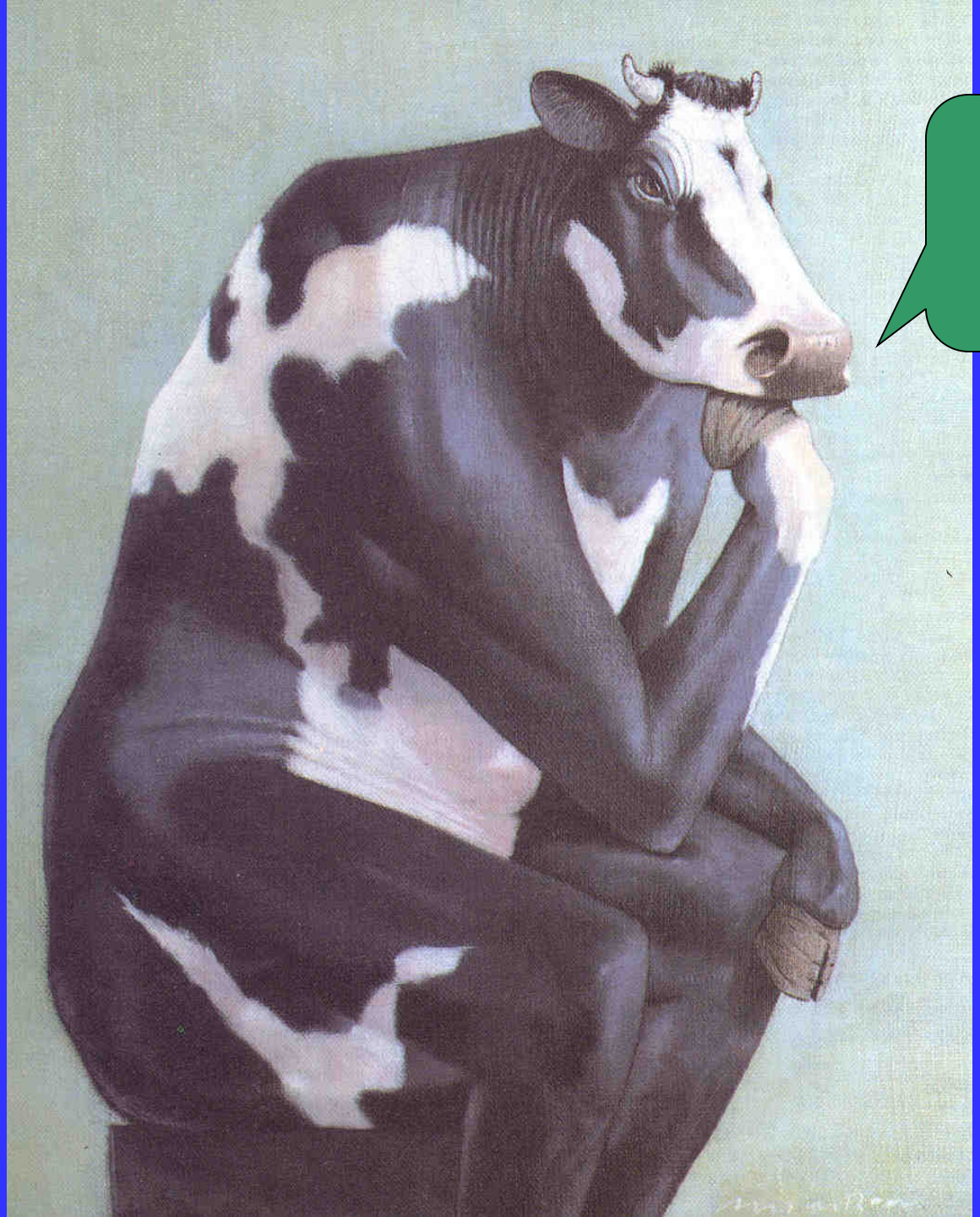
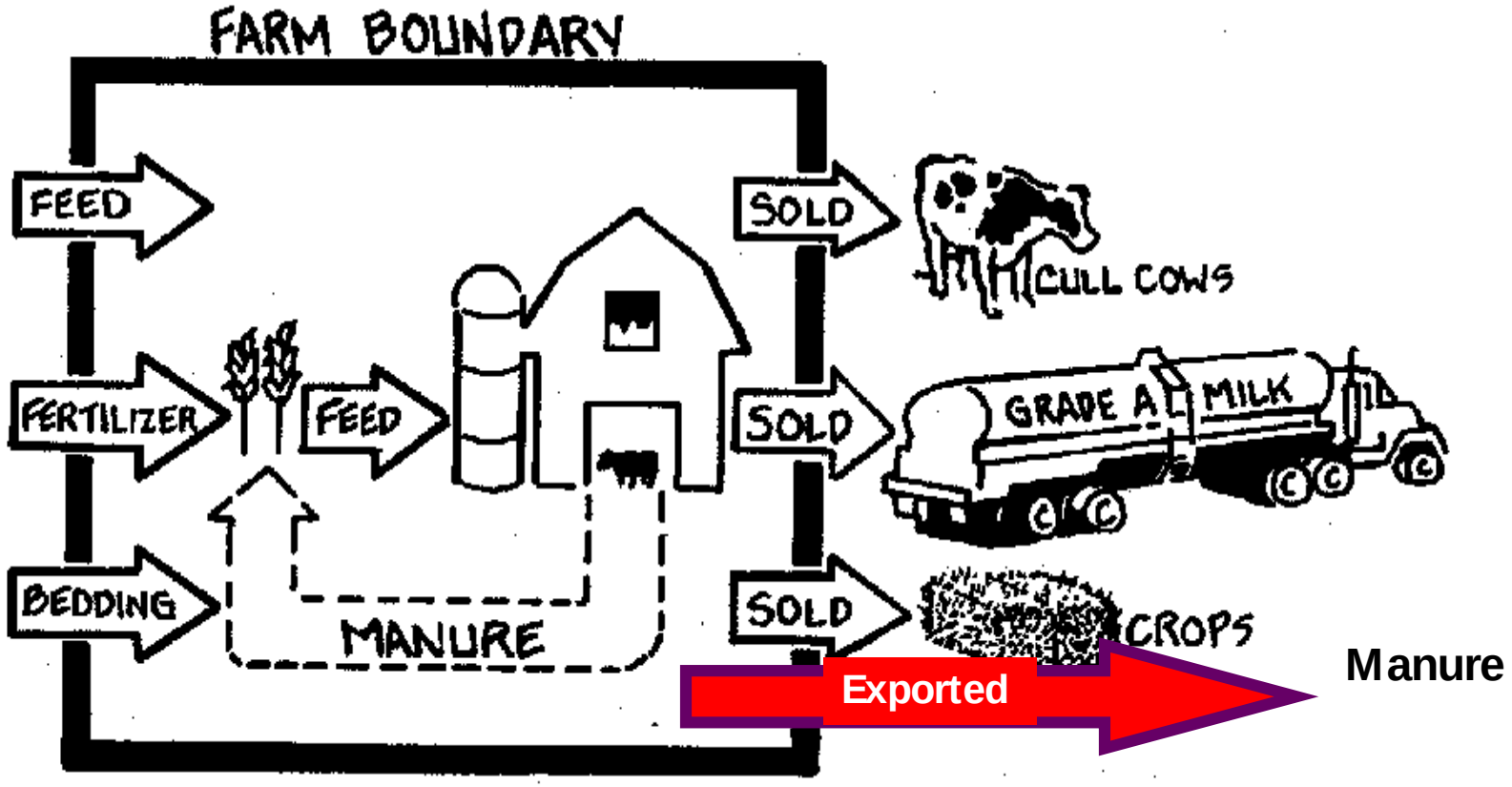


FNMP2.net

Joe Harrison
jhharrison@wsu.edu

Whole Farm Nutrient Management Needs to be considered at the Whole Farm Level and Beyond

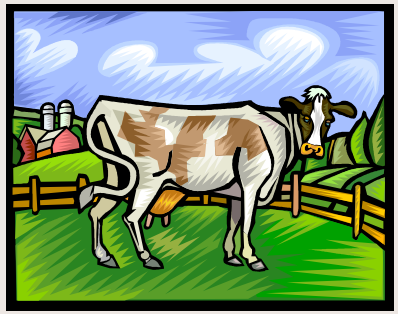


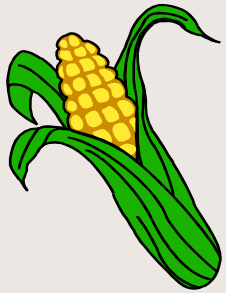
Most dairies are net importers of nutrients

Nutrient Inputs

Inputs

- Feed
- Animals
- Irrigation Water
- Fertilizer
- Legume N
- Bedding

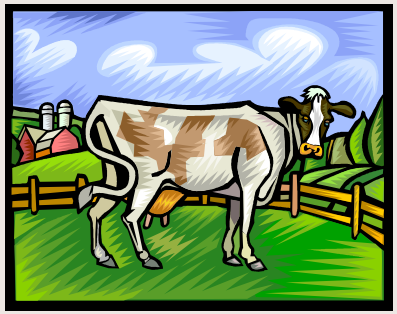


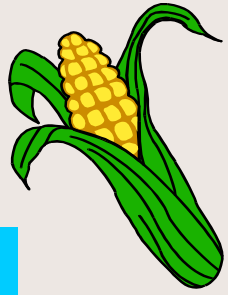


Farm Boundary

Managed Nutrient Outputs

Inputs





Farm Boundary

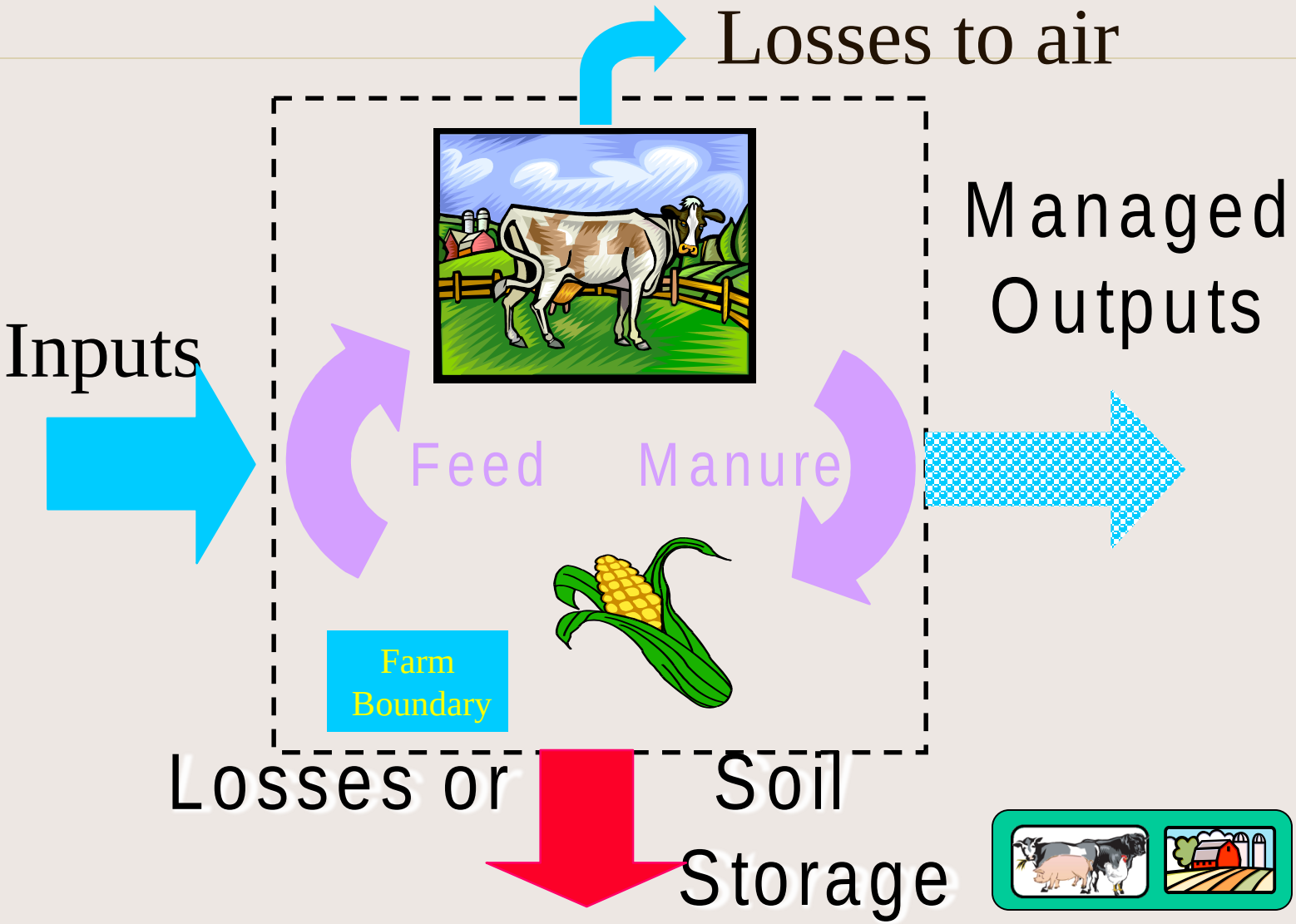
Managed Outputs

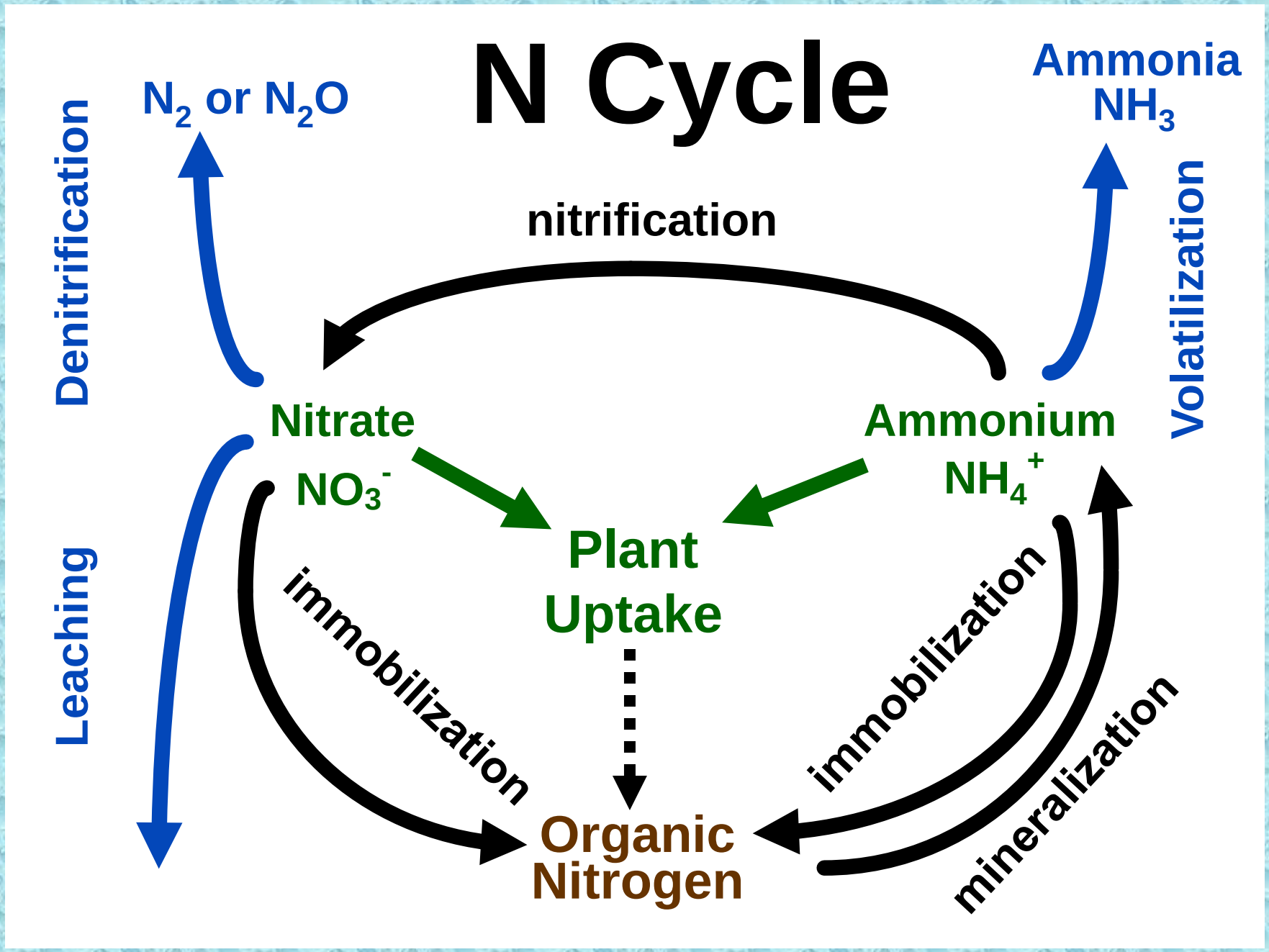
Milk& Meat

Crops

Manure

Recycling of Nutrients




N Cycle
N_2 or N_2O
Denitrification
Ammonia
NH_3
Volatilization
nitrification
Nitrate
NO_3^-
Ammonium
NH_4^+
Plant
Uptake
Leaching
immobilization
immobilization
mineralization
Organic
Nitrogen

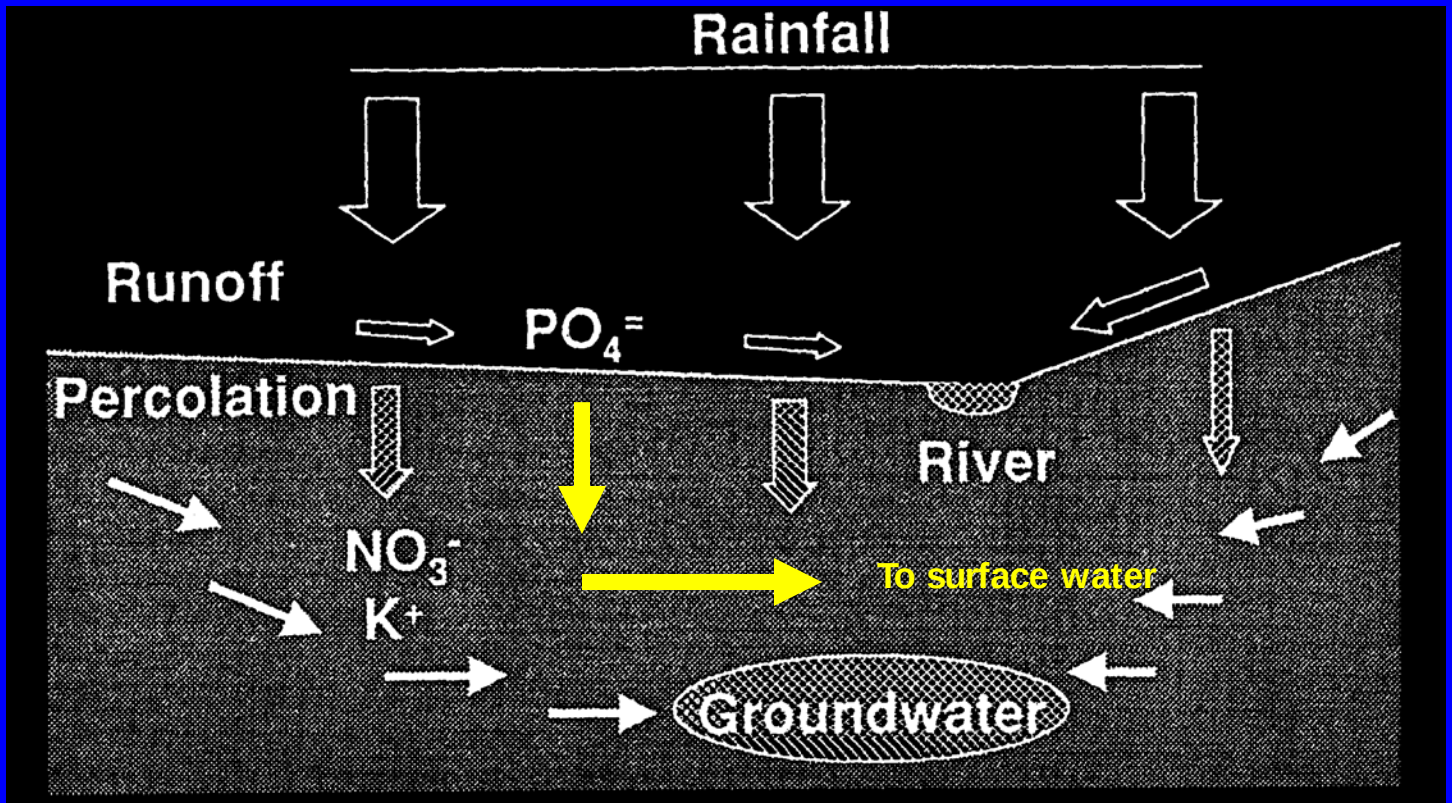


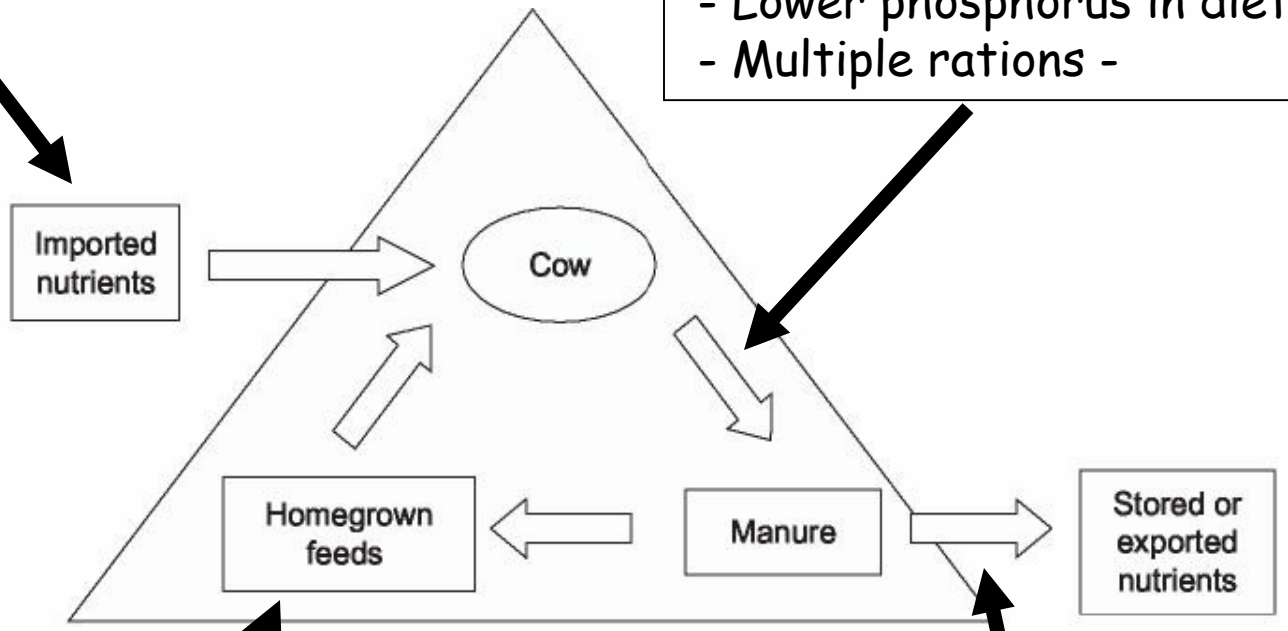
Figure 2. Effect of slope of the soil on the relative distribution of water to runoff and percolation. Runoff has major effects on quality of surface waters whereas leaching past the root zone has implications for quality of groundwater.

Feed Management

As a result of precision feeding, imported nutrients can be decreased

Feed Management (precision feeding)

- Better targeted protein requirement
- Lower phosphorus in diet
- Multiple rations -



Selection of forage type and acreage can impact need for imported nutrients

Capture phosphorus in easily exported form

fnmp$.net

Feed Nutrient Management Planning Economics

Welcome!

As of October 17, 2014 fnmp$.net is in beta testing mode as we complete the coding. Please send an e-mail to Joe Harrison at jhharrison@wsu.edu if you would like to serve as a beta-tester or want to know when the tool will be finalized.

fnmp$.net is a decision-aid software tool developed to connect feed decisions with crop nutrient management plans. FNMP$ stands for Feed Nutrient Management Planning economics. This tool estimates:

1. manure volume and nutrient content
2. land requirements for agronomic utilization of the manure
3. labor and land application equipment time requirements and travel distance of manure hauling
4. the costs associated with land application
5. the potential nitrogen and phosphorus nutrient value of manure
6. costs associated with feed changes

fnmp$.net has been developed over the last decade by a team including Rick Koelsch (Univ of Nebraska), Galen Erickson (Univ of Nebraska), Ray Massey (Univ of Missouri), Joe Harrison (Washington State University), Tamilee Nennich (Purdue University), Brian Richert (Purdue University), and Todd Applegate (Purdue University). In addition, the following graduate students provided contributions: Rebecca White, Aaron Jones, Andrea Watson, and Virgil Bremmer.

Contact

For more information about **fnmp$.net** contact:

You have logged in.

Getting started...

My Scenarios

Click on a scenario below to begin working with it.

werk	
swine	
werk as is	
poultry broiler as is	as is
poultry dry basis	dry basis
werk	as is
poultry hen	hen
swine lactating	

Return to My Scenarios

werk

Program Steps

1 Facilities 2 Animals 3 Manure 4 Crops 5 Economics

Facilities in this Scenario

Describe each of the facilities used in this scenario. Each facility is associated with one or more animal groups and the nutrient and solid retention factors common to those animals. The animal species, and the specifics of the manure management system, will be described in subsequent steps.

When you have finished adding facilities, proceed to Step 2.

Actions	Facility Description
	pens 1 and 2
	second one
	heifers

Add...

Animals in this Scenario

Feed Report

pens 1 and 2

Add another animal group...

pens 1 and 2

Animal Information

Description	pens 1 and 2
Number of animals	4,000
Average Body Weight (lb)	1,373.0

Feed Information

	Phase	Feed Intake (lbs/head/day)	Dry Matter (%)	Dietary Crude Protein (%)	Dietary Phosphorus (%)	Dietary Potassium (%)	Days in Milk	Average Milk Production (lb/day/animal)	Average Milk True Protein (%)	Feed Cost ($/head/day)
	lactating	55.0	100.0	15.0	0.3	1.5	150	80.0	3.0	9.0

Add...

	Phase	(lbs/head/day)	Matter (%)	Protein (%)	Phosphorus (%)	Potassium (%)	in Milk	(lb/day/animal)	Protein (%)	($/head/day)
	lactating	55.0	100.0	15.0	0.3	1.5	150	80.0	3.0	9.0

Add...

Manure Nutrients and Solids Summary for pens 1 and 2

Feed Phase	Dry Matter Excreted (lbs/yr)	Nitrogen Excreted (lbs/yr)	Phosphorus Excreted (lbs/yr)	Potassium Excreted (lbs/yr)	Manure Mass Excreted (lbs/yr)	Total Feed Cost ($/year)
First feed phase	31,378,434	1,921,323	124,100	1,040,980	241,372,571	$13,140,000
TOTAL:	**31,378,434**	**1,921,323**	**124,100**	**1,040,980**	**241,372,571**	**$13,140,000**

Explain these values

second one

Add another animal group...

dry cows

Animal Information

Description: dry cows

Number of animals: 200

Manure Management in this Scenario

Manure Report

Manure value

Fertilizer prices (per lb): N = $0.30 P = $0.27 K = $0.20

Manure Management for pens 1 and 2

Housing

Choose the type of housing and the percentage of solids and nutrients retained after housing.

Housing Type	Solids Retained (%)	Nitrogen Retained (%)	Phosphorus Retained (%)	Potassium Retained (%)
Free stall	100.0	84.0	100.0	50.0

Manure Handling

Describe the processing of manure and enter the percentage of solids and nutrients retained after processing.

Manure System Type		Solids Retained (%)	Nitrogen Retained (%)	Phosphorus Retained (%)	Potassium Retained (%)
Lagoon, solids removed before storage (12	primary	88.0	96.4	97.2	99.9
1-cell anaerobic treatment lagoon	liquid	100.0	30.0	100.0	100.0
Solids are composted and land-applied	solids	50.0	60.0	100.0	100.0

Describe the bedding used in the housing.

Bedding	Amount (lbs/head/day)	Nitrogen (%)	Phosphorus (%)	Potassium (%)
Shavings or sawdust	4.3	0.1	0.03	2.5

Retention of Nutrients and Solids for pens 1 and 2

	Solids	Nitrogen		Phosphorus		P205	Potassium		K20
Phase	lbs/yr	lbs/yr	$/yr	lbs/yr	$/yr	lbs/yr	lbs/yr	$/yr	lbs/yr
Manure	31,378,434	1,921,323		124,100		284,189	1,040,980		1,249,176
Manure after housing	31,378,434	1,613,911		124,100		284,189	520,490		624,588
Bedding	6,278,000	6,278		1,883		4,313	156,950		188,340
Manure plus bedding	37,656,434	1,620,189		125,983		288,502	677,440		812,928
Liquid after intermediate processing	27,613,022	1,555,810		120,625		276,232	519,970		623,963
Liquids after storage	**27,613,022**	**466,743**	**$140,023**	**120,625**	**$32,569**	**276,232**	**519,970**	**$103,994**	**623,963**
Solids to be composted	10,043,412	64,379		5,358		12,270	157,470		188,965
Solids after composting	**5,021,706**	**38,627**	**$11,588**	**5,358**	**$1,447**	**12,270**	**157,470**	**$31,494**	**188,965**

indicates manure which can be crop-applied.

Explain these values

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	Solids	Nitrogen		Phosphorus		P205	Potassium		K20
Phase	lbs/yr	lbs/yr	$/yr	lbs/yr	$/yr	lbs/yr	lbs/yr	$/yr	lbs/yr
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indicates manure which can be crop-applied.

Explain these values

Manure Management for second one

Crop Management

Crop Report

Manure Application

The fields below indicate the source and characteristics of harvested manure, and the method by which it is applied to crop fields.

Facility: pens 1 and 2

Manure Source	NH3 : Total-N	Organic-N : Total-N	Organic-N Availability (%)	Phosphorus Availability (%)	Moisture (%)	Application Method	Ammonium-N crop availability (%)
1-cell anaerobic treatment lagoon	80.0	20.0	70.0	100.0	92.0	Dragline with Inject	95.0
Composted solids	30.0	70.0	40.0	100.0	75.0	Surface Broadcast Soil conditions: Warm, Dry Soils Days to incorporation: 3	0.13

Facility: second one

			Organic-N	Phosphorus			Ammonium-N

General Crop System Properties

Average field size (acres) of crops in the area	200.0
Percentage of land in the region that is cropped	50.0
Percentage of cropped land availabe for manure application	25.0
Basis for determinining application rates	Nitrogen - 1 year

Crop Fields

					Nutrient Uptake (lbs/acre)		Nutrient Credit (lbs/acre)	
	Crop	% of crops	Yield, Dry-basis		N	P	N	P
🗑	High Moisture Forages - Alfalfa Hayl	25.0	5.0	tons/ac	109.0	50.0	0.0	0.0
🗑	High Moisture Forages - Corn Silage	50.0	7.0	tons/ac	180.0	63.6	0.0	0.0
🗑	Grains - Oats	25.0	80.0	bu/ac	62.6	18.6	0.0	0.0

Add...

Crop Summary

Nutrient Concentration and Application

	Manure Nutrient Concentration (crop available)				Crop Available Nutrients (lbs/yr)			Land Required (acres)	Manure Applied
Manure source	**N**	**P205**	**K20**		**N**	**P205**	**K20**		
pens 1 and 2: 1-cell anaerobic treatment lagoon	10.1	6.6	15.0	lbs/1000 gals	420,068.8	276,231.7	623,963.4	3,807.9	41,585,877 gals
heifers: 1-cell anaerobic treatment lagoon	0.5	2.1	4.1	lbs/1000 gals	25,704.3	102,368.2	204,779.0	233.0	49,537,747 gals
pens 1 and 2: Composted solids	1.1	1.2	18.8	lbs/ton	10,830.7	12,270.3	188,964.6	98.2	10,043 tons
second one: solids heap	1.0	37.0	50.1	lbs/ton	689.9	26,280.0	35,609.4	6.3	711 tons
heifers: Composted solids	0.0	0.7	3.5	lbs/ton	1.5	3,350.1	17,725.0	0.0	5,069 tons
TOTAL:					**457,295**	**420,500**	**1,071,041**	**4,145.4**	

Explain these values

Summary of Crop Results by Manure Source

	Nutrient Requirements (lbs/acre)	Land Required	Manure Applied	Estimated Manure Application Rate (units/acre)	Transport Distance

To begin, press the 'Create Estimate' button for any manure sources you would like to create manure application estimates for. The type of application depends on the Application Method selected for the manure source on the Crops page.

Economics Report

Towed Hose Application: Dragline with Injection Toolbar

Manure Source	pens 1 and 2 - 1-cell anaerobic treatment lagoon
Application equipment	Dragline with Injection Toolbar
Number of application rigs	15
Number of passes	1
Pipe/hose laydown speed (hr/mile)	2.0
Average field speed (mph)	1.0
Application swath width (ft)	12
Setup time per subfield (hr)	1.0
Maximum application rate (1000 gals/acre/pass)	27

Fuel, Labor, etc. costs — Fuel: $3.50, Labor: $15.00, Insurance: 2%, Interest: 7%, Lub: 10%

Big Gun Application: Big Gun Irrigation

gals/acre/pass)

Fuel, Labor, etc. costs — Fuel: $3.50, Labor: $15.00, Insurance: 2%, Interest: 7%, Lub: 10%

Big Gun Application: Big Gun Irrigation

Manure Source	heifers - 1-cell anaerobic treatment lagoon
Application equipment	Travelling Gun -Delivery Hose - 4
Number of traveling guns	10
Number of passes	1
Pipe/hose laydown speed (hr/mile)	2.0
Average pull speed (ft/min)	3.0
Irrigation spray spread width (ft)	250
Setup time per subfield (hr)	0.5
Maximum application rate (1000 gals/acre/pass)	27

Fuel, Labor, etc. costs — Fuel: $3.50, Labor: $15.00, Insurance: 2%, Interest: 7%, Lub: 10%

Spreader or Tanker Application: Surface Broadcast

Manure Source pens 1 and 2 - Composted solids

Summary of Agronomic Manure Application

Manure Application				Time Estimates			
Manure Source	Application Type	Land Required (acres)	Application Rate (per acre)	Total Application Time (hrs/yr)	Field Time (hrs/yr)	Road Travel Time (hrs/yr)	Load/Setup Time (hrs/yr)
pens 1 and 2 - Composted solids	Spreader or Tanker Application: Surface Broadcast by Tractor Pulled 10 ton spreader	98.2	326.0 tons	9,694.0	724.8	8,702.5	266.8
pens 1 and 2 - 1-cell anaerobic treatment lagoon	Towed Hose Application: Dragline with Injection Toolbar	3,807.9	34,807.6 gals	3,446.7	0	0	0
second one - solids heap	Spreader or Tanker Application: Surface Broadcast by Tractor Pulled 10 ton spreader	6.3	362.5 tons	686.4	51.2	616.3	18.9
heifers - Composted solids	Spreader or Tanker Application: Surface Broadcast by Tractor Pulled 10 ton spreader	0.0	1,170,175.0 tons	4,887.6	360.4	4,392.6	134.6
heifers - Composted solids	Spreader or Tanker Application: Surface Broadcast	0.0	1,170,175.0 tons	0.0	0	0	0

solids heap											
second one - solids heap	Oats	62.6	18.6	15.1	2.8	178 tons	64.5	0.5	tons	5.14	3.47
heifers - Composted solids	Corn Silage	180.0	63.6	64.1	0.0	2,535 tons	599,065.7	96.2	tons	5.14	3.47
heifers - Composted solids	Alfalfa Haylage, mid-bloom	109.0	50.0	139.8	0.0	1,267 tons	362,767.5	75.7	tons	5.14	3.47
heifers - Composted solids	Oats	62.6	18.6	15.1	0.0	1,267 tons	208,341.7	28.1	tons	5.14	3.47
TOTAL:					**5,187.6**						

Explain these values

* indicates selected application basis. When P-2 yr or P-4 yr application is selected, acres required are for 2 or 4 yrs total.

Crop Field Details

	Acres Manured	Crop Nutrients Required (lbs)			Crop Nutrients Applied (lbs)			Excess/Deficient Nutrients on Manured Acres (lbs)		
Crop		**N**	**P205**	**K20**	**N**	**P205**	**K20**	**N**	**P205**	**K20**
Alfalfa Haylage, mid-bloom	1,313	143,068	65,627	183,440	143,068	105,125	267,760	0	39,498	84,320
Corn Silage	1,590	286,135	101,101	101,890	286,135	210,250	535,521	0	109,149	433,630
Oats	2,285	143,068	42,509	34,540	143,068	105,125	267,760	-0	62,616	233,220

width	

Explain these values

Cost Estimates

Manure Application		Feed Cost	Nutrient Value			Application Cost			Net Value		
Manure Source	Application Type	Total ($/yr)	Total ($/yr)	Total ($/unit)	Total ($/head)	Total ($/yr)	Total ($/unit)	Total ($/head)	Total ($/yr)	Total ($/ton or 1000gals)	Total ($/head capacity)
pens 1 and 2 - Composted solids	Spreader or Tanker Application: Surface Broadcast by Tractor Pulled 10 ton spreader	$13,140,000	$44,529	$4 per ton	$11	$399,819	$40	$100	-$355,290	-$35	-$89
pens 1 and 2 - 1-cell anaerobic treatment lagoon	Towed Hose Application: Dragline with Injection Toolbar		$276,586	$7 per 1000 gals	$69	$708,862	$17	$177	-$432,276	-$10	-$108
second one - solids heap	Spreader or Tanker Application: Surface Broadcast by Tractor Pulled 10 ton spreader	$65,700	$9,550	$13 per ton	$48	$58,423	$82	$292	-$48,872	-$69	-$244

EQIP Funds