Manure Composition and Incorporation Effects on Phosphorus in Runoff Following Corn Biomass Removal

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Background

- Corn biomass removal (silage) has historically been a common practice in Wisconsin
- Increased interest in corn biomass for bioenery production
  - What effects could this have on surface losses of sediment and P?
  - If manure is applied in an effort to return some organic material to the soil, will it mitigate P losses?
- No information in the literature evaluating the effect of both tillage and manure on surface losses of sediment and P in a corn biomass removal system

Objective

- To determine the effect of spring surface-applied dairy manure with and without incorporation on simulated runoff amounts and sediment and P fraction losses in runoff in spring and fall when a corn biomass is removed

What did we do?

- Arlington Ag Research Station
  - Moderately well-drained Saybrook silt loam with 6% slope
    - 75 ppm P; 151 ppm K; 4.2% OM ; 6.8 pH
- Fall 2007 corn silage harvest
- Spring 2008 manure applied and tillage (notill or chisel) established

Manure	Manure info	Manure Analysis		Rates applied	
		lb P_2O_5/T	% Solids	lb P_2O_5/a	T Solids/a
Composted	3' in-barn pack of manure/sawdust	4.5	28	96	6.0
Pit	Free stall, rice hull bedding, transferred daily to a pit	5.3	21	194	7.5

We made it rain

- When
  - Spring (2-16 June)
  - Fall after silage harvest (13-16 Oct)
- Rainfall intensity of 3 inch/hr (~ 50 year event)
- Runoff collected
  - From a 8.93 ft^2 area in each plot
  - Total amount during 60 minutes immediately following rainfall initiation
  - Separated & filtered for various P and sediment fractions

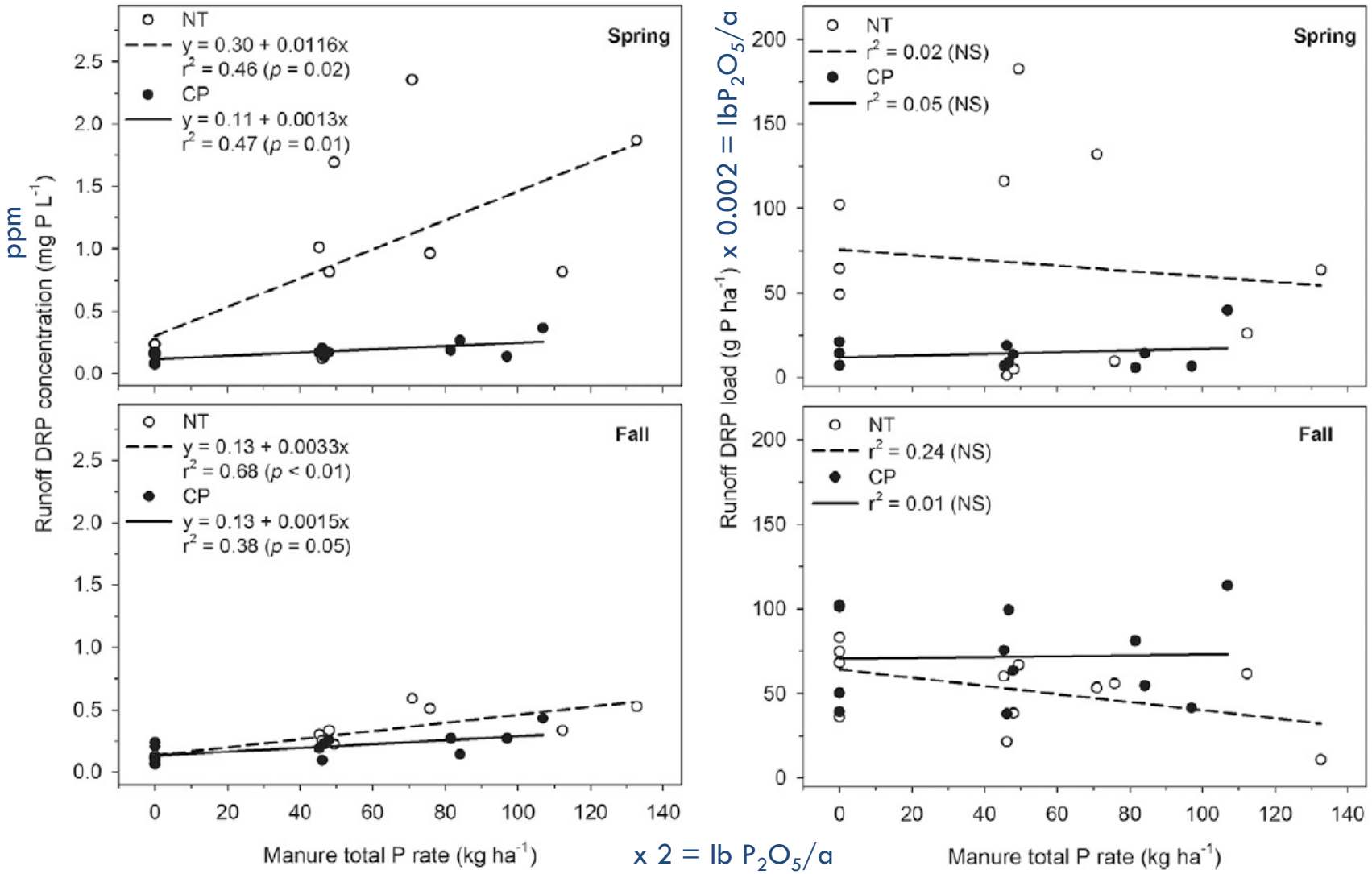
What did we learn?

Spring tillage and manure source effects on surface residue cover, amount of simulated rainfall applied before the onset of runoff, and runoff amount following 60 min of simulated rainfall

Tillage	Manure Source	Spring rainfall simulation			Fall rainfall simulation		
		Surface residue	Rainfall before runoff	Runoff	Surface residue	Rainfall before runoff	Runoff
		%	mm	mm	%	mm	mm
No-till	None	26 b	8	39 a	25 b	5	61 a
	Compost	67 a	27	6 c	57 a	8	17 d
	Pit	70 a	15	3 c	58 a	10	10 d
Chisel	None	13 c	7	12 b	13 c	6	52 a
	Compost	29 b	20	7 c	21 bc	6	37 b
	Pit	29 b	10	6 c	25 b	7	28 c
	Tillage	<0.01	0.27	0.04	<0.01	0.38	<0.01
	Source	<0.01	0.02	<0.01	<0.01	0.26	<0.01

Addition of manure reduced runoff volumes by an average of 82% in NT and 42% in CP averaged over spring and fall

Effect of P application rate and tillage on dissolved reactive P (DRP) concentration and load from spring and fall rainfall simulations



- Sediment and particulate P concentrations in runoff were decreased as manure P rate (and manure solids) increased and were higher in CP compared with NT

Conclusions

- Surface application of dairy manure with >20% solids may reduce sediment and particulate P losses in runoff without increasing dissolved reactive P and dissolved organic P losses in the year of application where corn biomass (or silage) was harvested
- Further research on soils with different infiltration capacity and/or separated solid manure sure be conducted to verify these results

Questions?

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