Economics of Manure Management

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Economist
Economic Decisions Consider

NET VALUE

Gross Value

- Cost

Net Value

Value can be revenue or a cost offset
Critical Costs

• Financial Costs
  – Application Costs
  – Storage Costs

• Time Requirements

• Land Requirements
Managing Manure Cost

• Objective: minimize the cost of storage and land application.
• Decision: store in an inexpensive structure that dissipates nutrients – lagoon.
• Result: lose valuable plant nutrients while increasing volume.
• Ask your boss for a pay cut so you won’t have to pay as much tax!
Managing Manure Costs

- Objective: Minimize transportation cost.
- Decision: apply manure to the closest land.
- Result: P and K overloading so that the value of P and K is lost.
- Drive 1 mile to the track to jog 1 mile.
Financial Objective: Increase Net Value

Gross Value
- Cost

Net Value
Critical Value Factors

- Valuation Choice
- Marketing Strategy
- Soil Fertility
- Cropping System
## Valuation Choice: Dollars/Acre

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Manure Supplied</th>
<th>Commercial Fertilizer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$/1000 gallons</td>
<td>$/acre @ 4K gallons/acre</td>
</tr>
<tr>
<td>Available N</td>
<td>$20.00</td>
<td>$80.00</td>
</tr>
<tr>
<td>$\text{P}_2\text{O}_5$</td>
<td>$18.88</td>
<td>$75.52</td>
</tr>
<tr>
<td>$\text{K}_2\text{O}$</td>
<td>$11.60</td>
<td>$46.40</td>
</tr>
<tr>
<td><strong>Total Value</strong></td>
<td><strong>$50.48</strong></td>
<td><strong>$238.80</strong></td>
</tr>
</tbody>
</table>

1. N = 160 lbs. @ $.50; P2O5 = 50 lbs. @ $.59; K2O = 40 lbs. @ $.40
**Marketing Strategy: Multi-year Fertility**

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1. N = 160 lbs. @ $.50; P2O5 = 50 lbs. @ $.59; K2O = 40 lbs. @ $.40
## Transportation Cost

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation Cost ($/hr)</td>
<td>$180</td>
</tr>
<tr>
<td>Road travel speed (mph)</td>
<td>10</td>
</tr>
<tr>
<td>Tank Capacity (gallons)</td>
<td>6000</td>
</tr>
<tr>
<td>Cost/1000 gallons/mile</td>
<td>$3.00</td>
</tr>
<tr>
<td>Application rate (gal/ac)</td>
<td>4000</td>
</tr>
<tr>
<td>Cost/acre/mile</td>
<td>$12.00</td>
</tr>
</tbody>
</table>
Valuation Choice: Dollars/Acre

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Manure Supplied</th>
<th>Commercial Fertilizer</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$/1000 gallons</td>
<td>$/acre @ 4K gallons/acre</td>
<td></td>
</tr>
<tr>
<td>Available N</td>
<td>$20.00</td>
<td>$80.00</td>
<td>$80.00</td>
</tr>
<tr>
<td>P$_2$O$_5$</td>
<td>$18.88</td>
<td>$75.52</td>
<td>$32.45</td>
</tr>
<tr>
<td>K$_2$O</td>
<td>$11.60</td>
<td>$46.40</td>
<td>$18.00</td>
</tr>
<tr>
<td>Total Value</td>
<td>$50.48</td>
<td>$238.80</td>
<td>$130.45</td>
</tr>
</tbody>
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1. N = 160 lbs. @ $.50; P2O5 = 50 lbs. @ $.59; K2O = 40 lbs. @ $.40

Capture Full Value:
$71.47 ÷ $12/acre-mile = 6 miles
Valuation Choice: Dollars/Acre

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<thead>
<tr>
<th>Nutrient</th>
<th>Manure Supplied Nutrients</th>
<th>Commercial Fertilizer $/acre&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>$/acre @ 4K gallons/acre</td>
<td></td>
</tr>
<tr>
<td>Available N</td>
<td>$20.00</td>
<td>$80.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>P&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;5&lt;/sub&gt;</td>
<td>$18.88</td>
<td><strong>$75.52</strong></td>
<td>$43.07</td>
</tr>
<tr>
<td>K&lt;sub&gt;2&lt;/sub&gt;O</td>
<td>$11.60</td>
<td>$46.40</td>
<td>$28.40</td>
</tr>
<tr>
<td>Total Value</td>
<td><strong>$50.48</strong></td>
<td><strong>$238.80</strong></td>
<td><strong>$71.47</strong></td>
</tr>
</tbody>
</table>

1. N = 160 lbs. @ $.50; P<sub>2</sub>O<sub>5</sub> = 50 lbs. @ $.59; K<sub>2</sub>O = 40 lbs. @ $.40

Capture P Value (if current land needs no P): $75.52 ÷ $12/acre-mile = additional 6.3 miles
Increase Net Value by Selecting Soils that Need P

Gross Value

- Cost

Net Value
Cropping System

• Apply to crops needing N.
• Apply all needed N to eliminate commercial N fertilizer application cost.
• Apply multiple years of P and K. Don’t reapply until P and K needed again.
• Apply to cropping systems that remove lots of nutrients and have high value.
Increase Net Value by Selecting Soils that Need P

Gross Value

- Cost

Net Value
Storage Costs - Lagoon

- Least cost of construction
- Least cost of application – irrigation
- Fewest nutrients to apply
- Stores P for later application
- Ideal for predominately pork producer; not necessarily ideal for integrated crop/pork producer.
Increase Net Value by Selecting Soils that Need P

Gross Value

- Cost

Net Value
Storage Costs - Slurry

- Greatest crop nutrient value
- Higher application costs – tanker or dragline
- Ideal for integrated crop/swine producer
Increase Net Value by Selecting Soils that Need P

Gross Value

- Cost

Net Value
Cost Reduction Strategies

• Reduce bulk from water
  – Wet-dry feeders
  – Water management
  – Cover storage

• Reduce travel by piping or larger tankers.
Opportunity Cost - Time

- Machinery
  - Custom hire or Owned
  - Single or multiple pieces

- Integrated crop/livestock producer can spread costs of equipment over more enterprises.

- Livestock producer is constrained by the willingness of crop producer to accept manure.
Opportunity Cost - Time

• Machinery: Pipe or tanker
• Machinery: Speeds and application rates
• Cropping system adoptions
  – Delay spring planting?
  – Wheat?
• Application limits and resulting rates.
## Application Limits – Time Costs

<table>
<thead>
<tr>
<th>Application Limit</th>
<th>Cost</th>
<th>Application Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dollars per 1000 gallons</td>
<td>Minutes per AU</td>
</tr>
<tr>
<td>Annual N Removal</td>
<td>$13.04</td>
<td>10.6</td>
</tr>
<tr>
<td>Annual P Removal</td>
<td>$18.54</td>
<td>15.0</td>
</tr>
<tr>
<td>4-year P Removal</td>
<td>$15.02</td>
<td>13.1</td>
</tr>
</tbody>
</table>
Land Cost - Slurry

- Corn-Soybean rotation – N supplied in corn year; P for both corn and soybean
  - 4800 head wean-finish operation needs 800 to 1200 acres
  - 4800 head grow-finish operation needs 1000 to 1600 acres
Land Tenure and Net Income

• Fertilizer value is optimized when put on land the producer controls (owns or rents).

• Implication: animal production will become reintegrated with crop production
Summary:
Focus on Net Value

Gross Value
- Cost
Net Value
New Resources

- Extension website: www.extension.org/pages/Manure_Value_and_Economics_Articles
  - Business Arrangements for Manure Offsite Transfer
  - Cost of Manure Application and Transport
  - Manure as a Source of Crop Nutrients and Soil Amendment
  - Value of Manure as an Energy Source
Manure Spreadsheets

• Manure Worth Spreadsheet
  - www.apec.umn.edu/faculty/wlazarus/interests_manureworth.html

• Feed Nutrient Management Planning Economics
  - www.puyallup.wsu.edu/dairy/nutrient-management/software.asp
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