

Knowledge forLife

Manure and Your Fertility Program

Crop Talk
February 7, 2022

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Challenges for Agriculture

- Nutrient applications
 - Increase yields
 - Increase return of carbon to the soil
- Unmanaged nutrient applications
 - Increase nutrient losses
 - Potential to degrade water and air quality
 - Potential to increase gaseous N losses

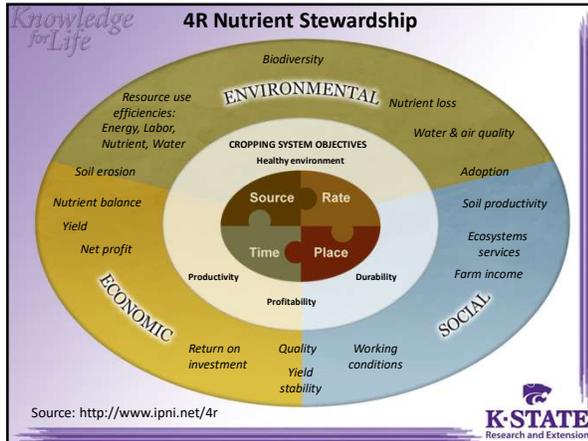
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Manure Management

- Production - Value as fertilizer
- Unbalanced fertilizer
 - Nutrient ratios (N, P, K, etc.) are fixed
 - Nitrogen based application exceed crop Phosphorus requirements.
 - Minimize impact on water quality
- **Fertility source** not manure disposal

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Manure Math - Conversion

- Results in PPM
 - Solid manure lbs/ton = ppm x 0.002
 - Liquid manure lbs/1000 gal = ppm x 0.00834
- Results in %
 - Solid manure lbs/ton = % x 20
 - Liquid manure lbs/1000 gal = % x 83.4
- Other useful conversions
 - $P_2O_5 = P \times 2.3$
 - $K_2O = K \times 1.2$

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Feedlot Manure

Tribune 10 yr Manure Fertility Study

Element	%			Lb/ton		
	Avg	Min	Max	Avg	Min	Max
Total N	1.5	0.8	2.0	29.5	16.2	40.6
Organic N	1.2	0.01	1.5	24.4	16.0	30.0
Inorganic N	0.3	.08	0.5	5.1	0.2	10.6
Phosphorus	0.5	0.26	0.7	9.14	5.2	13.2

Schlegel et al. 2015

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Swine Effluent Tribune 10 yr Manure Fertility Study

Element	%			Lb/1000 gal		
	Avg	Min	Max	Avg	Min	Max
Total N	0.14	0.08	0.28	12.1	6.3	23.7
Organic N	0.02	0.01	0.06	2.3	0.8	5.0
Inorganic N	0.12	0.07	0.28	9.8	5.5	18.7
Phosphorus	.008	.005	0.01	0.7	0.4	1.0

Schlegel et al. 2015



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Manure Nutrients

Element	Poultry Litter	Feedlot
	-----%-----	
Water	28	30
Carbon	36	-
Nitrogen	4.0	1.0
Phosphorus	1.6	0.4
Potassium	1.8	1.0
Calcium	3.1	-
Magnesium	0.4	-

Sims and Wolf, 1994; MF2586



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Manure Nutrients

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	-----%-----	
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Carbon	36	-
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Potassium	1.8	1.0
Calcium	3.1	-
Magnesium	0.4	-

Sims and Wolf, 1994; MF2586



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Dollars and Cents

- Fertilizer prices  (prices as of Nov 10, 2021)
 - N = \$0.85 per lb. N
 - P = \$0.85 per lb. P
 - K = \$0.39 per lb. K
- Based on nutrients N, P, and K value
 - Poultry litter:
 - \$65 per ton (first yr.)
 - \$110 per ton (first yr. + residual)
 - Feedlot manure:
 - \$16 per ton (first yr.)
 - \$28 per ton (first yr. + residual)
 - Actual value greater



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Nitrogen Based Plan

Crop	Yield	N Uptake	Manure Needed
	--ton/acre--	--lb/acre--	--ton/acre--
Corn silage (Feedlot)	20	165	
Corn silage (Poultry litter)	20	165	



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Nitrogen Based Plan

Crop	Yield	N Uptake	Manure Needed
	--ton/acre--	--lb/acre--	--ton/acre--
Corn silage (Feedlot)	20	165	10
Corn silage (Poultry litter)	20	165	2.5



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Phosphorus Based Plan

Crop	Yield	P ₂ O ₅ Uptake	Manure Needed
	--ton/acre--	--lb/acre--	--ton/acre--
Corn silage (Feedlot)	20	64	
Corn silage (Poultry litter)	20	64	



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Phosphorus Based Plan

Crop	Yield	P ₂ O ₅ Uptake	Manure Needed
	--ton/acre--	--lb/acre--	--ton/acre--
Corn silage (Feedlot)	20	64	5.2
Corn silage (Poultry litter)	20	64	1.3



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Phosphorus Over-Application

Crop	N – Manure Needed	P – Manure Needed	OVER APPLICATION N-BASIS
	--ton/acre--	--ton/acre--	--ton/acre--
Corn silage (Feedlot)	10.0	5.3	4.7
Corn silage (Poultry litter)	2.5	1.3	1.2



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Phosphorus

- Manage nutrients based on phosphorous
- Nutrient over application impacts bottom line

~~N~~ P



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Nitrogen Deficit

Crop	Phosphorus Manure Applied	Nitrogen Applied	Nitrogen Fertilizer Needed	Nitrogen Fertilizer Costs
	--ton/acre--	-----lbs/acre-----		--\$/acre--
Corn silage (Feedlot)	5.3	87.5		
Corn silage (Poultry litter)	1.3	85.8		



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Nitrogen Deficit

Crop	Phosphorus Manure Applied	Nitrogen Applied	Nitrogen Fertilizer Needed	Nitrogen Fertilizer Costs
	--ton/acre--	-----lbs/acre-----		--\$/acre--
Corn silage (Feedlot)	5.3	87.5	77	
Corn silage (Poultry litter)	1.3	85.8	79	



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Nitrogen Deficit

Crop	Phosphorus		Nitrogen	Nitrogen
	Manure Applied	Nitrogen Applied	Fertilizer Needed	Fertilizer Costs
	--ton/acre--	-----lbs/acre-----		--\$/acre--
Corn silage (Feedlot)	5.3	88	77	65
Corn silage (Poultry litter)	1.3	86	79	67

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Cropping system P requirements

Crop	Yield	P ₂ O ₅ Uptake	Poultry Litter Needed†
	--Bu/acre--	--lb/acre--	--ton/acre--
Corn - Soybeans	140/40	46+40=86	1.7
Wheat/Soybean - Corn	50/30/140	25+24+46=96	1.9
Corn - Corn	140/140	46+46	1.8

(†Based on 2.5% P₂O₅)
(KState MF-2586)

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- ### Phosphorus
- Agronomically
 - Root development
 - Plant cell membranes
 - Plant energy functions
 - Immobile – As far as agronomic concerns
 - Carried away adsorbed on soil particles during erosion
 - Environmentally
 - Frequently limiting nutrient in freshwater
 - 0.037 ppm threshold in scenic waterways
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Set Backs

- Minimum distance between water bodies and manure application
- Recommended Distances
 - 100 feet for perennial stream, well, pond or sinkhole
 - 50 feet for intermittent stream
- Distance can be reduced with established buffers



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Key Management Considerations

- Storage Site Evaluation
 - Access
 - Distances to water and residences
 - Soil type (infiltration)
 - Sensitive ground water
- Agronomics
 - Soil test and manage soil phosphorus
 - Mehlich-3 or Bray-1 <50 ppm
 - Observe set back recommendations
 - Incorporate within 24hr



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