Transforming Manure Management from “Waste” to “Worth”

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Transforming Manure Management from “Waste” to “Worth”

- Which fields benefit most from manure?
- Manure’s “value” messages for sharing with neighbors & others.
- One strategy for avoiding neighbor nuisances.
Manure’s Value to Crop Farmer…

- Fertility value…
- Soil health value…
- Potential to increase yield
Which nutrient adds most to Manure’s Fertility Value?

- **Organic Nitrogen**
  - Slow release N available as soils warm.

- **Ammonium – N**
  - Soil incorporation is essential to conserve.
  - Readily available to plant.

- **Phosphorus**
  - Not mobile if erosion is controlled.

- **Potassium & micro-nutrients**
Which fields should I target?

1. Fields requiring P
2. Fields requiring K

1. 2017s fertilizer prices,
2. 2017 fertilizer prices + value for potash + 5% yield increase
Fertility Value of Swine Slurry

Lower Estimate\(^1\):
- $19 per 1,000 gal.

Higher Estimate\(^2\):
- $39 per 1,000 gal.

Nutrient Composition:
- NH\(_4\)-N: 38%
- Organic-N: 10%
- P: 44%
- S: 26%
- Zn: 17%
- K: 29%

Preferred Fields for Slurry Manure:
1. Target fields requiring P
2. Apply ahead of crops requiring N
3. Incorporate manure to gain N Value
Achieving a $ Win from Manure’s Nutrient Value

Phosphorus

- Target fields with < 20 PPM P Bray
- Many manures deliver P needs for multiple years … Delay returning to the same field.
- Target crops with higher soil P recommendation … wheat.
Achieving a $ Win from Manure’s Fertility Value

Potassium
- Fields requiring potassium can add bonus value

Nitrogen
- Conserve the ammonium (slurry manure)
- Apply ahead of non-legume crops
Manure improves soil physical properties and biological properties.

Soil photo courtesy of USDA NRCS Soil Health flickr collection.
“When manure ... is added to the soil it is quickly colonized by millions of bacteria...bacteria producing large quantities of polysaccharides. These polysaccharides function like sticky glue in the soil and can actually stick particles together into aggregates.”
Organic matter value of manure

Manure → Soil Microbial Activity → Polysaccharides to create soil aggregates

↑ Infiltration  ↓ Runoff  ↓ Erosion
Conclusions from Wortmann/Shapiro & Wortmann/Walters research in Nebraska

- All manures increased macro-aggregates.
  - Aggregates form quickly (<2 weeks after manure)
  - Aggregates persist through crop season

- Composted beef manure:
  - Reduced erosion & runoff by >60% during crop season after application
  - Residual erosion and runoff benefit over next 3 cropping seasons (no manure)
  - Increased moisture infiltration into soil
  - Increased soil P levels and runoff
Achieving a Win from Manure’s Organic Value

Target Fields with:

- Lower organic matter.
- Crusting or higher runoff.
- Low biological activity - fewer earthworms
- Fields commonly experiencing ponding and drown out
Commercial Hauler Transportation & Application Costs:
Solid Manures

15 mile haul: $5/t
20 t/ ac rate: $4/t
Total cost: $9/t

Feedlot manure value: $14 to 28/t

1. Assumes $0.50/ton loading fee at the feedlot.

1. Assumes $0.50/ton push up and loading fee at field.
Messages For Your Neighbors

- Manure reduces erosion and runoff
- Manure reduces N losses to environment (if applied according to crop N needs)
- Manure improves soil health
Manure’s Value: Summary of 141 Studies Reviewing Substitution of Manure for Fertilizer:


Crop Yields:
- +5%
- +22%
- +36%

Soil N Pool:
- +33%
- +42%
- +36%

Soil C Pool:
- -27%
- 0%
- -26%

Nitrogen Losses:
- -29%
What is the fundamental principle to protecting water quality?

Utilize local manure nutrients in crop production systems prior to importing outside nutrients!
When is manure a waste?

When manure nutrients cannot be recycled!
UPPER MIDWEST HAS CAPACITY TO RECYCLE MANURE NUTRIENTS

Manure P Availability Relative to Crop P Needs

- < Crop needs
- Approaching Crop Needs
- > Crop Needs

Take Home Message?
Protecting water quality starts with recycling local nutrients before importing commercial fertilizer.
Odors and Slurry Manures:

Soil Injection is best solution
Surface applied manures: Avoid High Risk Weather Conditions

**Suggested strategy:**

- Check weather forecast for next 48 hours...
  - Will there be good drying conditions during daylight hours?
  - Will there be wind speeds above 10 mph during night hours?

- If “YES”, proceed.
- If “NO”, will wind direction during night hours place neighbors downwind of land application site?

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**High Risk for Neighbors**
Stable/Declining Temps + Low Wind Speeds
Take Home Messages: Transforming Manure from “Waste to “Worth”

Select fields benefitting from manure’s fertility and carbon value.

Help neighbors recognize manure’s value

Minimize Neighbor Concerns
Suggested References

Nebraska Extension Manure Web Site:  [http://Manure.UNL.edu](http://Manure.UNL.edu):
• What is the economic value of manure?
• Manure impact on erosion and runoff
• Manure impact on soil aggregation
• Timing manure application to avoid odor nuisance

Calculating the Value of Manure for Crop Production
• Nebguide …
  [http://extensionpublications.unl.edu/assets/pdf/g1519.pdf](http://extensionpublications.unl.edu/assets/pdf/g1519.pdf)
• Spreadsheet:
  [https://unl.box.com/shared/static/nb4wod1oc3m1hy2e6cjvg0id913jcftk.xlsx](https://unl.box.com/shared/static/nb4wod1oc3m1hy2e6cjvg0id913jcftk.xlsx)

Determining Crop Available Nutrients from Manure

Manure effects on soil organisms and soil quality – Michigan State Extension publication …