		K ₂ O	9	8	0.2 to 48	6
			----- lb/1000 gal -----			
Swine	Liquid	N	34	22	1 to 203	28
	Farrow-Finish	P ₂ O ₅	18	16	1 to 163	24
		K ₂ O	20	11	1 to 70	23

† Nutrient levels in 4691 solid/semi-solid dairy, 10144 liquid dairy, and 1044 liquid swine manure samples submitted to Wisconsin-based laboratories 1998-2008.

‡ Livestock Waste Facilities Handbook (MWPS, 2007).

Changes in Dairy Manure Nutrient Content over Time and by Region of the State

In studying the long-term trends in nutrient content over time, there has been a slight decline in both solid and liquid dairy manure N content, a decrease in liquid manure P content but very little change in solid dairy manure P levels. There has also been a fairly significant increase in solid dairy manure K content with very little change in liquid dairy manure K levels (Table 3). 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 is more than 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. In Table 4, the dairy manure nutrient content for the summary period is summarized by extension reporting district in the state. This table only includes samples where the county was listed so not all samples are able to be included. In terms of sample numbers, by far the greatest number of samples came from counties in the EC district followed by the SC and then the NE district.

Comparison of Dairy TMR Total P Levels with Manure P Content

In 2002, the UW Soil and Forage Analysis Laboratory began a program to evaluate total mixed rations (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 UW-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 contained significantly more P than was necessary for herd health and proper milk production at that time. Over the past 7 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). There has not been a similar decrease in solid dairy manure P levels over this same time period (Fig. 2). As mentioned previously, this may be related to the more common use of TMRs on larger dairies, which also typically have liquid manure management systems.

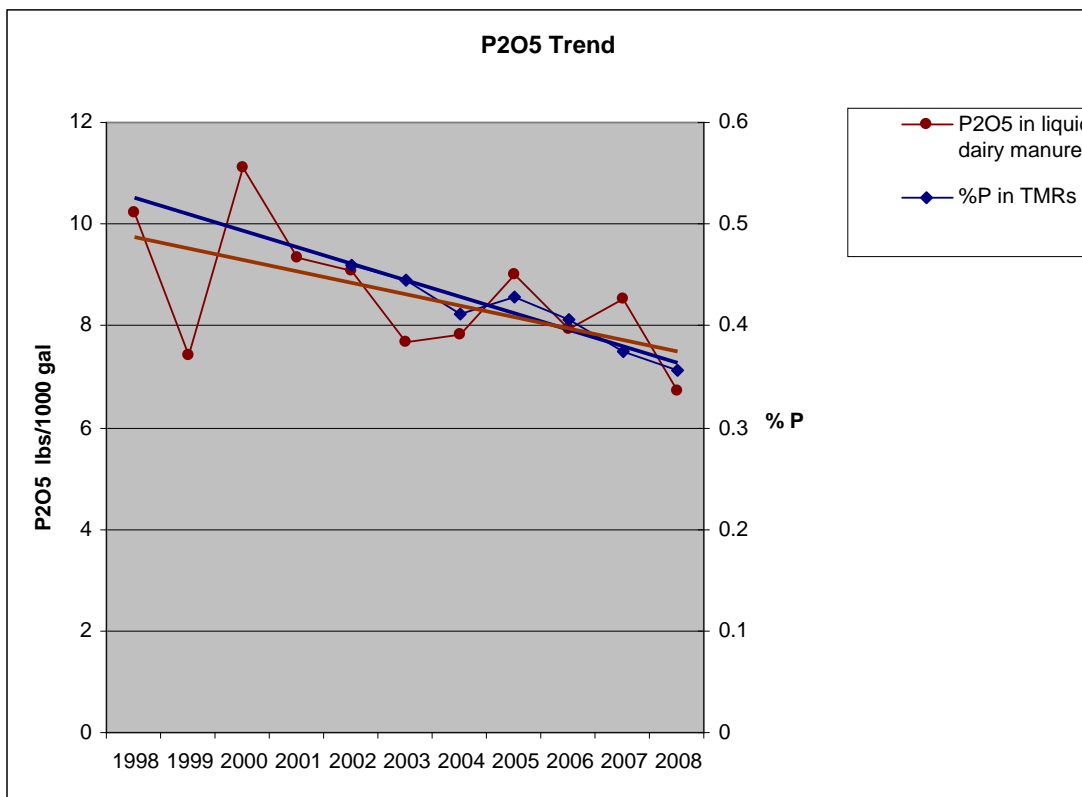


Fig. 1. Long-term trends in P levels in liquid dairy manure vs. TMRs.

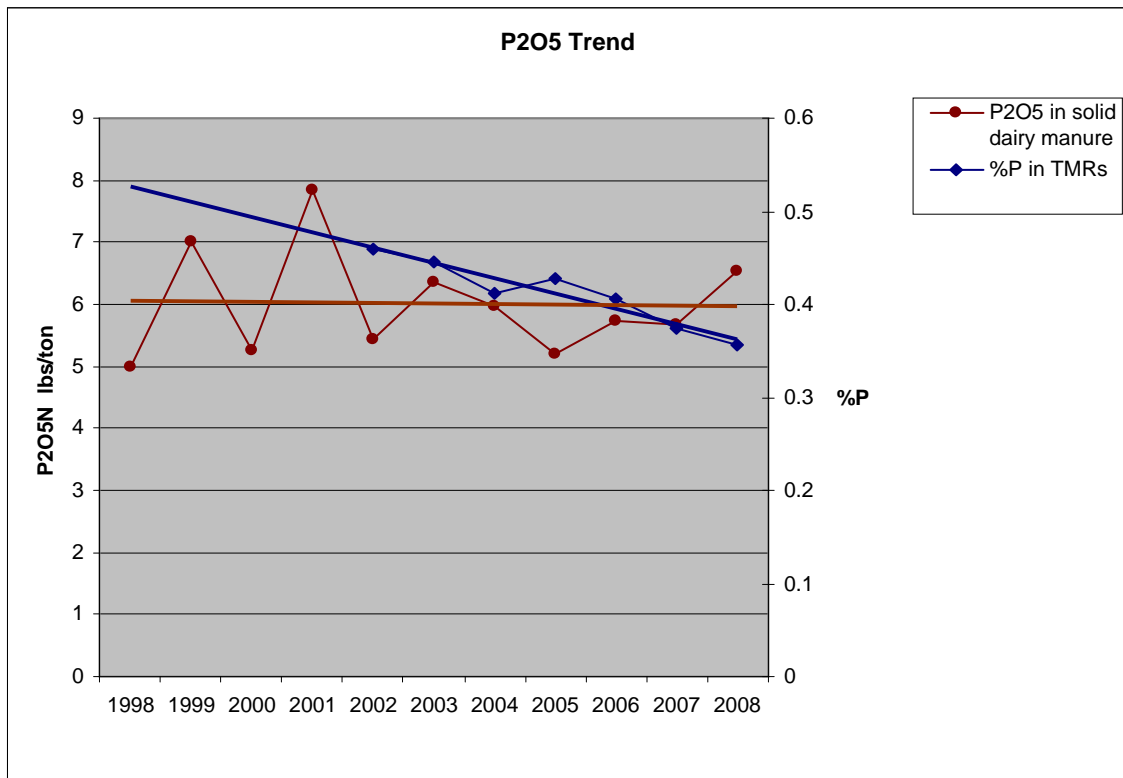


Fig. 2. Long-term trends in P levels in solid dairy manure vs. TMRs.

Recommendations

The number of manure samples tested by public and private labs has increased greatly from 1998 to their current levels in 2008. However, the majority of producers still do not sample manure. Using established norms (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, an appropriate manure nutrient content value can be obtained for a farm.

References

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- Peters, J.B. (ed.) Recommended methods of manure analysis. (Feb. 2003). UWEX Publ. no. A3769 (web based), Univ. of Wisconsin-Extension, Madison, WI.
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- MWPS Livestock waste facilities handbook. Handbook no.18 (2nd ed.). Midwest Plan Service. Ames, Iowa, 2007.

Table 1 - Wisconsin manure analysis summary (1998-2008).

	DM %		N			P2O5			K2O		
	1998-2008 †	A2809 ‡	1998-2008	A2809	MWPS §	1998-2008	A2809	MWPS	1998-2008	A2809	MWPS
Solid (lb/ton)											
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	21	14	14	19	10	8	14	9	5
Chicken-broiler	81	-	64	-	46	82	-	53	49	-	36
Chicken-layer	56	-	51	-	34	54	-	51	33	-	26
Turkey	61	60	50	40	40	46	40	50	31	30	30
Duck	37	35	13	17	17	16	21	21	9	30	30
Horse	42	45	10	10	-	6	6	-	8	10	-
Sheep	36	45	20	26	-	12	18	-	33	40	-
Poultry (general)	58	-	43	-	-	43	-	-	31	-	-
Liquid (lb/1000 gal)											
Dairy	7	6	22	24	31	8	9	15	19	20	19
Beef	6	5	21	20	20	10	9	16	17	20	24
Swine-finish (indoor pit)	7	7	46	50	50	26	42	42	23	30	30
Swine-finish (outdoor pit)	4	4	30	34	32	17	16	22	16	20	20
Swine (farrow-nursery)	3	3	24	25	25	13	23	19	13	22	22
Swine (all combined)	4	-	34	-	28	18	-	24	20	-	23
Poultry (all)	4	3	17	16	-	12	10	-	14	12	-
Veal	2	2	19	15	26	6	10	22	17	25	40
Duck	3	-	14	-	22	12	-	15	10	-	8

† 1998-2008 - long-term summary.

‡ A2809 - value currently used.

§ MWPS - book value from Midwest Plan Service Publ.18 (2007).

Table 3. Change in dairy manure nutrient content overtime, Wisconsin (1998-2008).

Year	<u># of samples</u>		<u>N</u>		<u>P2O5</u>		<u>K2O</u>	
	Solid	Liquid	Solid	Liquid	Solid	Liquid	Solid	Liquid
			<i>lb/ton</i>	<i>lb/1000 gal</i>	<i>lb/ton</i>	<i>lb/1000 gal</i>	<i>lb/ton</i>	<i>lb/1000 gal</i>
1998	270	111	9.6	24.0	5.0	10.2	4.7	19.9
1999	127	258	15.0	19.8	7.0	7.4	9.4	16.5
2000	241	318	11.6	25.1	5.3	11.1	10.3	23.7
2001	243	266	13.5	22.6	7.8	9.3	11.2	21.4
2002	198	337	11.1	23.2	5.4	9.1	11.3	20.3
2003	495	782	10.4	21.0	6.4	7.7	9.1	18.5
2004	581	1165	11.6	22.1	6.0	7.8	9.7	18.8
2005	593	1168	13.3	23.3	5.2	9.0	9.7	20.8
2006	652	1739	11.3	22.0	5.7	7.9	10.8	19.5
2007	696	2408	10.3	20.6	5.7	8.5	9.5	19.5
2008	605	1585	10.1	20.4	6.5	6.7	16.2	17.3

Table 4. Dairy manure nutrient content by region, Wisconsin (1998-2008).

Wis. Agricultural Statistics District	<u># of samples</u>		<u>N</u>		<u>P2O5</u>		<u>K2O</u>	
	Solid	Liquid	Solid	Liquid	Solid	Liquid	Solid	Liquid
	<i>lb/ton</i>	<i>lb/1000 gal</i>	<i>lb/ton</i>	<i>lb/1000 gal</i>	<i>lb/ton</i>	<i>lb/1000 gal</i>	<i>lb/ton</i>	<i>lb/1000 gal</i>
NW	32	36	11.8	28.3	5.8	12.3	11.3	26.4
NC	202	305	10.2	25.0	4.7	9.2	10.9	22.6
NE	264	923	10.4	25.0	4.4	8.2	10.1	21.7
WC	336	144	13.4	25.5	4.9	10.8	5.3	19.1
C	251	573	10.5	23.9	5.0	9.4	8.0	20.2
EC	1007	3109	11.8	22.4	6.2	7.6	15.0	18.2
SW	300	375	11.5	21.1	6.7	7.7	10.8	18.1
SC	360	1216	11.2	20.6	7.2	7.7	10.9	18.6
SE	120	126	11.3	24.4	6.4	8.6	11.9	19.5