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Nutrient Management Practices for Small Livestock Farms

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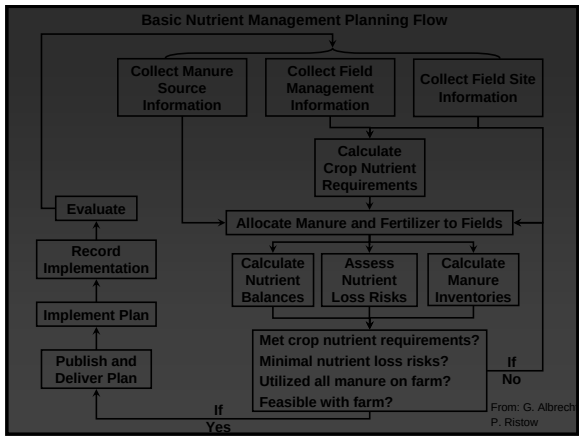

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- How much nitrogen and phosphorus will be produced on a farm with 30 adult horses and 10 growing beef steers?
- How will manure be spread on 30 available acres? (15 for hay production and 15 for grazing).

Horses

- Animal Units (AU's):
  (30 horses x 1.0 Animal Unit) = *30 AU's*
  1.0 Horse
- Manure Production:
  (30 AUs x 10.03 tons manure) = *300.9 tons manure*
  AU x year year
- Nitrogen Production:
  (300.9 tons manure x 8.73 lb N) = *2626.9 lb N*
  ton
- Phosphorus Production:
  (300.9 tons manure x 1.67 lb P) = *502.5 lb P*
  ton

Beef Cows

- Animal Units (AU's):
  (10 – 750 Pound Steers x 1 Animal Unit) = *7.5 AU's*
  1000 pounds
- Manure Production:
  (7.5 AUs x 11.5 tons manure) = 86.25 *tons manure*
  AU x year year
- Nitrogen Production:
  (86.25 tons manure x 10.95 lb N) = *944.4 lb N*
  ton
- Phosphorus Production:
  (86.25 tons manure x 3.79 lb P) = *326.9 lb P*
  ton

Total Manure and Nutrient Production

- Total manure production = 387.2 tons of manure annually
- Nitrogen as excreted = 3571.3 lbs N annually
- Phosphorus as excreted = 829.4 lbs P annually
- 30 tons straw bedding added
- "Excreted" vs "removed" estimates
- Fertilizer phosphorus is reported as the amount of P_2O_5. Soil tests are in P and manure tests may be reported as P or P_2O_5. Similarly, potassium fertilizer recommendations call for K_2O.

  Conversions: P * 2.29 = P_2O_5 K * 1.20 = K_2O

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Manure Testing Values (Pounds per ton of manure)

N	P2O5	K2O
9.22	4.91	7.40

Available Crops	Unit	Per Unit P2O5 Uptake	Per Unit K2O Uptake	Estimated Yield Per Acre	Crop P2O5 Removal	Crop K2O Removal	Manure P2O5	Manure Spreading Rate (Tons per acre)	1.5 X Manure Spreading Rat
Corn	(bu)	0.4	0.3	0	0	0	4.9	0.0	0.0
Grain sorghum	(bu)	0.6	0.8	0	0	0	4.9	0.0	0.0
Wheat/Rye	(bu)	1	1.8	0	0	0	4.9	0.0	0.0
Oats	(bu)	0.9	1.5	0	0	0	4.9	0.0	0.0
Barley	(bu)	0.6	1.5	0	0	0	4.9	0.0	0.0
Soybeans	(bu)	1	1.4	0	0	0	4.9	0.0	0.0
Alfalfa	(T)	15	50	0	0	0	4.9	0.0	0.0
Red clover	(T)	15	40	0	0	0	4.9	0.0	0.0
Trefoil	(T)	15	40	0	0	0	4.9	0.0	0.0
Cool-season grasses	(T)	15	50	2	30	100	4.9	6.1	9.2
Cool-season grasses	(T)	15	50	3	45	150	4.9	9.2	13.8
Bluegrass	(T)	10	30	0	0	0	4.9	0.0	0.0
Corn silage	(T)	5	11	0	0	0	4.9	0.0	0.0
Forage sorghum	(T)	3	10	0	0	0	4.9	0.0	0.0
Sorghum/sudangrass	(T)	7	7	0	0	0	4.9	0.0	0.0
Small grain silage	(T)	7	26	0	0	0	4.9	0.0	0.0
Rye straw	(T)	4.4	28	0	0	0	4.9	0.0	0.0

Estimated Spreading Rate (P2O5 removal ÷ P2O5 per ton of manure) = tons of manure to spread per acre

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Nutrient Balance Whole Farm

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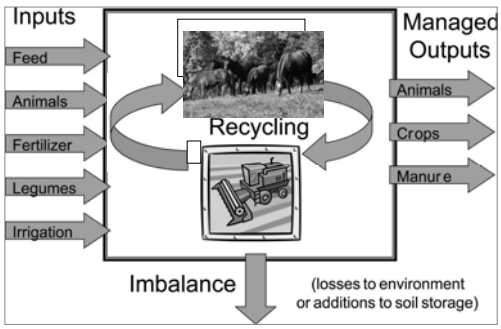

From: G. Albrecht

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Example Nitrogen Balances on Dairy Farms

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	Number of dairy cows 45	320	500	1300
	--tons of N/yr--			
INPUT				
purchased fertilizer	1.0	13.5	26.1	9.8
purchased feed	3.8	43.8	78.5	205.0
N fixation by legumes	1.3	14.6	13.9	21.3
purchased animal	0.0	0.1	0.0	0.0
	6.1	72.0	118.5	236.1
OUTPUT				
milk	2.0	18.6	26.4	72.8
animals sold	0.1	1.9	1.9	3.2
crops sold	0.1	0.0	0.0	0.0
	2.2	20.5	28.3	76.0
REMAINDER	3.9	51.5	90.2	160.1
% remaining on the farm	**64%**	**71%**	**76%**	**68%**

From: Klausner (1997) Nutrient Management: Crop Production and Water Quality.

Small Farm Distinctives

- Smaller numbers of livestock - less waste to handle.
- No formal waste storage structure.
- Smaller amount of land available for grazing - more concentrated livestock areas, more likelihood of erosion and polluted runoff.
- Smaller amount of land available for spreading - greater potential for overspreading manure on grass - more likelihood of runoff.
- Operators have less experience in waste management.

Small Farm Distinctives

- Closer to neighbors?
- May have a limited budget for manure storage and handling. (Although in some locales, small farmers are affluent.)
- May be able to dispose of manure offsite. Limitations?
- Composting may be an option, but the producer may not be equipped to properly undertake this.
- Less aware of manure management BMP's?

Manure Test Results

MANURE ANALYSIS REPORT
Sample Number: 12174460

Date Sampled:
Date Received: 2/27/2008
Date Mailed: 2/28/2008
Description: FALL 2007 MANURE PROJECT
Statement ID: 5 - ALE

RUTGERS UNIV WESTENDORF S563582
84 LIPMAN DR
NEW BRUNSWICK, NJ 08903

Components	As Received	Lbs / Ton	Lbs / 1000 Gal
Nitrogen (N)	2.059%	41.2	55.7
Ammonia Nitrogen	.045%	.9	1.2
Organic Nitrogen	2.014%	40.3	54.5
Phosphorus (P)	.500%	10.0	13.5
Phosphate Equivalent (P205)	1.147%	22.9	31.0
Potassium (K)	.668%	13.4	18.1
Potash Equivalent (K20)	.805%	16.1	21.8
Total Solids	97.73 %		
Density	.32 kg/l	20.23 Lbs/CuFt	2.70 Lbs/Gal

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Use book values if you haul manure on a daily or weekly basis.

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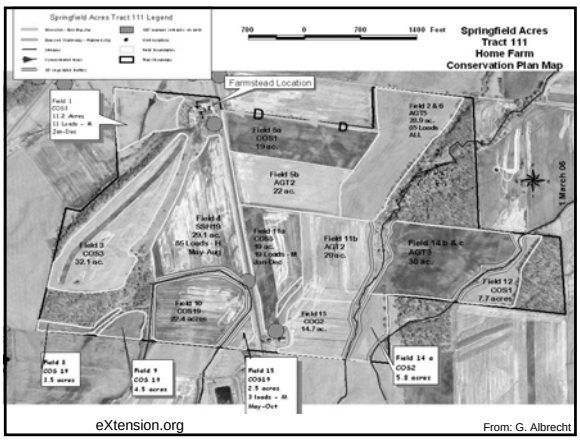
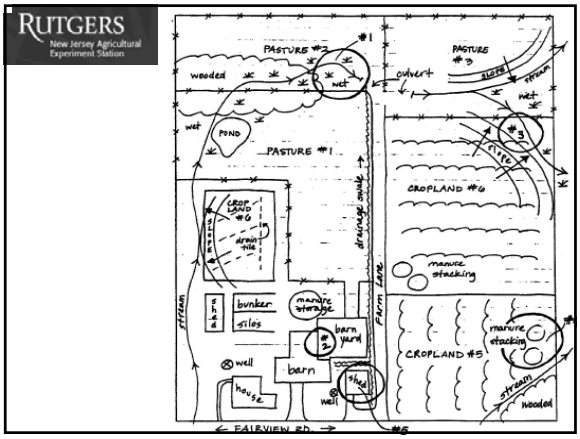
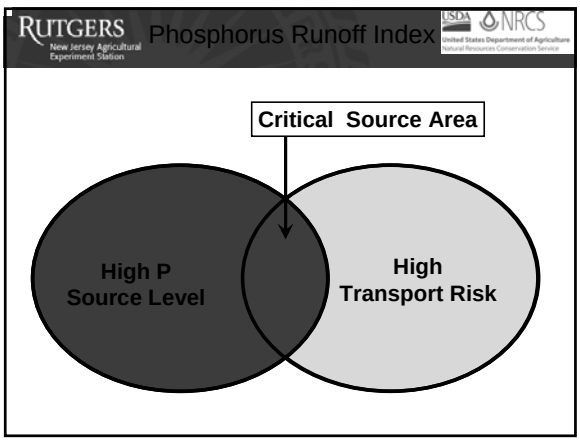
Bedding Use

- Typical materials are sawdust, hay, straw, wood shavings, and sand.
- Typical use scenarios are dairy freestall and loafing barns, poultry raised on litter, swine hoop structures, and horse stalls.
- Volume addition due to bedding may be 1/3 to 1/2 of the original dry bedding volume.
- Manure tends to fill void spaces between bedding material particles.



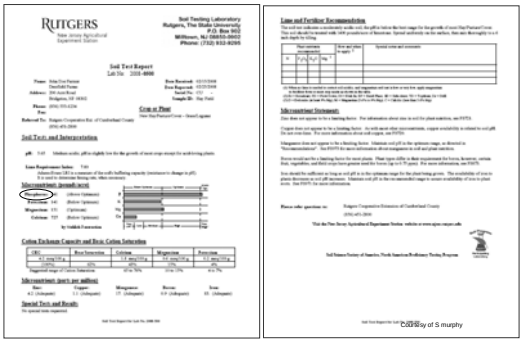
eXtension.org From: G. Albrecht





(*Livestock Poultry Environmental Stewardship Curriculum Lesson 32, Lesson 34*)

Soil Test Report



Best Management Practices

- Manure storage out of the flood plain
- Limit or control animal access to streams/water
- Divert clean water from dirty water
- Use buffers or filter strips to keep manure out of water
- Spread manure according to a nutrient management plan

Pasture and Crop Management

Lush, well-managed pastures such as the one above will take up more nutrients from manure, be more productive and permit a greater stocking density, and will present a lower risk of agricultural runoff polluting streams and water bodies.

Pasture and Crop Management

Poorly vegetated pastures will take up fewer nutrients from the soil or from manure either deposited or spread, and will be at greater risk of polluting runoff from manure, either from grazing animals or spread on the pasture. These pastures will also be much greater erosion risks than will well-vegetated pastures.

Feeding and Exercise Areas

Manure Spreading

Nutrient Management Plans for Small Farms

- Time consuming
- Limited resources
- Limited expertise
- Limited public commitment ?

Simplified Example

LPES Small Farms Fact Sheets*

Nutrient Management–
SIMPLIFIED!

By Randall James, Ohio State University Extension

eXtension.org

- How much nitrogen and phosphorus will be produced on a farm with 30 adult horses and 10 growing beef steers?
- How will manure be spread on 30 available acres? (15 for hay production and 15 for grazing).

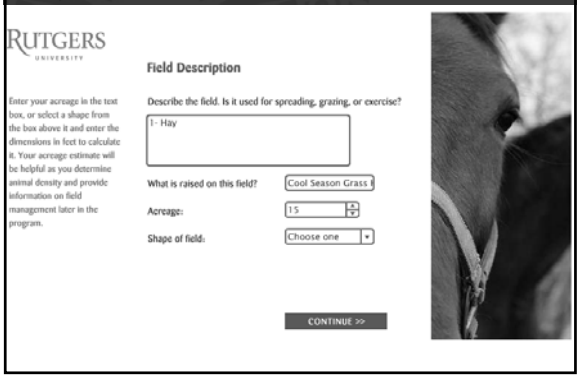
Simplified Example

- Total manure production = 387.2 tons of manure annually or 35 tons per month
- Nitrogen as excreted = 3571.3 lbs N annually or 298 pounds per month
- Phosphorus as excreted = 829.4 lbs P annually or 69 pounds per month
- Determine yields and plant uptake:

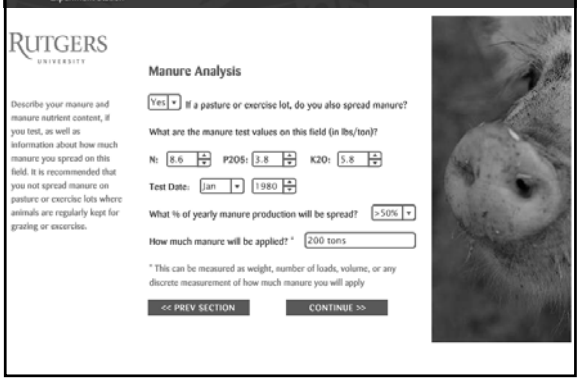
Available Crops	Unit	Per Unit P2O5 Uptake	Per Unit K2O Uptake	Estim. Yield Per Acre	P2O5 Removal	K20 Removal Removal
Grass hay	(T)	15	50	3	45	150
Grass hay	(T)	15	50	2	30	100

- Field 1 – Hay: Required P2O5 (45 pounds * 10 acres) divided by (69 pounds * 2.29) = 3.0 months of manure can be spread on this field.
- Field 2 – Hay: Required P2O5 (45 pounds * 5 acres)divided by (69 pounds * 2.29) = 1.5 months of manure can be spread on this field.
- Field 3 – Grazing: Required P2O5 (30 pounds * 15 acres) divided by (69 pounds * 2.29) = 3.0 months of manure can be spread on this field.
- 4.5 months remaining and accounted for by recycling while grazing, losses during storage, off-farm disposal, etc.

Computer Program Example



Computer Program Example



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Soil Analysis

Describe soil test results (if available), cropping plans, and yield expectations to determine fertilizer requirements for this field.

Remember that grazing recycles nutrients onto pastures. If you also spread manure onto this field, there will be a net increase in nutrients. This will particularly be a problem with phosphorous, but can be offset if the field is relatively flat, not close to water, and with abundant vegetative cover.

What are the soil test values on this field (in lbs/acre)? *

pH: 5.7 Organic Matter: 1 %

P: 210 K: 350

Test Date: 1980 * Should be taken every 3-5 years

Crop grown on field: Cool-season grasses (T)

Your crop yield: 3 (T)/acre

P2O5 Uptake: 15.0 lbs/(T) Spreading Rate: 11.8421052631579 (T

K2O Uptake: 50.0 lbs/(T) 1.5xSpreading Rate: 17.763157894734

<< PREV SECTION CONTINUE >>

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Erosion Control

Describe slope of the field and the distance to water as well as some information about grazing and pasture management. The **slope** of a field is the amount of incline or decline in a particular area.

If this field is grazed:

Yes Do you drag it to break up manure piles and make them more available?

Yes If this field is in permanent pasture, is it harvested for hay?

What is the slope? Moderate (3-8%)

What is the distance to the nearest water body?

100-250 feet

<< PREV SECTION NEXT >>

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Erosion Control

Select the erosion control practices in use on this field (e.g. permanent hayfields or pastures, grassed buffers or borders to prevent runoff). These can help offset the damage to waterways caused by excessive grazing and spreading.

Check erosion control measures utilized on this field:

- ☑ Permanent hayfield or pasture
- ☑ Grassed buffers or borders 20 feet or wider around the fields to prevent runoff into open water
- ☐ Terraces to limit erosion
- ☐ Strip cropping or contour planting of fields
- ☐ Use of winter cover crops to prevent erosion

<< PREV NEXT >>

Computer Program Example

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Erosion Control

Check erosion control measures utilized on this field:

- ☑ Grassed Waterways
- ☐ Crop rotation with 3 or more years of hay
- ☐ Residue management (no-till or minimum-till)
- ☑ Pastures are dragged to spread waste
- ☐ Other

<< PREV NEXT >>

Computer Program Example

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Erosion Control

No ▾ Do you spread manure on frozen ground during winter months on this field?

Describe your manure spreading techniques on this field.

Spread on well-maintained pasture (drag annually) ▾

ADD ANOTHER FIELD OR FINISH AND VIEW REPORT

Putting it all Together

- Develop a manure spreading plan for all manure remaining on farm after off-farm disposals.
- Evaluate field risks.
- Match nutrients in manure with crop uptake. Adjust manure spreading rates for commercial fertilization.
- Remember to account for recycling on pastures that are grazed.
- Take care to use Best Practices for spreading management, leave adequate buffers, incorporate, drag harrow on pasture.
- Record loads and the amount of manure spread.
- Evaluate and feed back.