

# Manure Nutrients – Short Plan

## Cut Your Costs & Protect Your Water



### Cut Your Costs:

- ▶ 80% of farmers found they can **cut fertilizer costs** when using this type of manure plan.
- ▶ Manure can **save roughly \$10 to \$40 per acre\*** in first-year N fertilizer when using this plan.
- ▶ The carry-over N can **save another \$10 to \$20 per acre\*** in N fertilizer during the second cropping season after spreading manure.
- ▶ When soil tests show that more phosphorus is needed, added manure can often **save \$5 to \$20 per acre** in phosphorus fertilizer costs.
- ▶ This plan may help you **qualify for conservation program payments**, when combined with soil testing and accurate record-keeping practices.
- ▶ You can **double N fertilizer savings** by immediately incorporating manure.

\* Calculations based on 20 tons/acre solid manure.

### Protect Your Water:

- ▶ Follow this plan to **protect your well water and nearby surface waters**.
- ▶ Follow this plan to **meet state water quality rules** for N management and setbacks (if less than 300 animal units). Additional information is needed if you require a feedlot permit, or if you are over 300 animal units and do not use a commercial applicator.

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For more information go to [www.pca.state.mn.us/publications/wq-f8-07.doc](http://www.pca.state.mn.us/publications/wq-f8-07.doc)

# 1. Calibration:

## Know your manure application rate

**1<sup>st</sup> rate** - My rate is \_\_\_\_\_ (tons or 1,000 gallons) at normal tractor speed.

**2<sup>nd</sup> rate** - My rate is \_\_\_\_\_ (tons or 1,000 gallons) at slow tractor speed.

### Solid Manure:

**Step 1:** Weigh the spreader both empty and full. Subtract empty weight from full weight to determine tons of manure per load.

**Step 2:** See how many acres are covered by one load – multiply the distance traveled by the width of the spread.

*Example:*  $800 \text{ feet traveled} \times 20 \text{ foot width} = 16,000 \text{ square feet per load}$   
 $16,000 \text{ square feet} \div 43,560 \text{ square feet per acre} = 0.37 \text{ acres per load}$   
 $6 \text{ tons per load} \div 0.37 \text{ acres per load} = 16 \text{ tons/acre}$

**\*Alternative to step 2:** See how many loads it takes to cover a field when going at a known tractor speed

*Example:*  $30 \text{ loads} \times 6 \text{ tons/load} = 180 \text{ tons applied}$   
 $180 \text{ tons} \div 11 \text{ acres} = 16 \text{ tons/acre}$

### Liquid Manure:

**Step 1:** Determine 1000's of gallons hauled per load by multiplying tank volume by 90%.

**Step 2:** Determine acres covered per load using the same procedures as in step 2 for solid manure.

### WEIGHING YOUR SPREADER:

- Takes less than 20 minutes
- Contact your SWCD or NRCS office to find out how to get load cell scales and assistance.

# Calibrating Manure Spreaders Using Scales

## 1. Determine Manure Weight (per load):

	Full weight	-	Empty weight	=	Manure weight
Right front	_____		_____		
Left front	+ _____		+ _____		
Right rear	+ _____		+ _____		
Left rear	+ _____		+ _____		
Tongue*	+ _____		+ _____		
<b>Total</b>	<b>=</b> _____	<b>-</b>	<b>=</b> _____	<b>=</b>	_____ lbs

(\*Jack up tongue so weight is not on tractor)

Manure weight divided by 2,000 lbs/ton ÷ \_\_\_\_\_

or 8,400 lbs/1,000 gallons

*Tons or 1000's gallons of manure per load* = \_\_\_\_\_

### Example:

12,000 lbs

÷ 2,000 lbs/ton

= **6 tons/load**

## 2. Determine area covered:

Distance traveled by spreader \_\_\_\_\_ ft

Width of uniform spread pattern x \_\_\_\_\_ ft

Total area covered = \_\_\_\_\_ sq ft

Divide by square feet per acre ÷ 43,560 sq ft/acre

*Acres covered per load* = \_\_\_\_\_ acres

800 ft

x 20 ft

= 16,000 sq ft

÷ 43,560 sq ft/acre

= **0.37 acres/load**

## 3. Determine application rate:

*Tons or 1000's gallons of manure per load* \_\_\_\_\_

*Acres covered per load* ÷ \_\_\_\_\_ acres

**Tons or gallons/acre**

= \_\_\_\_\_

6 tons/load

÷ 0.37 acres/load

= **16 tons/acre**

Description of spreader:

Spreader setting:

Tractor Make and Model:

Tractor speed or gear setting:

## 2. Manure Analysis and Nutrient Availability

For more information about manure testing, go to <http://www.extension.umn.edu/distribution/cropsystems/DC6423.html>

Manure source \_\_\_\_\_

Date of analysis \_\_\_\_\_

Manure analysis

\_\_\_\_\_ lbs Nitrogen

\_\_\_\_\_ lbs P<sub>2</sub>O<sub>5</sub>

\_\_\_\_\_ lbs K<sub>2</sub>O

My application rate: \_\_\_\_\_

My application method is (circle):

Surface Applied

Knife Injected

Sweep Injected

How soon after application is manure incorporated?

Within 12 hours

12 hr to 4 days

More than 4 days

Nutrients available for crop:

		N		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
A	Lab analysis	_____lbs		_____lbs	_____lbs
B	Rate of application (tons or 1000's gals per acre)	X _____		X _____	X _____
C	Total applied (A X B)	= _____ lbs N		= _____ lbs P <sub>2</sub> O <sub>5</sub>	= _____ lbs K <sub>2</sub> O
D	Availability	*1 <sup>st</sup> Year N	**2 <sup>nd</sup> Year N	X 80 %	X 90 %
		X _____ % (table 1)	X 25% (15% if swine)		
	<i>Total nutrients available to crop (C X D)</i>	= _____ lbs 1 <sup>st</sup> yr N*	= _____ lbs 2 <sup>nd</sup> yr N**	= _____ lbs P <sub>2</sub> O <sub>5</sub> (compare to tables 4 & 5)	= _____ lbs K <sub>2</sub> O (compare to table 6)

\*1<sup>st</sup> crop following manure additions

\*\*2<sup>nd</sup> crop following manure additions

# 3. Crop Nitrogen Needs

Complete each row that fits your crop/manure scenarios

	Crop Scenario	Crop N Needs					N Additions		
		A. N needs before credits (see table 2)	B. Legume credit (see table 3)	C Crop N needs after legume credits (A – B)	D. 2 <sup>nd</sup> year manure N (see ** on previous page)	E. Crop N needs after legume & 2 <sup>nd</sup> yr manure credits (C – D)	F. 1 <sup>st</sup> year manure N (see * on previous page)	G. Starter nitrogen fertilizer	H. Additional N fertilizer needs (E – F – G)
✓ if applies:									
	1 <sup>st</sup> year corn after hay/alfalfa	_____ #	_____ #	_____ #	0 #	_____ #	_____ #	_____ #	_____ #
	2 <sup>nd</sup> year corn after alfalfa (no manure before 1 <sup>st</sup> yr corn)	_____ #	_____ #	_____ #	0 #	_____ #	_____ #	_____ #	_____ #
	2 <sup>nd</sup> year corn after alfalfa (manure applied before 1 <sup>st</sup> yr corn)	_____ #	_____ #	_____ #	_____ #	_____ #	_____ #	_____ #	_____ #
	Corn following corn - (no manure on previous year – no alfalfa 2 yrs ago)	_____ #	0 #	_____ #	0 #	_____ #	_____ #	_____ #	_____ #
	Corn following corn (manure on previous year corn – no alfalfa 2 yrs ago)	_____ #	0 #	_____ #	_____ #	_____ #	_____ #	_____ #	_____ #
	Corn following soybeans (manure or no manure on previous year)	_____ #	40 #	_____ #	0 #	_____ #	_____ #	_____ #	_____ #
	Other _____								
	Other _____								
	Example: 2 <sup>nd</sup> yr corn after alfalfa (manure applied before 1 <sup>st</sup> yr corn)	180	75	105 lb	40 lb	65 lb	50 lb	15 lb	0#

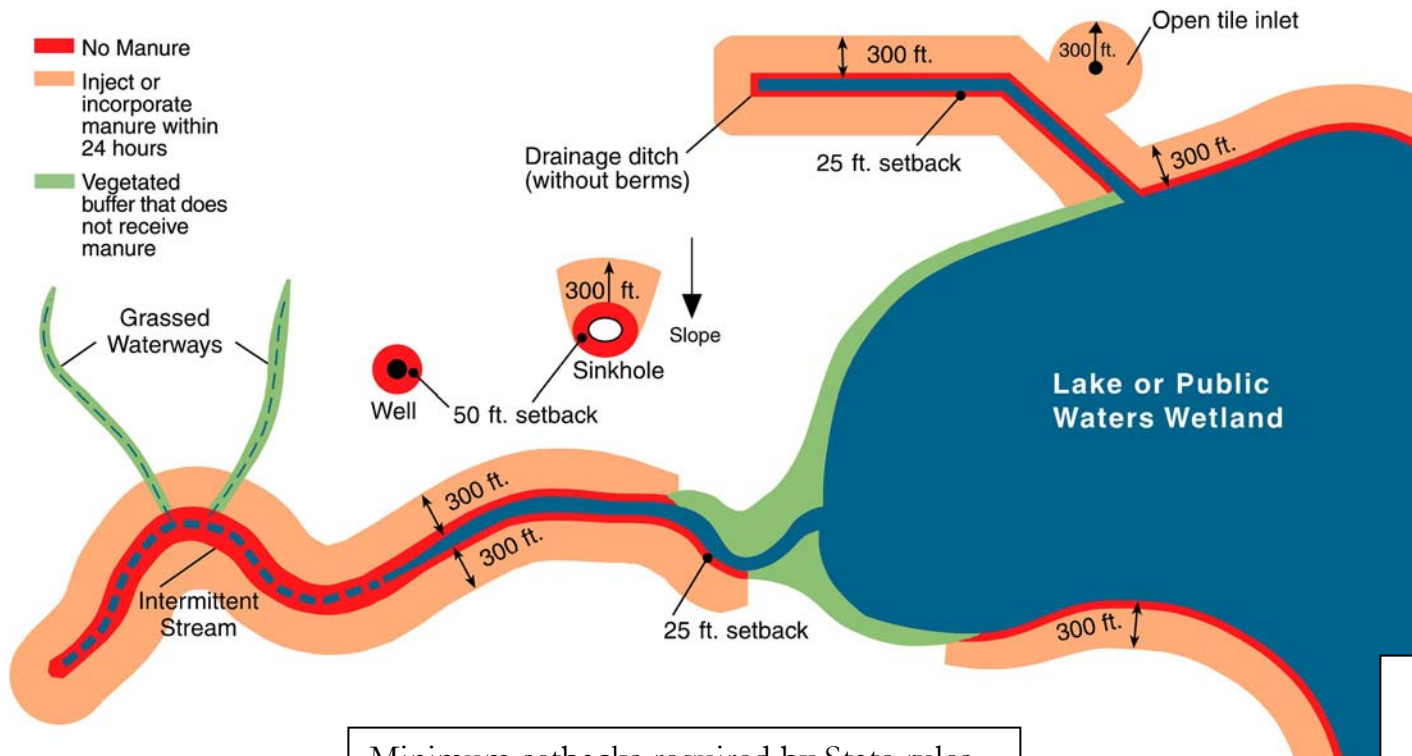
## 4. Environmental Setbacks

### Lakes, streams, intermittent streams, wetlands (10+ acres), & drainage ditches without berms

- No manure can be applied within 25 feet of the above listed waters.
- Within 300 feet from above listed waters, all manure must be incorporated before 24 hours and before rain.
- No manure can be applied within 300 feet when the ground is frozen or snow-covered.

### Open tile intakes

- Within 300 feet, all manure must be incorporated before 24 hours and before rain.



Minimum setbacks required by State rules.  
Local ordinances may be more restrictive.

### Wells, quarries, & sinkholes

- No manure within 50 feet.
- Near sinkholes, keep surface-applied manure 300 feet away if not immediately incorporated (upslope areas).

For more information on setbacks, see  
<http://www.pca.state.mn.us/publications/feedlots-manureapplication.pdf>

## 5. Tables

**Table 1. 1<sup>st</sup> year N availability from manure (%)**

	Incorp. After 4 days	Incorp. $\frac{1}{2}$ to 4 days	Incorp. Within $\frac{1}{2}$ day	Sweep inject	Knife inject
<b>Beef</b>	25	45	60	60	50
<b>Dairy</b>	20	40	55	55	50
<b>Swine</b>	35	55	75	80	70
<b>Poultry</b>	45	55	70	NA	NA

**Table 2. Crop N needs w/manure – before legume credit**

	Medium or Low productivity soils	High Productivity soils
Corn	100-140	130-180
Alfalfa	0	0
Soybeans	0	0
Wheat	80-105	130-170
Grass-legume	60	60

**Table 3. Legume N credits for corn (lbs)**

	Good quality	Average quality
<b>1<sup>st</sup> year after alfalfa</b>	150	100
<b>2<sup>nd</sup> year after alfalfa</b>	75	50
<b>Soybeans</b>	40	40
<b>1<sup>st</sup> year grass/legume hay</b>	75	75
<b>2<sup>nd</sup> year grass/legume hay</b>	0	0
<b>1<sup>st</sup> year after red clover</b>	75	75
<b>2<sup>nd</sup> year after red clover</b>	35	35

**Table 4. Phosphorus removal by crops**

Crop	P <sub>2</sub> O <sub>5</sub> removal	Crop	P <sub>2</sub> O <sub>5</sub> removal
Alfalfa	10.8 lbs/ton	Oats	0.25 lbs/bu
Alsike clover	10.5 lbs/ton	Peas	0.01 lbs/lb
Barley grain	0.41 lbs/bu	Potatoes	0.14 lbs/cwt
Canola	1.3 lbs/cwt	Red clover	10.8 lbs/ton
Corn	0.34 lbs/bu	Rye	0.44 lbs/bu
Corn silage	3.8 lbs/ton	Soybeans	0.82 lbs/bu
Edible beans	0.01 lbs/lb	Sugar beats	2.2 lbs/tons
Grass hay or pasture	8.9 lbs/ton	Sweet corn	11 lbs/ton
Grass/legume	11.2 lbs/ton	Wheat	0.53 lbs/bu

**Table 5. Crop P<sub>2</sub>O<sub>5</sub> needs (lbs)**

	6-10 Bray 4-7 Olsen	11-15 Bray 8-11 Olsen	16-20 Bray 12-15 Olsen	21+ Bray 16+ Olsen
Corn (175-200 bu) Broadcast	75	45	15	0
Corn (175-200 bu) Row	40	30	10-15	10-15
Alfalfa (6 ton)	65	40	15	0
Soybeans (50-60 bu)	60	35	15	0
Wheat (70-79 bu) Broadcast	50	25	0	0
Grass-legume (4 ton)	50	30	10	0

**Table 6. Crop K<sub>2</sub>O needs – based on soil test**

	Soil test K in ppm		
	41-80	81-120	121-160
Corn (175-200 bu)	135	80	35
Alfalfa (6 ton)	195	105	15
Soybeans (50-60 bu)	60	30	0
Wheat (70-79 bu)	125	75	0
Grass-legume	135	80	25

**Table 7. Mid-range rough estimates of typical manure nutrient content. Use actual manure nutrient analyses whenever possible.**

Livestock Type		Liquid			Solid		
		N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
		----- lb./1000 gal. -----			----- lb./ton -----		
<b>Swine</b>							
	Farrowing	15	12	11	14	6	4
	Nursery	25	19	22	13	8	4
	Gestation	25	25	24	9	7	5
	Finishing	58	44	40	16	9	5
<b>Dairy</b>							
	Cows	31	15	19	10	3	6
	Heifers	32	14	28	10	3	7
<b>Beef</b>							
	Cows	20	16	24	7	4	7
	Finishing Cattle	29	18	26	11	7	11
<b>Poultry</b>							
	Broilers	63	40	29	46	53	36
	Layers	57	52	33	34	51	26
	Tom Turkeys	53	40	29	40	50	30
	Hen Turkeys	60	38	32	40	50	30



**For more  
information:**

Go to  
<http://www.pca.state.mn.us/hot/feedlot-management.html>

Sources: Table 1. Manure Management in Minnesota, 2006; Table 2. Manure Management in Minnesota (draft), 2007; Table 3. Fertilizer recommendations for agronomic crops in Minnesota, 2001; Table 4. <http://npk.nrcs.usda.gov>; Table 5. Fertilizer recommendations for agronomic crops in Minnesota, 2001; Table 6. Fertilizer recommendations for agronomic crops in Minnesota, 2001; Table 7. Manure Characteristics, MWPS-18 Section 1, Midwest Plan Service, 2004