

Value of Secondary & Micronutrients in Dairy Manure



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Method



- Randomly select 100 manure samples
- 65 liquid < 11% dry matter (DM)
- 35 solid >12% DM
- 3 years 2013-2015
- 195 liquid samples
- 105 solid samples
- This is a survey of samples delivered to UW lab

Average of Secondary & Micronutrients 2013-2015

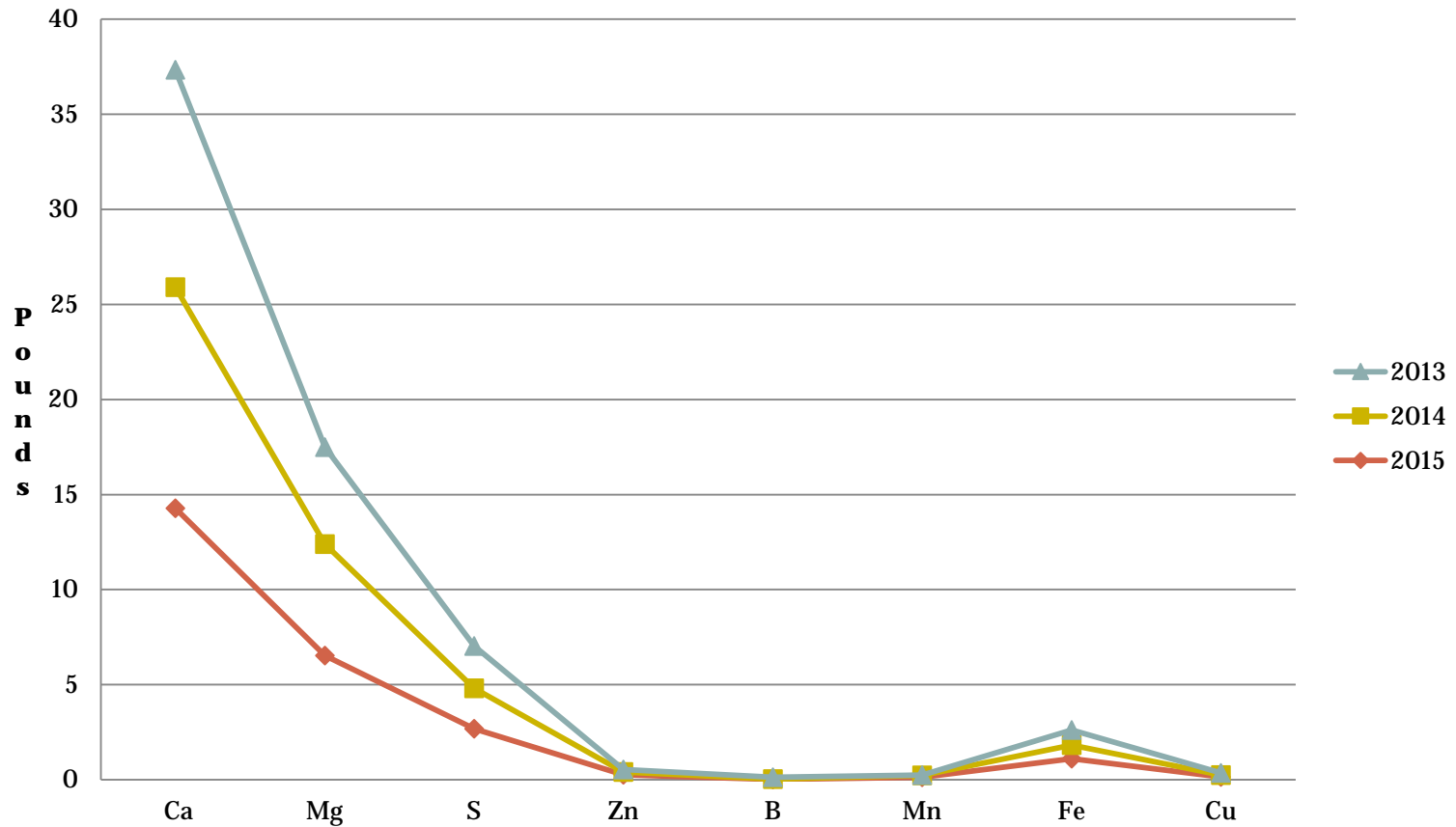


Nutrient	Lbs./1000 gallons	Lbs./ton
Calcium	12.44	11.59
Magnesium	5.83	5.46
Sulfur	2.35	1.27
Boron	0.05	0.03
Copper	0.12	0.03
Iron	0.87	1.56
Manganese	0.08	0.06
Zinc	0.18	0.06

Liquid averages 2013-2015



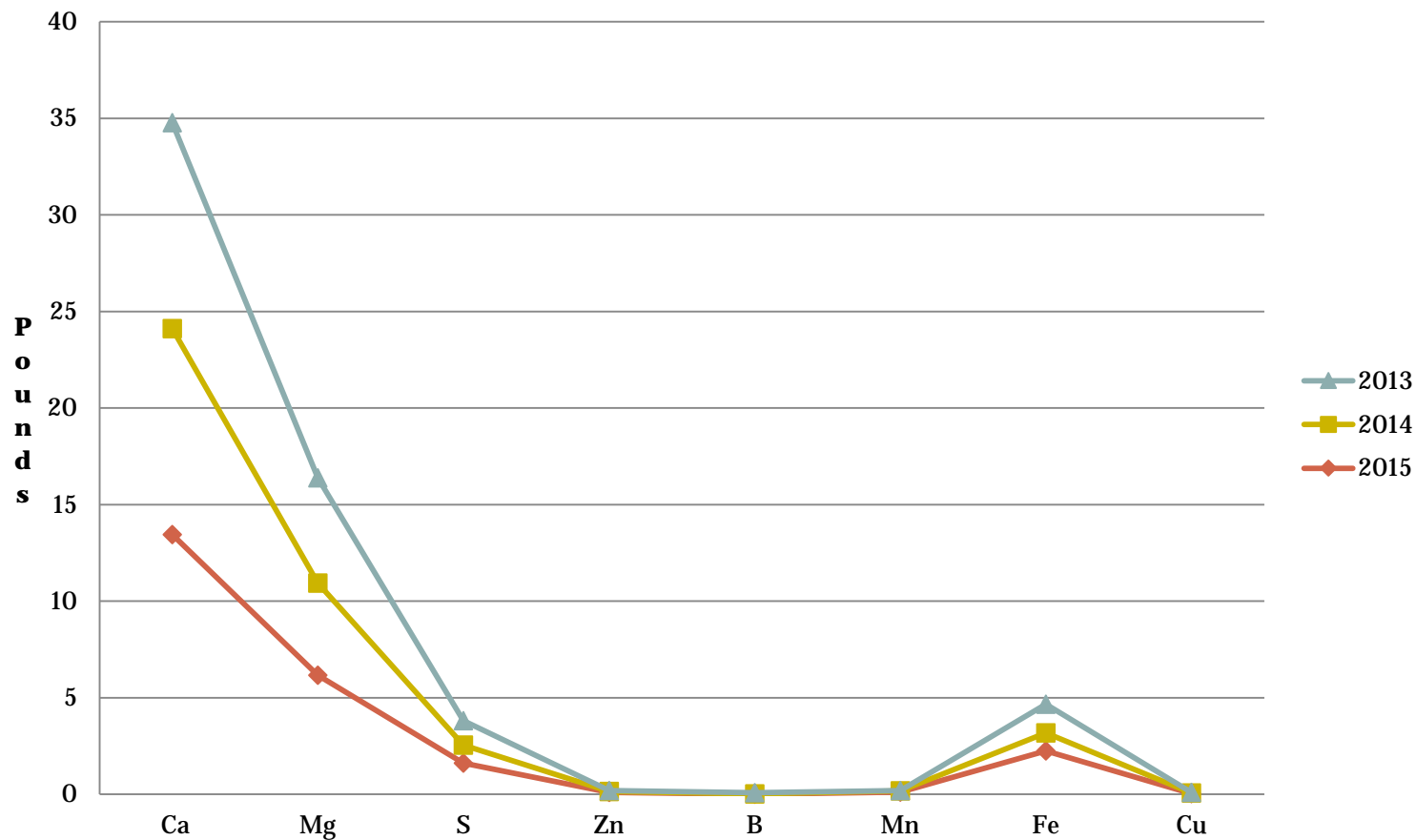
2013-15 liquid manure lbs./1000 gal.



Solid averages 2013-2015



2013-15 Solid manure lbs./ton



Confidence of the survey liquid

	P	K	Ca	Mg	S	Zn	B	Mn	Fe	Cu
Mean	3.71	15.80	12.44	5.83	2.35	0.18	0.05	0.08	0.87	0.12
STDEV	1.47	4.75	8.10	4.05	0.96	0.20	0.05	0.07	0.75	0.17
n=	195	195	195	195	195	195	195	195	195	195
90%=	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
confid.int	0.17	0.56	0.96	0.48	0.11	0.02	0.01	0.01	0.09	0.02
min.	0.37	1.96	1.17	0.90	0.20	0.01	0.00	0.00	0.02	0.00
1st quat.	2.80	13.29	7.52	3.70	1.77	0.09	0.01	0.02	0.38	0.04
median	3.59	15.65	10.20	4.65	2.20	0.12	0.02	0.06	0.66	0.07
2nd quat.	4.55	17.80	14.06	6.44	2.89	0.17	0.07	0.13	1.12	0.13
max.	9.10	35.05	57.79	28.90	7.78	1.32	0.28	0.32	5.83	2.02

Confidence of the survey solid

	P	K	Ca	Mg	S	Zn	B	Mn	Fe	Cu
Mean	1.79	6.55	11.59	5.46	1.27	0.06	0.03	0.06	1.56	0.03
STDEV	1.12	4.37	15.90	9.13	0.95	0.06	0.05	0.09	2.20	0.03
n=	105	105	105	105	105	105	105	105	105	105
90%=	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
confid.int	0.18	0.71	2.57	1.48	0.15	0.01	0.01	0.01	0.36	0.01
min.	0.15	0.15	1.40	0.49	0.28	0.01	0.00	0.00	0.12	0.00
1st quat.	1.09	3.56	4.26	1.71	0.65	0.03	0.01	0.01	0.40	0.01
median	1.51	5.56	6.62	2.82	0.97	0.05	0.01	0.04	0.69	0.02
2nd quat.	2.10	8.18	13.92	5.74	1.45	0.07	0.02	0.08	1.35	0.04
max.	6.66	31.09	104.18	58.83	5.20	0.41	0.27	0.68	11.38	0.20

What did we learn?



- **Manure has a great deal of variability**
- **Rainfall may contribute to the variability**
- **Management on the farm contributes to variability**
- **There is a range of DM in both liquid and solid manure**

What can we use from this survey?



- Even with variability we have numbers for secondary and micronutrients available in dairy manure
- These are total lbs. available not all may be available in the growing season
- About 55% of S is available in year one
- We can apply an economical number or value for secondary and micronutrients

How can we apply an economical number?



- **Base on fertilizer price for each nutrient**
- **Calculate value on a per 1,000 gallons or per ton**
- **Calculate the value per application**

Where do we start?



Calculating The Value of Dairy Manure



Price Per ton of

<u>Potash</u>	\$340.00
<u>DAP</u>	\$430.00
<u>Urea</u>	\$375.00

Blue cells are required green cells have
book values inserted if you have a manure sample or raise
a species other than dairy enter your own farms numbers.

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What is the fertilizer value of 1,000 gallons of liquid manure?



Liquid Manure

Potash \$/#	Potash #	Value \$
0.17	10.00	\$1.70
DAP \$/#	DAP #	
0.215	36.96	\$7.95
Urea \$/#	Urea #	
0.1875	0.76	\$0.14

Fertilizer Value/1000 gallons Manure

\$9.79

*Fertilizer Value per cow/year at 1400 lbs (1)

\$114.32

*1) Manure values from MDC

What is the fertilizer value of a ton of solid manure?



Solid Manure

Potash \$/#	Potash #	Value \$
0.17	5.00	\$0.85
DAP \$/#	DAP #	
0.215	13.04	\$2.80
Urea \$/#	Urea #	
0.1875	1.42	\$0.27

Fertilizer Value/ton Manure

\$3.92

*Fertilizer Value per cow/year at 1400 lbs

\$105.84

What is the value of the secondary & micronutrients?



- Again remember the data has great variability
- Remember from our data it would be total available nutrients
- Some may not be available the 1st year
- The conversation begins that there is added value in manure

Solid manure



Nutrient	Lbs./ton	Fertilizer replacement value/ton of solid manure
Calcium	11.6	\$0.95
Magnesium	5.5	\$0.75
Sulfur	1.3	\$0.80
Boron	0.03	\$0.25
Copper	0.03	\$0.10
Iron	1.56	\$1.00
Manganese	0.06	\$0.15
Zinc	0.06	\$0.15

~\$4.00/ton (~50% is available the 1st year)

Liquid manure



Nutrient	Lbs./1,000 gallons	Fertilizer replacement value/ 1,000 gallons
Calcium	12.4	\$1.00
Magnesium	5.8	\$0.75
Sulfur	2.4	\$1.00
Boron	0.05	\$0.40
Copper	0.12	\$0.35
Iron	0.87	\$0.60
Manganese	0.08	\$0.20
Zinc	0.18	\$0.35

~\$5.00/1,000 gallons (~50% available the 1st year)

Apply liquid manure to 100# N



Nutrient	Lbs./10,000 gallons	Requirement only when a low soil test*
Calcium	124	50-100 lbs./acre
Magnesium	58	10-20 lbs./acre
Sulfur	24	10-25 lbs./acre
Boron	0.50	1 lbs./acre
Copper	0.30	Low pH soil
Iron	9	>7.5 pH soil
Manganese	0.80	1 lbs./acre
Zinc	1.80	4-8 lbs./acre

*A2809 feed and grain crops, vegetables may have a greater requirement

Apply solid manure 100# N



Nutrient	Lbs./35 ton	Requirement only when a low soil test*
Calcium	406	50-100 lbs./acre
Magnesium	192	10-20 lbs./acre
Sulfur	46	10-25 lbs./acre
Boron	1.00	1 lbs./acre
Copper	1.00	Low pH soil
Iron	55	>7.5 pH soil
Manganese	2.00	1 lbs./acre
Zinc	2.00	4-8 lbs./acre

*A2809 feed and grain crops, produce may have a greater requirement

Secondary nutrients



- Generally not a problem for calcium and magnesium
- Some farms are now finding Mg deficiencies
- Sulfur may be required every year as atmosphere has been cleaned up

Micronutrient crop requirement?



- Boron ~1 lb. is required for alfalfa
- Zinc; corn may require if high pH soil, high P level
- Manganese ~ not sure, pH is factor
- Copper only in acid soil
- Produce crops (vegetables) have a greater requirement for micronutrients

What have we learned from the survey



- Test manure to know true values of manure (liquid is very important)
- Manure can replace more than then N-P-K
- Manure does provide a 2nd & 3rd year credit of nutrients
- We can reduce expenses if we credit all of our manure nutrients
- Remember soils are alive and even when you think nutrients are gone you may be mistaken

Why is any of this important?



- Provides a better understanding of value of manure and the ability to use manure to replace purchased fertilizer
- Sustainability of the farm; more dollars stay on the farm
- Environment, understanding will provide the farmer with confidence to use manure to replace fertilizer and account for all of our on farm fertilizer sources, potentially reducing an environmental concern with proper management, remember management is your responsibility

One last **Comment**



- As agronomist and farmers we must manage our farms in a manner using best management practices
- Farmers are about 1% of the population today
- 99% of the population will believe a press release (popular press) rather than what is true
- If we don't manage our farms by reducing soil erosion, wise use of nutrients, and animal welfare, regulators will manage our farms!!!!!!

THANK YOU



- Questions????
- Contact me richard.halopka@ces.uwex.edu or 715-743-5121