

The Value of Manure

"Use those nutrients, Don't lose 'em"

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[Thanks to organizers of Manure Management 2000 conference for opportunity to participate.](#)

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New URL for ManureNet - 2009

<http://gis.lrs.uoguelph.ca/AgriEnvArchives/bioenergy/manurenet.html>

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The Value of Manure

“Use those nutrients, Don’t lose ‘em”

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Role of Manure

A resource:

N, P, K, S, micronutrients: **Fertilizer**

Organic Matter: **Soil Builder**

A challenge: 1) variable *test, test!*

2) dilute

3) restrictive

N:P may be too low: want ~ 10:1

N:S may be too high: want ~ 7:1

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Manures Are Different

Liquid Swine Effluent

~ 98% H₂O: low in O.M. per unit of wet weight.

15 - 50 lbs Total **Nitrogen** / 1000 gallons.

30% to 90% of the total N is ammonium.

Availability of effluent N in year of application

Ammonium N + Organic N

(100% available)

(20% - 30% available)

~ 50% to 70% availability of N in swine effluent
compared to commercial urea fertilizer.

Good Short-Term N source

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Phosphorus in Liquid Effluent:

- closely related to solids content: solids ↑, P ↑
- 1 to 20 lbs total P / 1000 gallons.
10% to 50% of P is readily soluble

Availability of effluent P in year of application

~ 50% compared to commercial P fertilizer.

P in manure *initially* quite strongly **fixed** in many Western Canadian soils.

- **Repeated** application can result in **saturation** of fixation sites.

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Potassium, Sulfur, Micronutrients in Effluent:

- **8 to 20 lbs K / 1000 gallons**
 - K is readily available to crops
- **0.1 to 3 lbs S / 1000 gallons**
 - S content of effluents is low: high S demanding crops may benefit from additional fertilizer S.
- **0.05 to 0.5 lbs Cu, Mn, Zn / 1000 gallons**
 - Micros strongly fixed in our soils.
Watch for imbalances.
- **Sodium content 3- 8 lbs Na / 1000 gallons**
 - Effects of repeated applications on soil sodicity should be monitored.

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Solid Manures

- ~ 50 % water (varies!).
- Compared to effluents, much more **organic matter**: improves soil tilth, slowly increases nutrient supply power.

Long-term soil builders  soil organic matter

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Nitrogen in Solid Manures:

- 0.5% to 3% total N on dry weight basis.
 - analysis expressed on wet weight basis will be lower but most relevant to producers.
- Poultry manure typically higher in total and available N than cattle manure.
- Most of the N is organic. Availability in year of application depends greatly on

Carbon : Nitrogen Ratio

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Organic C : Organic N ratio greater than 20:1, can expect low availability in year of application.

For example: cattle manure with lots of straw bedding.

Can take months, years for C:N to narrow and see release of all the N from the organic matter.

Therefore, many solid manures are long-term N sources: slowly release over a number of years.

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Phosphorus in Solid Manures:

- Cattle manure is ~ 0.5 to 1.5 % total P
- Cattle manure has relatively low proportion of total P as readily soluble inorganic P.
 - ie: ~ 10% of total P as readily soluble phosphate in fresh feedlot penning material.
 - Crop recovery in year of application about 25% of recovery from fertilizer P.
- Poultry manure, esp. chicken, highest in P.

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Potassium, Sulfur, Micros in Solid Manure:

- K in solid manures is readily available.
 - excess K could interfere with Mg uptake, lower Mg content in forages.
- Solid manures better suppliers of plant available S than liquid effluents.
- Micronutrients Cu, Mn, Zn ~ 0.01% by weight.
 - complex organic matter-metal interactions can influence availability and mobility of micronutrients.

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So Whats It Worth?

- Too simplistic to multiply nutrient content of manure by price per lb at local fertilizer dealer.
- Value is the yield and quality increase \times crop price after transportation and application costs are paid.

This year & subsequent years (residual).

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Economic Evaluation (Nagy, Schoenau & Schoney 1999, U of S)

Handling and Application Costs

Liquid Swine Effluent

3300 gpa : \$33.00/acre

-based on hauling and injecting (\$0.009/gallon)
within 2.4 km plus cost of two tractors and labor
to run pump.

Liquid Cattle Manure

10 tons / acre : \$20.00/acre

-based on \$1.75/tonne for short hauling distance.

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Net Revenue over Three Years:

Based on Crop Response at Dixon Field
Trials, Black soil zone, East Central Sask.
1997 Canola, 1998 Wheat, 1999 Barley

Manure

Crop Revenue minus Application Costs

Urea

Crop Revenue minus Application Costs and
Fertilizer Costs

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Net Revenue over 3 yrs

Control	\$212.00/acre
3300 gpa/yr swine	\$343.00/acre
50lbs N/acre/yr as urea	\$362.00/acre

Economic Hauling Distance

3300gpa/yr swine	8.3 km
10 tons/acre/yr cattle manure	3.3 km

Note: Over-application decreases net revenue and jeopardizes environmental quality.

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A sound manure nutrient management strategy should provide benefit for all involved.

Approaches which maximize crop recovery of manure nutrient (rates, placement, timing) will minimize environmental concerns and maximize economic benefit.

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