

# **What is Manure *Really* Worth?**

## **Determining and Maximizing the Value of Manure**

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**Bob Koehler  
Bill Lazarus**



# Presentation Goals


- Understand how to determine what the \$ value is for a given amount of manure...

and

- in so doing recognize ways to increase that amount.

# Reasons to Accurately Determine Manure Value

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- Manure Impact in Cash Flow Projections
- Manure Sale/Transfer Values 
- Maximize Crop/Livestock Profitability
- Economic & Environmental Compatibility



# Economics/Environment/Management

- Maximizing manure value has a positive environmental benefit (efficient use of nutrients).
- Approaching manure management in an economic context requires looking at all aspects of manure management.

# Manure/Commercial Fertilizer Difference

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- Nutrients in commercial fertilizer are priced per unit, plus a small application fee.
- Nutrients in manure are usually “purchased/utilized” with application costs.  
(Issues like nutrient availability, nutrient ratio, crop need, nutrient concentration, field location, etc., complicate value determination.)

Net Economic Impact of Manure =  
(usually on a per acre basis)

Value of Year 1 Fertilizer & Application  
Costs Replaced

+ Residual Value (Mostly Year 2 if any)

+/- Yield (or other) Response/Cost

– Manure Application Costs



# Comparing & Analyzing

**(Economic Impact Per Acre) x (Acres Applied (Total Gallons for Facility / Application Rate Per Acre)) = Total Economic Impact for Facility.**



**Total Economic Impact for Facility / Pigs Produced or Pig Spaces or 1000 gal. units**

# What is Manure Worth?

Bob Koehler - Southwest Research & Outreach Center, University of Minnesota

Bill Lazarus - Department of Applied Economics, University of Minnesota

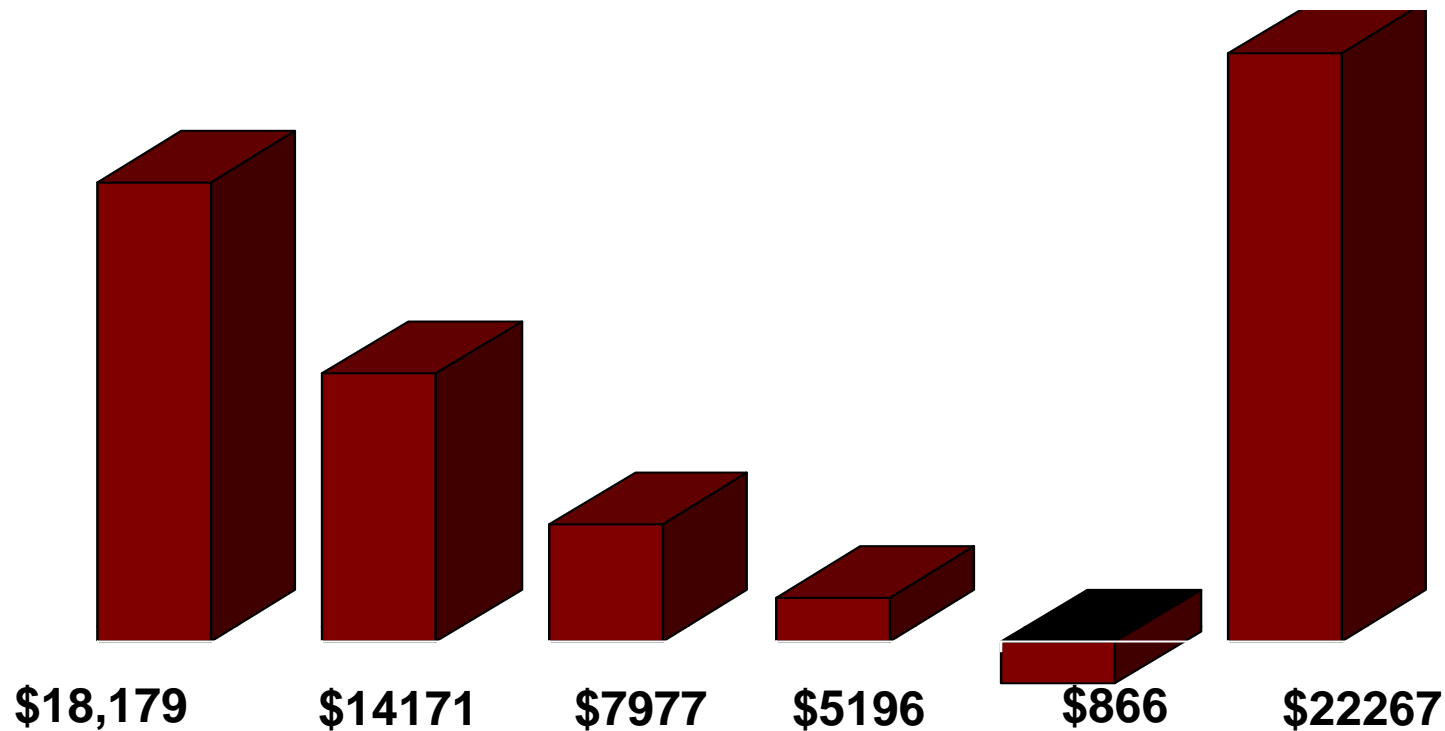
Step 1. Determine the Value of Nutrients Needed for First Year Crop Production	Total	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
1. Nutrients that would be applied to this field with commercial fertilizer if no manure was used - N, P <sub>2</sub> O <sub>5</sub> , K <sub>2</sub> O # Per Acre		140	45	40
2. Commercial fertilizer value (applied) Per Unit of N, P <sub>2</sub> O <sub>5</sub> , K <sub>2</sub> O , \$/lb.		\$0.58	\$0.90	\$0.73
3. Value of individual fertilizer nutrients that would be applied to this acre (line 1 x 2)		\$81.20	\$40.50	\$29.20
4. Value of micronutrients that would be purchased - \$/acre	\$0.00			
5. Total application costs of commercial fertilizer per acre (do not credit if commercial fertilizer is used with manure-(see comment box)	\$15.00			
6. Total value of fertilizer nutrients that would be applied to this acre (sum of line 3 values plus any micronutrient value from line 4 and also the application cost shown in line 5)	\$165.90			

<b>Step 2. Calculate the Value of Required Nutrients That Are Applied With Manure (for First Year Crop Production)</b>	<b>Total</b>	<b>N</b>	<b>P<sub>2</sub>O<sub>5</sub></b>	<b>K<sub>2</sub>O</b>
7. Specie of livestock (select from drop-down menu)	Swine			
8. Select type of manure (liquid or solid) from drop-down menu	Liquid			
<b>9. Nutrients per 1000 gallons</b>		<b>53</b>	<b>25</b>	<b>35</b>
<b>10. Manure application method (select from drop-down menu)</b>	Injection-sweep			
11. Estimated nutrient availability (%) of manure to be used in scenario		80%	80%	90%
12. Do you want to use the default numbers for nutrient availability?	Yes			
<b>13. If No, enter your own numbers</b>		<b>80%</b>	<b>80%</b>	<b>90%</b>
<b>14. Do you wish to have an N or P<sub>2</sub>O<sub>5</sub> based application rate? (select with drop down menu)</b>	N			
15. Application rate needed to meet the rate (N or P <sub>2</sub> O <sub>5</sub> ) chosen in line 14 in gallons/acre	3,302			
<b>16. Gallons of manure actually applied (or planned) per acre</b>	<b>3,500</b>			
17. Pounds of available nutrients applied with manure per acre (line 8 x nutrient availability x (line 16 ÷ 1000))		148	70	110
18. Value of "needed" nutrients applied with manure, N, P <sub>2</sub> O <sub>5</sub> , & K <sub>2</sub> O		\$81.20	\$40.50	\$29.20
19. Estimated value of micronutrients in this manure that will replace purchased micronutrients.	\$0.00			
20. Total value of "needed" nutrients applied with manure for first year crop production (sum of N, P <sub>2</sub> O <sub>5</sub> , & K <sub>2</sub> O in line 18 + value of micronutrients in line 19 + cost of applying commercial fertilizer shown in line 5)	\$165.90			

<b>Step 3. Calculate the Value of Applied Nutrients That Will Replace Second Year Purchases Or Are Desired to Improve Soil Fertility Levels</b>	<b>Total</b>	<b>N</b>	<b>P<sub>2</sub>O<sub>5</sub></b>	<b>K<sub>2</sub>O</b>
21. % of applied nitrogen available for year 2		15%		
22. Potential nutrients available in year 2		28	25	70
<b>23. Nutrients that will be used and credited in year 2 (or later for P<sub>2</sub>O<sub>5</sub>, &amp; K<sub>2</sub>O)</b>		<b>0</b>	<b>0</b>	<b>0</b>
24. Individual value of residual nutrients, per acre		\$	\$	\$
25. Total value of residual nutrients per acre	\$0.00			
<b>Step 4. Adjust For Yield or Other Factors</b>				
<b>26. Per acre adjustment for yield impact (\$ Plus or Minus)</b>	<b>\$30.00</b>			
<b>27. Per acre adjustment for tillage impacts (\$ Plus or Minus)</b>	<b>\$0.00</b>			
<b>Step 5: Subtract Application Costs</b>				
<b>28. Cost of applying these manure nutrients (\$/gal)</b>	<b>\$0.0125</b>			
29. Total cost of manure application per acre (line 16 x line 28)	\$43.75			
<b>This Section Calculates Total Net Value of Manure Application Per Acre and Per 1000 gallons</b>				
30. Net per acre value of manure application in excess of application cost (line 20 + line 25 + line 26 + line 27 - line 29)	\$152.15			
31. Net value of manure per 1000 gallons (line 30 ÷ 16)	\$43.47			

Calculated Facility or Farm Totals - Manure Perspective	Total	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
<b>32. Gallons of manure available to be applied</b>	<b>300,000</b>			
33. Acres receiving manure (line 32 ÷ 16)	85.7			
34. Net value of manure application in excess of application cost (line 30 ÷ 33)	\$13,041			
<b>Calculated Facility or Farm Totals – Acres to be Covered Perspective</b>				
35. Acres needing manure	100			
36. Gallons of manure per acre (from Line 16)	3500			
37. Gallons of manure that will be needed to cover all acres shown in line 35.	350,000			
<b>Break-Even Application Costs</b>				
38. Gross value created per acre (line 20+line25+line26+line27)	\$195.90			
39. Gallons applied per acre (from Line 16)	3500			
40. Value per gallon	\$0.056			

# Net Return Per 300,000 Gallons Manure



<b>Crop Need</b>	180-75-80	180-75-80	180-75-80	140-0-0	140-0-0	140-40-40
<b>Manure Test</b>	53-39-29	53-39-29	25-25-24	53-39-29	25-25-24	53-39-29
<b>App. Rate, gal./acre</b>	4245	5500	9000	3300	7000	1300
<b>App Cost/ Gal., \$</b>	0.0125	0.011	0.009	0.013	0.01	0.025
<b>Residual Value, \$/a</b>	45.00	45.00	45.00	0	0	0
<b>Yield Impact, \$/a</b>	30.00	30.00	30.00	0	0	30.00
<b># Avail. N Applied/a</b>	180	233	180	140	140	55
<b># Avail. P<sub>2</sub>O<sub>5</sub> Applied/a</b>	132	172	180	103	140	41
<b>Acres Covered</b>	71	55	33	91	43	233

# How to Maximize Manure Value:

## Value of Year 1 Fertilizer & Application Costs Replaced (Replacement of nutrients that would have been purchased)

- Apply for nitrogen requiring crop.
- Apply to crops & fields that need  $P_2O_5$  &  $K_2O$  (Low soil test level fields).
- Consider lower rates ( $P_2O_5$  &  $K_2O$  level) with supplemental commercial N (often increases efficiency of nutrient use).
- Incorporate manure at application time (reduces N volatilization losses).
- Manure nutrient concentration (high density manure requires less gallons or tons to haul to meet crop need (therefore less application cost)). Avoid dilution if possible.
- Develop a multi year set of manure tests for each barn to better estimate nutrient levels in manure.

# How to Maximize Manure Value:

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## + Residual Value

Apply to low soil testing fields ( $P_2O_5$  &  $K_2O$ ) that need fertility increase and 2nd year nutrient application (that you would have purchased).

## +/- Yield (or other) Response

Apply to fields that do not have a recent manure history (low organic matter, etc.).

# How to Maximize Manure Value:

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## – Manure Application Costs

- Many factors are fixed.
- Use application equipment that has a range of application levels and that can be calibrated so that application accuracy is achieved.
- Avoid over-application (over-application wastes nutrients and increases application costs).

# **Manure Value is Reduced by:**

- **Over Application (wasting N)**
- **No  $P_2O_5$  and/or  $K_2O$  Need (wasting P & K)**
- **Low Nutrient Manure (high app cost)**
- **Under Applied N (yield loss?)**
- **Surface Application (volatilization)**
- **Crop Selection (wasted N)**



## Economic Modeling of Manure Application with Manurcst

- Fertilizer replacement value
- Machinery economic costs of ownership and operation
- Time required
  - *application time*
  - *travel and loading time (tank systems)*

## Economics of Supplying Nutrient Needs of 2,500 Acres of Corn (140-45-40) With Six Million Gallons of Manure (50-25-30)

	<u>N based</u>	<u>High Rate</u>
Commercial Fertilizer Costs with No Manure Used/Available	\$155,125	\$155,125
Manure Gallons Applied Per Acre	3,500	5,500
Acres Required for Manure Application	1,714	1,091
Acres Receiving Only Commercial Fertilizer	786	1,409
Manure Pumping and Application Costs per Year	\$68,271	\$60,539
Manure Pumping and Application Costs Per 1,000 Gallons	\$11.38	\$10.09
Cost to Apply Fertilizer Needed in Addition to Manure	\$48,754	\$87,434
Total Cost to Meet Fertility Needs with Manure and Fertilizer	\$117,025	\$147,973
Difference in Total Cost Compared to High Rate	xxx	\$30,948
Difference in Total Cost Compared to Using All Fertilizer	(38,100)	(7,152)
Days required	29.0	23.7
Machinery Investment Required, Manure Operation Share	\$240,435	\$226,737
N Application in Excess (Deficit) of 1st Year Crop Needs/Acre	-	80
P application in Excess of 1st Year Crop Needs/Acre	25	65

# Impact of Fertilizer Prices

	Fall 2007	Spring 2008	Fall 2008
N, per lb.	\$0.33	\$0.44	\$0.58
P <sub>2</sub> O <sub>5</sub> , per lb.	\$0.34	\$0.62	\$0.90
K <sub>2</sub> O, per lb.	\$0.26	\$0.44	\$0.73
Per acre N application	\$5.00	\$5.00	\$9.00
Per acre dry application	\$3.21	\$5.41	\$6.25

	Deep Pit	Deep Pit	Deep Pit
	Fall 2007 Fertilizer Price	Spring 2008 Fertilizer Quote	Fall 2008 Fertilizer Price
<b>Crop Need</b>	140-45-40	140-45-40	140-45-40
<b>Fertilizer Cost/Acre, \$</b>	\$80.11	\$117.51	\$166.15
<b>Yield Boost Value, \$ Acre</b>	\$30.00	\$30.00	\$30.00
<b>Total Manure Value/Acre</b>	\$110.11	\$147.51	\$186.15
<b>N Based Rate/Acre</b>	3,302	3,302	3,302
<b>Rate Applied/Acre</b>	3,500	3,500	3,500
<b>Application Cost, per gallon</b>	\$0.0125	\$0.0125	\$0.0125
<b>Application Cost, Acre</b>	\$43.75	\$43.75	\$43.75
<b>Net Value above Application Cost, Acre</b>	\$66.36	\$103.76	\$152.40
<b>Net Value per 1000 gallons</b>	\$18.96	\$29.65	\$43.54

# Manure Dry Matter

- Dry matter level is highly predictive of manure nutrient concentration and therefore potential manure value.
- Fairly predictable by farm and facility.
- Why does it vary so much???

# Spreadsheet Resources

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- **Manurwkst**
  - <http://swroc.coafes.umn.edu/Bob/docs/manurwkst.htm>
- **Manurcst**
  - Bill Lazarus
- **Manure Distribution Cost Analyzer**
  - <http://agebb.missouri.edu/mgt/analyzer.htm>