Liquid Manure Application

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Objectives

- Manure Application
  - What are we trying to achieve
- Manure Agitation
- Consideration in Tank Systems
- Consideration in Draglines Systems
- When the manure hits the soil
  - Injection/Incorporation

What's the goal of your manure program?

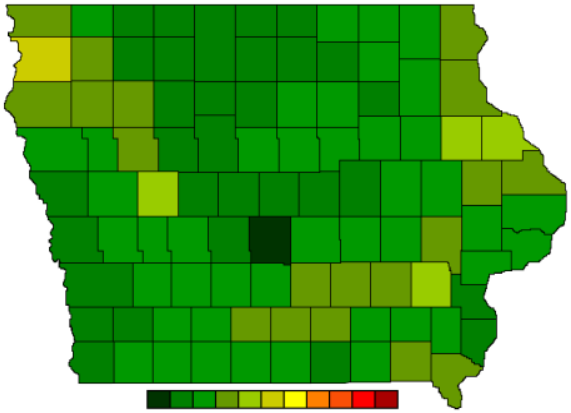
- Maximize fertilizer benefits

- Minimize cost
- Minimize environmental harm/risk

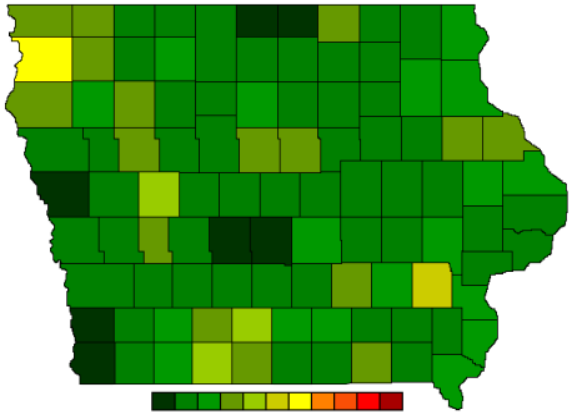
- Recover storage capacity
- Get done quickly

Too much manure?

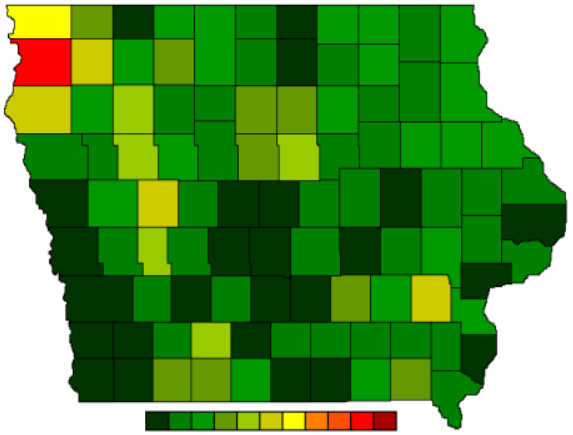
- In Iowa about 25% of our fertilizer needs can be met by manure
- But it isn't spatially uniform across state



Nitrogen Ratio - 1987



Nitrogen Ratio - 1997



Nitrogen Ratio - 2007

Value of Manure Test
How did you use that knowledge

Results

Manure Type	Rotation	Pre-application		During application	
		N limited	P limited	N limited	P limited
		$ ac^{-1}			
Swine Slurry	Corn-Soybean	$8.07	$8.94	$1.37	$8.93
	Corn-Corn	$12.41	$4.30	$3.39	$4.30
Layer Manure	Corn-Soybean	$13.22	$5.82	$4.01	$5.82
	Corn-Corn	$20.25	$2.74	$8.28	$2.74
Dairy Slurry	Corn-Soybean	$12.09	$3.97	$11.10	$3.97
	Corn-Corn	$27.45	$2.00	$20.42	$2.00
Beef Feedlot Scrapings (Earthen Lot)	Corn-Soybean	$12.76	$2.89	$5.64	$2.89
	Corn-Corn	$20.32	$1.51	$11.12	$1.51

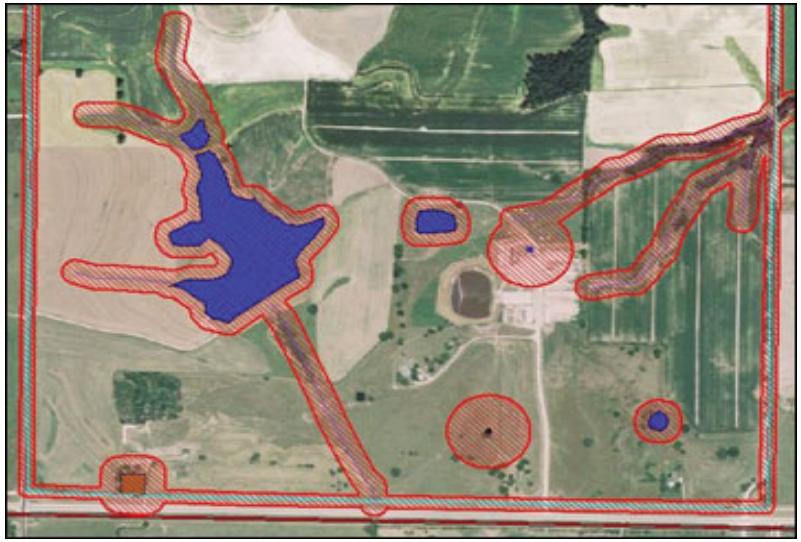
How far can I move manure

Break Even Hauling Distance	Swine Slurry	Dairy Slurry	Beef Solids	Layer	Turkey
All Nutrients	12 (5-20)	8 (2-13)	14 (9-20)	25 (16-34)	16 (13-19)
N-only	1 (0-4)	0 (0)	0 (0)	1 (0-3)	2 (1-2)
P&K only	5 (0-10)	6 (2-11)	13 (8-18)	21 (13-28)	11 (9-13)

- Table provides miles where manure can be hauled to be as cost effectively as commercial fertilizer.
- Take advantage to get manure to fields where all nutrients needed.

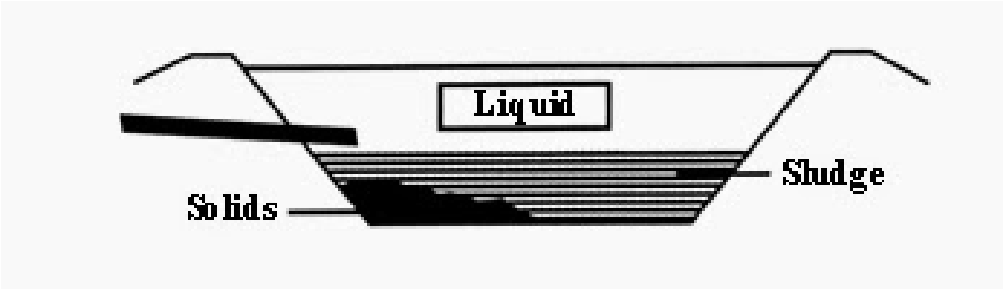
So we have a manure plan, now what?

- Lots go is to getting a good manure plan
  - **Nutrient Supply**
    - **how much is in the manure**
  - **Nutrient Demand**
    - **how much does the crop need**
  - **Environmental Risk**
    - **P-Index**
    - **N loss potential**
  - **Labor availability**



Why Agitate

- Manure Uniformity
  - Consistent Nutrients
  - Better handling
- Remove solids
  - Recover space



Manure Agitation

Agitating Deep Pits

- Agitation releases gases
  - Methane, hydrogen sulfide,
- Hydrogen sulfide can be dangerous
  - Need good ventilation in barn
  - Listen/watch for pig stress
  - Employee safety

Agitating Large Storages

- Manure Agitation Boats
- Floating engines with pump and nozzles
- Take agitation to where you need it
- Access into storage?
- What about the liner

Tank Wagon Manure Application

- Affordable
  - farmer could own his own
- Concern over compaction
  - Full tanks are heavy

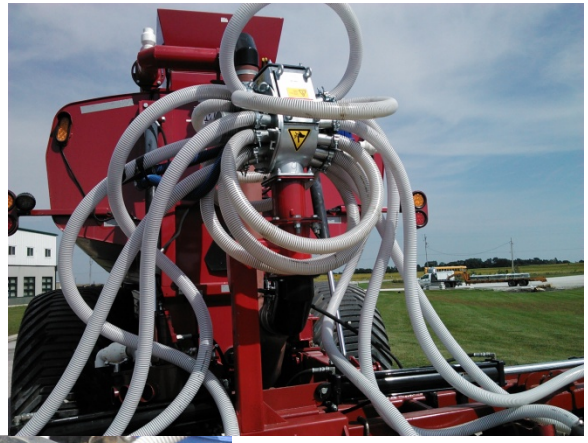
- Most purchased with rate control

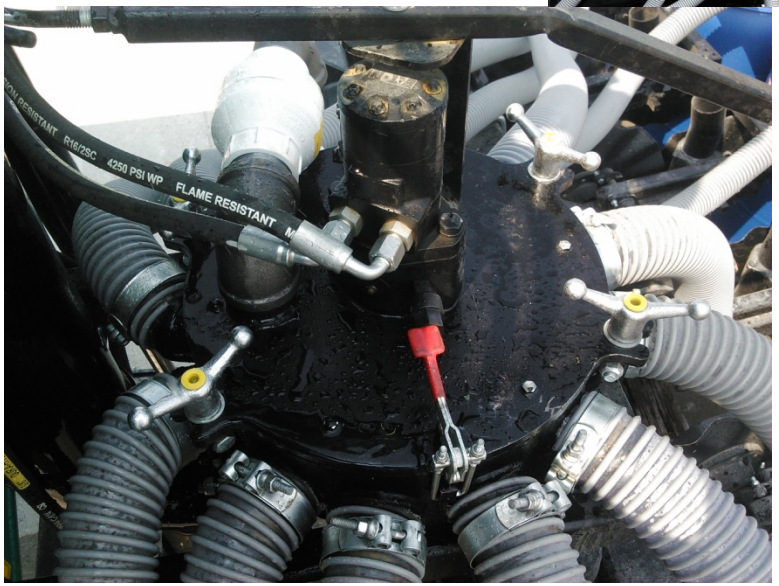
Rate Control

- In tractor controller
- Flow-meter
- Pump or valve

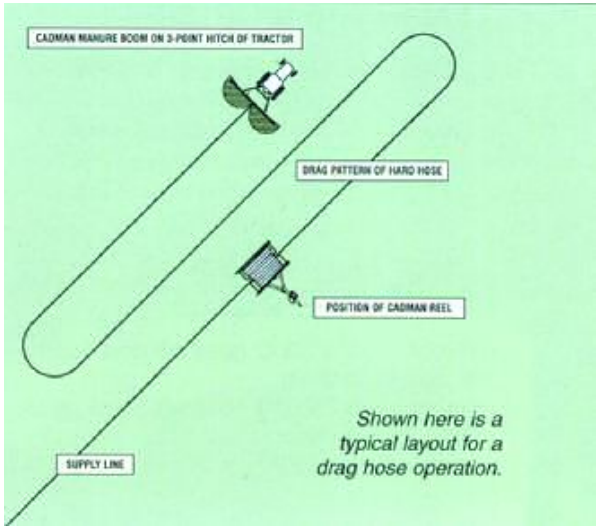
Distribution Across Toolbar

- Want manure evenly spread across tool bar
- Spreader will have a distributor





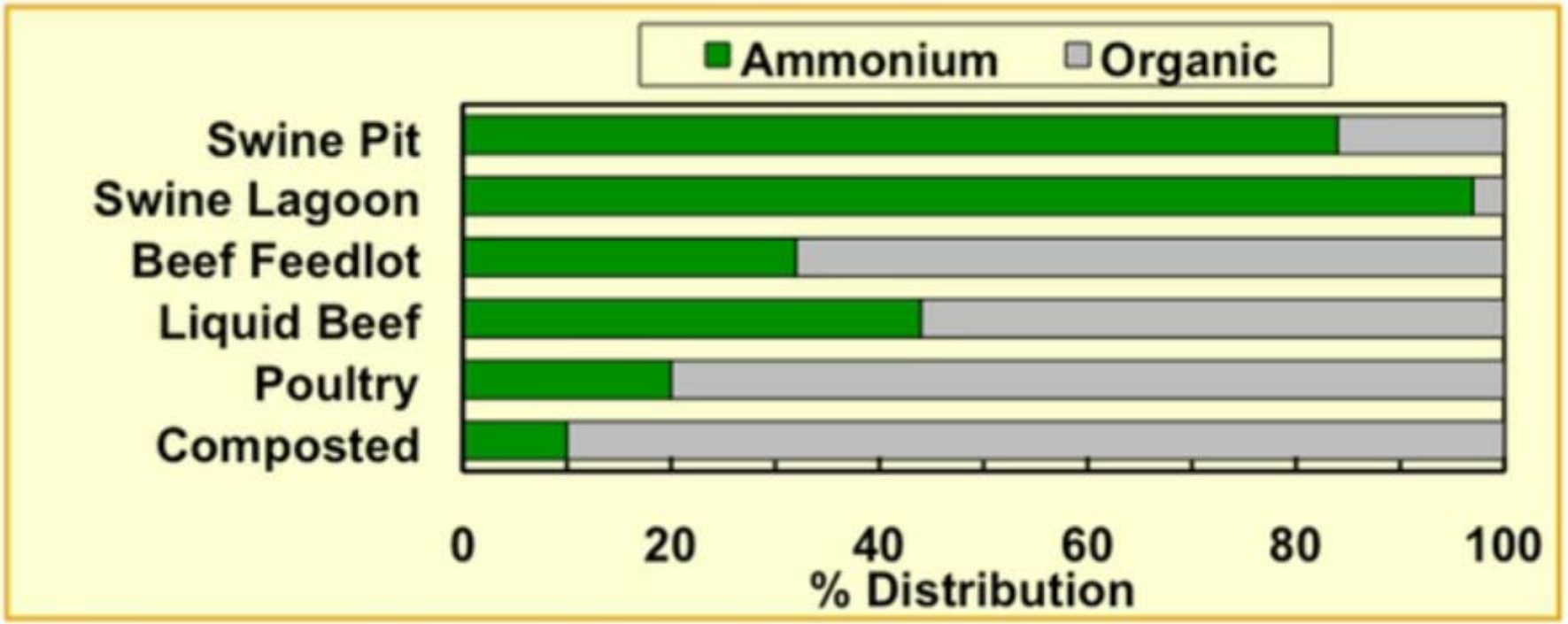
Drag Hose System



Nitrogen in Manure

Total N

Ammonium + **Organic**



Nutrient Supply

Using Manure Nutrients for Crop Production

Table 2. Correction factors to account for N volatilization losses during and after land application of animal manure.[1]

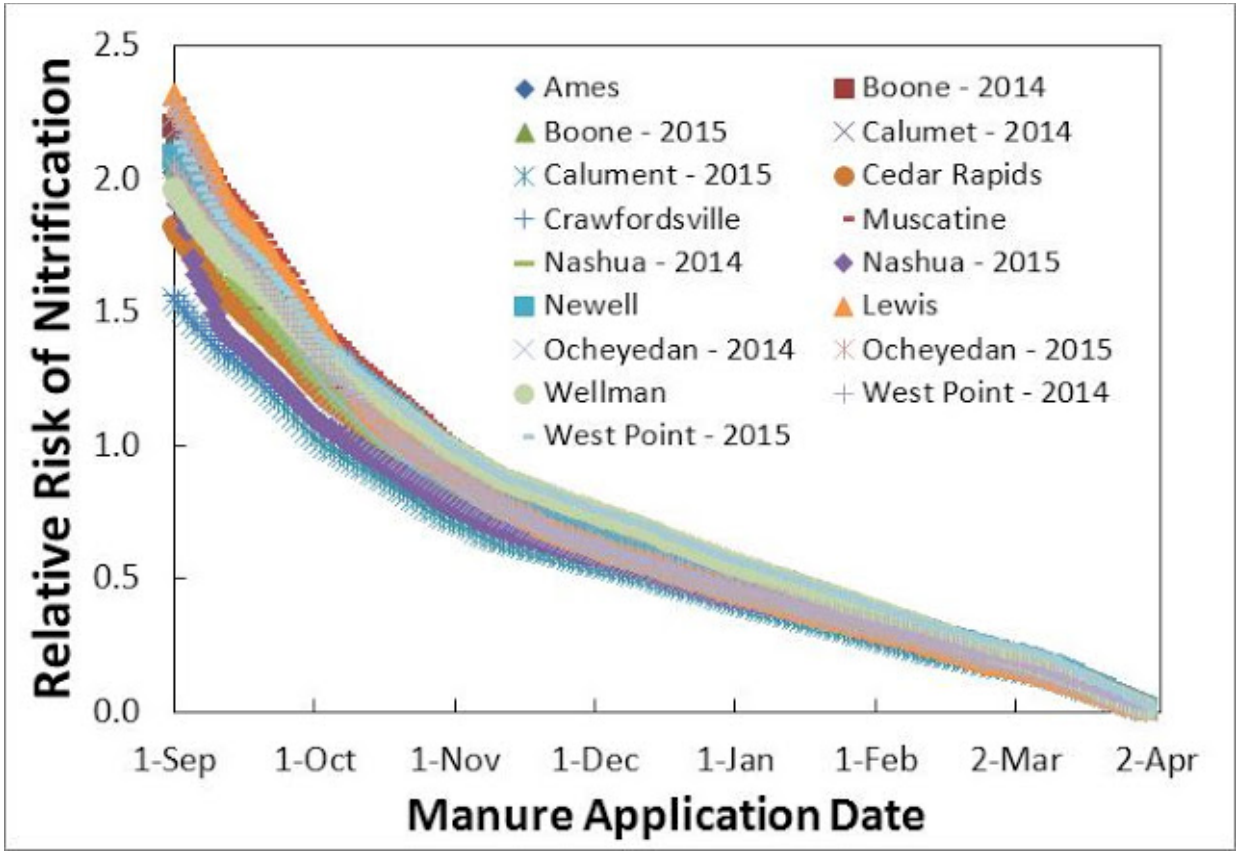
Application Method	Incorporation	Volatilization Correction Factor[2]
Direct injection	—	0.98–1.00
Broadcast (liquid/solid)	Immediate incorporation	0.95–0.99
Broadcast (liquid)	No incorporation	0.75–0.90
Broadcast (solid)	No incorporation	0.70–0.85
Irrigation	No incorporation	0.60–0.75

[1]Adapted from Midwest Plan Service MWPS-18, Third Edition. Nitrogen losses during and within four days of application.

[2]Multiply the manure total N rate applied times the volatilization correction factor to determine the portion of total manure N remaining.

- Get manure injected/incorporated to reduce ammonia volatilization
- Timing to minimize nitrate leaching

Nitrogen Timing



- Early fall application has potential to double the amount of conversion to nitrate!

Injection

Swine manure

60-30-25 (N-P2O5-K2O) pounds per 1000 gallons

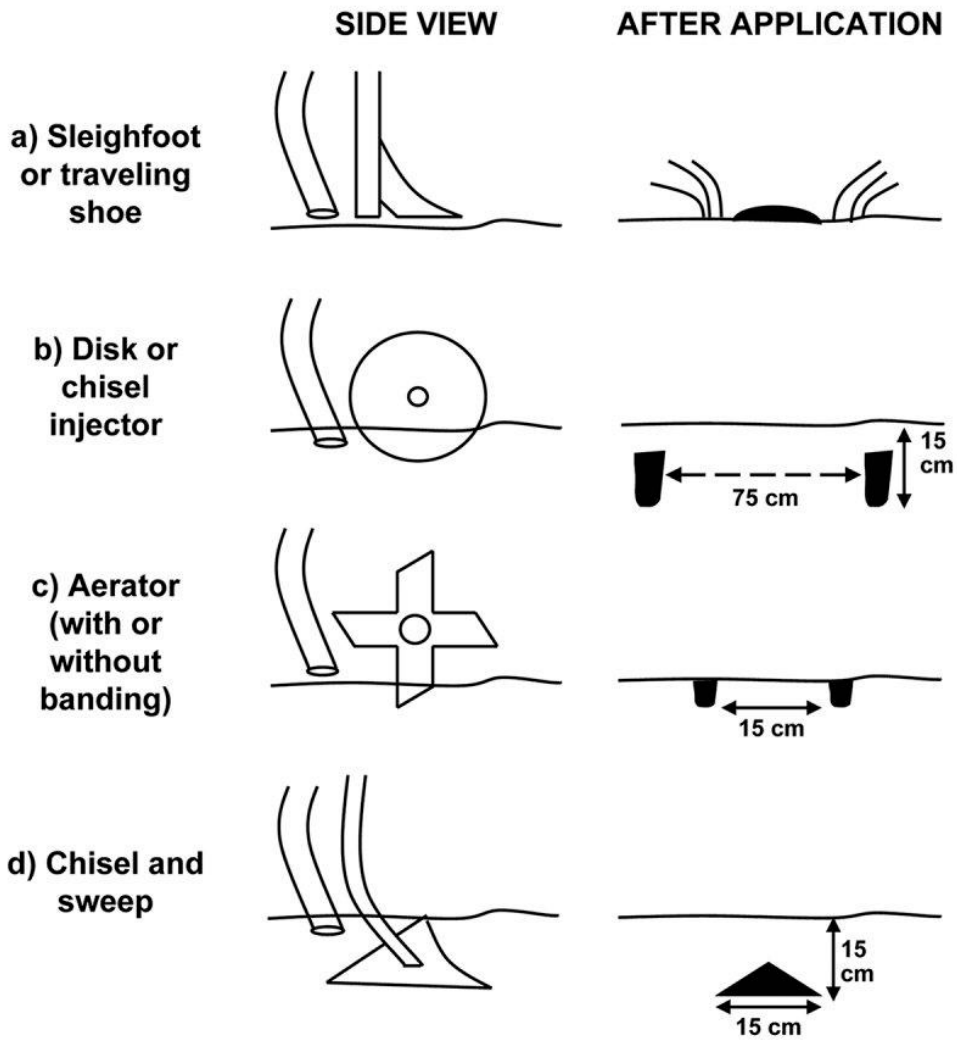
Surface applied – 10-25% N volatilized
Injected – 0-2% N lost

Applying 2400 gallons per acre if injected
Applying 3150 gallon per acre if surface applied

Surface application is costing us about $18 in nitrogen value!

The cost of injection is about $18 an acre more, so switching to injectiong would pay for itself.

Injection Implements



- Injector Choice:
  - Soil disturbance
  - Fuel consumption
  - Coverage
  - Amount of manure that will fit in slit

Questions and Comments

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