

MANURE UTILIZATION GUIDELINES



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**These 2001 Guidelines were reviewed by the following
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UME Cooperative Extension - Aroostook County
UME Cooperative Extension - Cumberland County
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UME Cooperative Extension - Hancock County
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Natural Resources Council of Maine
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Maine Farm Bureau
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Maine Forest Services
Maine Land Use Regulation Commission
State Planning Office
Aquaculture Association of Maine
Beef Industry Council of Maine
Beef Producer's Association of Maine
Brown Egg Council of New England
Dairy Industry Association
Deer & Elk Farmer's Association of Maine
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Equine Industry Association
Hog Grower's Association
Maine Horse Association
Maine Organic Farmers and Gardeners Association
Maine Sheep Breeders Association
Maine Department of Marine Resources
Maine Horse Association

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MANURE UTILIZATION GUIDELINES

November 1, 2001

These Guidelines replace The Maine Guidelines for Manure and Manure Sludge Disposal on Land, July 1972, published by the Life Sciences and Agriculture Experiment Station, University of Maine Cooperative Extension Service and the Maine Soil and Water Conservation Commission.

NUTRIENT MANAGEMENT PLAN

Maine law and Chapter 565, the Nutrient Management Rules, requires that many farms have and follow a Nutrient Management Plan, developed by or approved by a Certified Nutrient Management Planning Specialist, Certified by the Commissioner of the Department, in accordance with 7 MRSA Chapter 747 (see attachment 1 for farms required to have a Nutrient Management Plan).

For farms that are not required to have a Nutrient Management Plan and for those farms which have not chosen to voluntarily develop one, the following guidelines may be followed for storage and utilization of manure.

STANDARDS (Nutrient Management Plan not required)

1. CALCULATE CROP NUTRIENT NEEDS - The following should be considered when determining crop nutrient needs. Crop nutrient needs should be determined for each field and for each crop type:

- a. **Determine the nutrient content of your manure** - This should be done by sampling your manure and having it analyzed for N, $\text{NH}_3\text{-N}$, P_2O_5 , $\text{K}_2\text{O}+\text{H}_2\text{O}$. If you have more than one type of manure or storage method (liquid vs. field stacked), take samples from each storage area. You should also take into consideration N losses through volatilization, depending upon application method (up to 80% of ammonia N is available to the crop if incorporated within 2 days but only about 20% is available if not incorporated or incorporated after 7 days). Sampling should be done at least every 5 years or when there is a management change that affects manure nutrient values. It is critical that the sample be taken and handled properly or you will get an inaccurate reading. (See attachment 2 for manure sampling and handling procedure).
- b. **Soil test each field**- Each field should be soil tested at least once every 5 years to determine P, K, Mg, Ca and pH levels. N levels in the soil are not measured in the standard soil test because N is so mobile in some forms that the levels constantly change. For corn, you can do a soil N test for a crop that is in the early stages of growth but it is difficult to apply manure at that time. N needs are generally based

upon the crop needs but residual N from legumes and previous manure applications should be taken into consideration (see attachment 4 for calculating residual nitrogen contributions from legumes). If a field has a significant change in soil type, drainage or management practice, samples should be taken from each of the different areas in the field. Follow "Instructions on how to take a soil sample" by the University of Maine Plant and Soil Lab" (see attachment 3).

- c. **Determine the nutrient requirements for the crop**- Crop nutrient requirement should be based upon realistic yield goals for your specific soil types and cropping practices. Realistic yield goals for most major crops are listed on attachment 5. You can use actual yield goals that are in excess of those listed on the attached table if you can demonstrate that in 2 out of 5 years your average exceeded these thresholds. Application method and incorporation times must also be considered.
- d. **Use the N and P Priority Matrix** - To determine which nutrient to base manure application rates on, use attachment 6, N and P Priority Matrix. Supplement with other nutrient sources once the appropriate threshold has been exceeded.
- e. **Use manure as your primary source of plant nutrients** - Manure should be your primary source of nutrients for growing a crop. Other nutrient sources should only be used as a supplement to provide nutrients not supplied by the manure.

2. MANURE UTILIZATION - The following should be considered when utilizing manure on the farm as a soil amendment or nutrient:

- a. **Transportation method** - Choose a method to transport your manure that is appropriate for the type (consistency) of manure. It should not result in leakage or spillage that can become a nuisance or source of pollution.
- b. **Calibrate application equipment** - The equipment you use for spreading manure should be based upon the type of manure (consistency) you intend to spread. Regardless of the application equipment you use, it will need to be calibrated so that you only apply the nutrients needed to produce the desired crop. The equipment should be checked periodically (at least annually) to verify that the proper application rate is being applied. (See attachment 7, which is a chart for calculating manure spreading rate).
- c. **Time applications based on crop need** - To maximize nutrient uptake by a crop, the nutrients should be applied so that they are available when the crop needs them. Manure applied at times other than when the crop needs them should utilize techniques to maximize nutrient retention and availability for the crop to use when it is growing (as an example, grow a cover crop to uptake nutrients in the fall so they will be available to the crop the next spring when the cover crop is plowed down). Do not spread on frozen or snow covered ground.
- d. **Use correct application technique** - Start in the corner of the field furthest from the entry point so that you don't have to drive through it repeatedly before driving on a public road. Make sure spreader is spreading evenly. Do not overlap spreading patterns or turn around in the same area repeatedly while still spreading.

- e. **Buffers (setbacks)** - Use setbacks to create buffers as a way to protect water quality. Buffer widths should be determined on a site specific basis taking into consideration such factors as field slope, soil type, drainage, watershed size, row direction, cover crop, tillage method, sensitivity of water body, type of well, season manure is applied and rate of manure application. In lieu of site specific buffer widths, the following can serve as setback guidelines:

1. 25 feet from intermittent and perennial streams and rivers
2. 100 feet from lakes, ponds and marine water bodies
3. 100 feet from private wells and springs¹
4. 300 feet from public wells²
5. Avoid diversions, drainage ditches, gullies, non-vegetated swales and ravines
6. Avoid bedrock outcrops

3. GENERAL MANURE FIELD STACKING GUIDELINES - The Maine Department of Agriculture, Food and Rural Resources requires that Manure Field Stacking Sites be located by qualified professionals when they are part of a Nutrient Management Plan. If a Nutrient Management Plan is not required and has therefore not been developed, the Department recommends the following guidelines:

a. Applicability:

These guidelines have been developed to be used by persons with no field training or practical experience in the location and/or development of manure field stacking sites. They should only be used for farms with stackable manure (18% or more organic matter, dry weight). The setback numbers recommended in these guidelines are conservative because they are general in nature and do not take into consideration site specific conditions. If you wish to use site specific setbacks, they should be determined by a qualified professional (a person who has been trained and is experienced in developing site-specific field stacking plans).

b. General Recommendations:

1. Locate as many suitable field stacking sites as possible. This will allow for rotating between field stacking sites and/or stacking smaller amounts of manure in several locations as compared to larger amounts in fewer locations.
2. Unless otherwise necessary, only stack that amount of manure in a field that is needed to meet the field's nutrient requirements.
3. Only stack more manure in a field than is needed to meet the field's nutrient requirements when suitable stacking sites are not available on surrounding fields or when unable to access other field stacking sites due to weather, road or soil conditions.

1 Mandatory (except for farmer's own well) for people required to develop a Nutrient Management Plan.

2 Mandatory for people required to develop a Nutrient Management Plan.

c. Siting recommendations:

1. Choose a site which is on a knoll or high position in the landscape so that the soil does not have a high water table and does not receive much runoff. Sites which are mostly low and wet with only small knolls should be avoided or they should be evaluated by a qualified professional.
2. Do not stack manure on a site with less than 24 inches of soil between bedrock and the bottom of the manure pile. It may be possible to modify shallower soils but will require the assistance of a qualified professional.
3. Do not stack manure on sites where the soil is gravel or sand. It may be possible to modify such soils so that they can be stacked upon but will require the assistance of a qualified professional.
4. The stacking site should be on as level a slope as possible but should not be on a slope greater than 5%. With the assistance of a qualified professional, it may be possible to modify a site with greater than a 5% slope so that it can be stacked upon.
5. The stacking site should meet the following setbacks unless site specific set-backs have been developed by a qualified professional:

FEATURE

**SETBACK DISTANCE
WHEN FEATURE IS**

	<u>upslope</u>	<u>downslope</u>
Perennial (year round) Waterbodies	100'	300'
Intermittent (seasonal) Waterbodies	50'	200'
Private Water Supplies (not owners)	100	300'
Public Water Supplies (wells, lakes, ponds, rivers, springs)	500'	500'
Private Water Supplies (owners)	100'	200'
Property Line	100'	200'
Residences (neighbor)	300'	300'
Diversion	25'	150'
Gully/Swale/Ravine	25'	150'
One Hundred Year Flood Plain	Not Within	Not Within

If you can not locate a manure field stacking site which falls within all of these guidelines, you should contact a qualified professional. A qualified professional will take into consideration site specific conditions to identify and/or develop field stacking sites for your manure. They are also trained to modify existing site conditions, when necessary, to develop manure stacking sites in fields which would not otherwise have suitable sites. For a list of qualified professionals contact:

Maine Department of Agriculture, Food and Rural Resources
Office of Agricultural, Natural and Rural Resources
State House Station # 28
Augusta, Maine 04333
Phone(207) 287-1132

Attachment 1

(From Nutrient Management Rules, February 2001)

§1. §4. Nutrient Management Plans Required.

Unless exempted by statute or these rules, a person who owns or operates a farm shall have and implement an approved nutrient management plan for that farm if it meets one or more of the following criteria:

- A. The farm confines and feeds 50 or more animal units at any one time;³
- B. The farm utilizes more than 100 tons of manure per year not generated on that farm;
- C. The farm is the subject of a verified complaint of improper manure handling⁴;
- D. The farm stores or utilizes regulated residuals.

The nutrient management plan must be prepared by a certified NMP specialist or approved and signed by a certified NMP specialist, pursuant to the provisions of §7 of these rules.

³Note: This means that the farm confines and feeds any combination of animals totaling 50,000 lb. live animal weight. Without limitation, some examples are :

- 24 dairy cows (plus an equivalent number of young cattle) (1400 lb./mature animal)
- 35 dairy cows with no young cattle(1400 lb./animal)
- 50 beef cows (1000 lb./animal)
- 125 sows or finishing pigs (400 lb./animal)
- 1000 feeder pigs (50 lb./animal)
- 50 horses (1000 lb./animal)
- 500 sheep (100 lb./animal)
- 2800 turkeys (18 lb./animal)
- 10,000 laying hens/broilers (5 lb./animal).

⁴Note: Complaints are usually handled under the 'Right to Farm Law', 17 MRSA § 2805.

Attachment 2
MANURE SAMPLE INFORMATION FORM

Name: _____

Mailing address: _____

City: _____ State _____ ZIP: _____

Voice no. _____

Would you like your report faxed ?

If so, fax no. _____

Sample name: _____

Date Sample: _____

Analysis includes: percent moisture, total nitrogen, ammonia nitrogen, total phosphate and total potash. Include a check payable to "Analytical lab", to cover the \$25 analysis fee for each sample.

Results should be mailed back in are to two weeks time.

Check those items which best describe your situation:

KIND OF MANURE:

☐ Dairy ☐ Beef
☐ Swine ☐ Poultry
☐ Horse ☐ Sheep
☐ Other (List) _____

MATERIAL WILL BE HANDLED AS:

☐ Solid (results reported per ton)
☐ Liquid (reported per 1000 gal.)

Sampling Instructions

1) Timing: it is best to sample your manure at least one month before spreading. This allows time for lab turnaround and the development of a manure management program for your fields based on the results.

2) A PVC tube sampler is a handy device for sampling both semi-solid and liquid samples. Check with your local Extension or NRCS office. They may have one that you can borrow. If not, use a shovel or bucket.

3) Scrape any frozen or dried crust from the outside of the storage or pile. Agitate and thoroughly mix liquid storages before sampling.

4) The sample should be representative of the entire storage. Taking 3 to 4 subsamples uniformly distributed around the entire storage should be sufficient. Sample the entire depth profile of the storage if possible.

5) Solid/semi-solid samples: take 3 to 4 subsamples with a shovel or inner pipe only of the tube sampler. Be sure to include both manure and bedding in the sample. Place all subsamples in a clean bucket.

6) Liquid samples: take 3 to 4 subsamples with the sampling tube by inserting it vertically into the storage. Insert it with the holes covered, turn the inner tube to line up the slots and take the sample, turn it back to cover the slots and withdraw the tube. Empty the tube with the plug in the bottom into a clean bucket. Use a small bucket to sample liquid if no tube is available.

7) Thoroughly mix all subsamples in the bucket and fill a quart or pint mason jar. Leave at least one inch headspace in the jar and seal with an airtight screw-on lid. The headspace is critical to allow for expansion when the sample is frozen.

8) Keep the sample(s) cool until you can make arrangements for delivery to the lab. If you can't deliver the sample(s) to the lab on the same day, it is best to freeze it to prevent fermentation. It is possible to ship samples by UPS or Priority Mail if frozen and well insulated with newspaper. Ship early in the week. It may be possible to drop your sample(s) off at your local Extension or NRCS office for delivery to the lab. Check with them ahead of time to make arrangements.

Please mail form and sample(s) to: **Analytical Lab**
5722 Deering Hall
Orono ME 04469-5722

INSTRUCTIONS ON HOW TO TAKE A SOIL SAMPLE:

Soil is quite variable over a surprisingly small area. The following steps will help you get a soil sample that truly represents the area you want tested.

1 FORMS

Obtain information and sample boxes from the County Extension office. This form should be filled out as completely as possible. Sample forms may also be downloaded & printed from our web site: <http://anlab.umescd.maine.edu>

2 EQUIPMENT

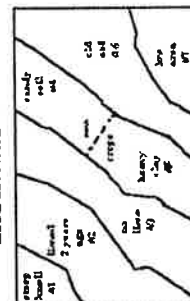
A soil sample can be taken with a probe, spade garden trowel, or soil auger.

3 DEPTH

Areas to be planted in row crops or seeded down should be sampled to plow depth (or about 8 inches.) Areas in soil, such as lawns or hayfields, should be sampled to a 3- or 4-inch depth. Areas under tree crops should be sampled to a 12-inch depth.

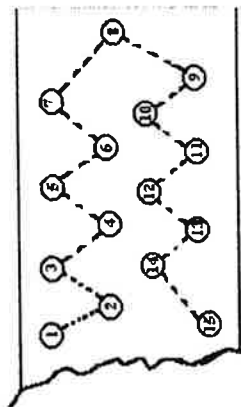
4 AREAS OF SAMPLING

Low spots, trouble spots, and areas with obvious differences in soil type should be treated as separate sampling areas. Also, areas that have been treated differently in the past should be sampled separately. In areas where past treatments and soil types are unknown, limit the sampling area to 8 acres in size. Make a permanent field sampling map for your reference when test results are returned.



5 TAKE A REPRESENTATIVE SAMPLE

Take soil from approximately 15 different spots in the sample area. Place this soil in a clean plastic bucket and mix thoroughly.



6 HOW MUCH IS NEEDED?

Fill a half-pint container from this bucket of well-mixed soil. Maine Soil Testing Service sample boxes are preferred. Your local Cooperative Extension office has soil test boxes.

7 LABEL THE CARTONS

The carton from each sample area should be identified on the side with the identification of the sample area and your test name. **DO NOT** put identification on top, because cartons are thrown away. Be sure identifying names agree with your map of sample areas, so when test results are returned they will be no question of where the samples were taken. Be sure the names on the cartons agree with the names on the information forms!

SOIL MANAGEMENT LEVELS

The typical pH management levels that are assumed to be optimum for field crops and for gardens and grounds in Maine are as follows:

- general agricultural crops - 6.5
- broccoli, cauliflower, or peas in potato rotation - 6.0
- commercial potatoes & other potato rotation crops - 5.5
- commercial beans and sweet corn - 6.0
- all other commercial vegetables - 6.5
- home gardens and organic crops - 6.5
- blackberries, other acid loving plants below 5.2 (corrected)
- all other commercial fruit - 6.0
- all turf - 6.0
- all forestry - 6.0
- shade trees - current pH
- shrubs (other than azaleas & rhododendrons) - 6.0
- all other ornamentals - 6.5

These are the "default" pH management levels. If for some reason you wish to manage your pH at some other level, please choose one of the alternative pH levels listed on page 1.

AVAILABLE ANALYTICAL SERVICES	PER SAMPLE
STANDARD SOIL TEST: Soil pH, available P, K, Ca, Mg; Organic Matter; Available Zn; field corn and potatoes only; Leaf Scan (gardens and grounds only); Exchangeable Na (on request); Lime and fertilizer recommendations	\$ 10.00
GREENHOUSE MEDIA TEST (for soils as potting mixes ONLY); Available P, K, Ca, Mg, no nutrients; Soluble salts; Nitrate (use greenhouse sample form if possible)	\$ 10.00
Standard leaf plus soluble salts	\$ 14.00
Standard test plus nitrate	\$ 16.00
Soil interpretation analysis and tissue testing are available on request. Contact the nearest cooperative extension office, or call 581-2917 or 581-2945. The current price list may also be viewed on our website: http://anlab.umescd.maine.edu .	

* PRICES SUBJECT TO CHANGE.

Attachment 4

RESIDUAL NITROGEN CONTRIBUTIONS FROM LEGUMES

Alfalfa:

First Year after Alfalfa

50% - 75% stand	110 lb./ ac.
25% - 49% stand	80 lb./ ac.
< 25% stand	40 lb./ ac.

Second Year after Alfalfa

50% - 75% stand	50 lb./ ac.
-----------------	-------------

Red Clover and Trefoil:

First Year after Clover or Trefoil

> 50% stand	100 lb./ ac.
25% - 49% stand	70 lb./ ac.
< 25% stand	40 lb./ ac.

RESIDUAL NITROGEN FROM MANURE ORGANIC MATTER

<u>When Applied</u>	<u>Percent of Total Organic N Available</u>	
	Poultry	Dairy or Other
Current Year	60%	*25% - 35%
1 Year Ago	10%	12%
2 Years Ago	5%	5%
3 Years Ago	5%	2%

*Use lower number for solid, higher number for liquid or slurry

AMMONIA-N LOSS TO VOLATILIZATION IF NOT INCORPORATED

Spring or summer applied

<u>Days until Incorporation</u>	<u>Percent of Total Ammonia-N available</u>		
	Poultry	Liquid Dairy	Solid Dairy
0 - 2	80	55	60
2 - 4	60	50	45
4 - 7	40	45	25
> 7	20	40	10

Attachment 5

Calculating Total Pounds of Nitrogen and P₂O₅ Required for Crop Growth:

The following tables should be used to calculate crop removal rates in Maine. **Note the dry matter of the indicated yields. Producer yields need to be adjusted accordingly.** Yield data must accompany any nutrient removal rates beyond the typical yield per acre listed.

Table 3. Typical Crop Nutrient Removal—Forage and Grain Crops

Crop (units)	lbs. Per unit of yield			Typical Yield Acre	Removal for given yield (lbs/acre)		
	N	P ₂ O ₅	K ₂ O		N	P ₂ O ₅	K ₂ O
Corn (bu)	75	0.4	0.3	120 (bu)	90	50	35
Corn silage(T) ¹	7.7	4.3	9.4	20 (T)	155	86	188
Forage Sorghum(T) ²	9	3	10	15 (T)	135	45	150
Sudangrass (T) ²	8	7	7	15 (T)	120	105	105
Alfalfa (T) ^{3,4}	50	15	50	5 (T)	250	75	250
Red Clover (T) ^{3,4}	40	15	40	3.5 (T)	140	55	140
Legume silage (T) ^{3,5}	13.3	5	13.3	14 (T)	186	70	186
Grass mixtures (T) ^{4,6}	40	15	50	4 (T)	160	60	200
Grass silage (T) ^{5,6}	13.3	5	16.6	12(T)	160	60	200
Wheat rye (bu)	1.5	1	1.8	60 (bu)	90	60	110
Oats (bu)	1.1	0.9	1.5	80 (bu)	90	70	120
Barley (bu)	1.4	0.6	1.5	75 (bu)	105	45	110
Soybeans (bu) ⁷	3.8	1	1.4	40 (bu)	150	40	56
Small grain sil. (T) ²	17	7	26	8.5 (T)	145	56	221
Pasture ⁸					100	30	50

Note: Adapted from Beegle, 1996 and Nutrient Recommendations for Field Crops in Vermont, 1998

1. 30% dry matter
2. 35% dry matter
3. Legumes can fix nitrogen. However, they are able to use nitrogen as indicated.
4. 90% dry matter or Hay equivalent (HE)
5. 30% dry matter
6. For grass/legume mixtures, use the predominant species in the mixture.
7. Includes straw
8. Yields are highly variable. Figures shown are for well managed pastures in rotation.

Typical Vegetable crop Removal Rates

For Vegetable crops removal rates and yields, consult the most recent version of the New England Vegetable Management Guide (available at your County Extension office)

N and P Manure Priority Matrix



Manure Application Guide

1. What is your manure application rate? From the chart below, select the (1) spreader capacity, (2) spreader pattern length, and (3) spreader pattern width for typical manure applications. Rate per Acre = Spreader Capacity X 43560 / (Width of Spread X Length of Spread)

Spread Width-->	2000 gallon tank :						2500 gallon tank :						3000 gallon tank :						3500 gallon tank :						4000 gallon tank :						4500 gallon tank :					
	10'	15'	20'	25'	30'	35'	10'	15'	20'	25'	30'	35'	10'	15'	20'	30'	40'	50'	10'	15'	20'	30'	40'	50'	10'	15'	20'	30'	40'	50'	10'	15'	20'	30'	40'	50'
Length	Liquid manure application rate (1000's of gallons per acre)																																			
600'	15	10	7	6	5	4	18	12	9	7	6	5	22	15	11	7	5	4	25	17	13	8	6	5	29	19	15	10	7	6	33	22	16	11	8	7
800'	11	7	5	4	4	3	14	9	7	5	5	4	16	11	8	5	4	3	19	13	10	6	5	4	22	15	11	7	5	4	25	16	12	8	6	5
1000'	9	6	4	3	3	2	11	7	5	4	4	3	13	9	7	4	3	3	15	10	8	5	4	3	17	12	9	6	4	3	20	13	10	7	5	4
1200'	7	5	4	3	2	2	9	6	5	4	3	3	11	7	5	4	3	2	13	8	6	4	3	3	15	10	7	5	4	3	18	11	8	5	4	3
1400'	6	4	3	2	2	2	8	5	4	3	3	2	9	6	5	3	2	2	11	7	5	4	3	2	12	8	6	4	3	2	14	9	7	5	4	3
1600'	5	4	3	2	2	2	7	5	3	3	2	2	8	5	4	3	2	2	10	6	5	3	2	2	11	7	5	4	3	2	12	8	6	4	3	2
1800'	5	3	2	2	2	1	6	4	3	2	2	2	7	5	4	2	2	1	8	6	4	3	2	2	10	6	5	3	2	2	11	7	5	4	3	2
2000'	4	3	2	2	1	1	5	4	3	2	2	2	6	4	3	2	2	1	8	5	4	3	2	2	9	6	4	3	2	2	10	7	5	3	2	2
2500'	3	2	2	1	1	1	4	3	2	2	1	1	5	3	3	2	1	1	6	4	3	2	2	1	7	5	3	2	2	1	8	5	4	3	2	2
3000'	3	2	1	1	1	1	4	2	2	1	1	1	4	3	2	1	1	1	5	3	3	2	1	1	6	4	3	2	1	1	7	4	3	2	2	1

Spread Width->	5000 gallon tank :					5500 gallon tank :					6000 gallon tank :					3 ton spreader (90 bushel)					4 ton spreader (120 bushel)					6 ton spreader (175 bushel)										
	10'	15'	20'	30'	40'	50'	10'	15'	20'	30'	40'	50'	10'	15'	20'	30'	40'	50'	10'	15'	20'	25'	30'	35'	10'	15'	20'	25'	30'	35'						
Length	Liquid manure application rate (1000's of gallons per acre)																																			
600'	36	24	18	12	9	7	40	27	20	13	10	8	44	29	22	15	11	9	22	15	11	9	7	6	29	19	15	12	10	8	44	29	22	17	15	12
800'	27	18	14	9	7	5	30	20	15	10	7	6	33	22	16	11	8	7	16	11	8	7	5	5	22	15	11	9	7	6	33	22	16	13	11	9
1000'	22	15	11	7	5	4	24	16	12	8	6	5	26	17	13	9	7	5	13	9	7	5	4	4	17	12	9	7	6	5	26	17	13	10	9	7
1200'	18	12	9	6	5	4	20	13	10	7	5	4	22	15	11	7	5	4	11	7	5	4	4	3	15	10	7	6	5	4	22	15	11	9	7	6
1400'	16	10	8	5	4	3	17	11	9	6	4	3	19	12	9	6	5	4	9	6	5	4	3	3	12	8	6	5	4	4	19	12	9	7	6	5
1600'	14	9	7	5	3	3	15	10	7	5	4	3	16	11	8	5	4	3	8	5	4	3	3	2	11	7	5	4	4	3	16	11	8	7	5	5
1800'	12	8	6	4	3	2	13	9	7	4	3	3	15	10	7	5	4	3	7	5	4	3	2	2	10	6	5	4	3	3	15	10	7	6	5	4
2000'	11	7	5	4	3	2	12	8	6	4	3	2	13	9	7	4	3	3	7	4	3	3	2	2	9	6	4	3	3	2	13	9	7	5	4	4
2500'	9	6	4	3	2	2	10	6	5	3	2	2	10	7	5	3	3	2	5	3	3	2	2	1	7	5	3	3	2	2	10	7	5	4	3	3
3000'	7	5	4	3	2	1	8	5	4	3	2	2	9	6	4	3	2	2	4	3	2	2	1	1	6	4	3	2	2	2	9	6	4	3	3	2

Spread Width-->	8 ton spreader (230 bushel)					10 ton spreader (290 bushel)					12 ton spreader (350 bushel)					14 ton spreader (410 bushel)					16 ton spreader (470 bushel)					18 ton spreader (530 bushel)				
	10'	15'	20'	25'	30'	35'	10'	15'	20'	25'	30'	35'	10'	15'	20'	25'	30'	35'	10'	15'	20'	25'	30'	35'	10'	15'	20'	25'	30'	35'
Length	Solid manure application rate (tons per acre)																													
600'	58	39	29	23	19	17	73	48	36	29	24	21	87	58	44	35	29	25	102	68	51	41	34	29	116	77	58	46	39	33
800'	44	29	22	17	15	12	54	36	27	22	18	16	65	44	33	26	22	19	76	51	38	30	25	22	87	58	44	35	29	25
1000'	35	23	17	14	12	10	44	29	22	17	15	12	52	35	26	21	17	15	61	41	30	24	20	17	70	46	35	28	23	20
1200'	29	19	15	12	10	8	36	24	18	15	12	10	44	29	22	17	15	12	51	34	25	20	17	15	58	39	29	23	19	17
1400'	25	17	12	10	8	7	31	21	16	12	10	9	37	25	19	15	12	11	44	29	22	17	15	12	50	33	25	20	17	14
1600'	22	15	11	9	7	6	27	18	14	11	9	8	33	22	16	13	11	9	38	25	19	15	13	11	44	29	22	17	15	12
1800'	19	13	10	8	6	6	24	16	12	10	8	7	29	19	15	12	10	8	34	23	17	14	11	10	39	26	19	15	13	11
2000'	17	12	9	7	6	5	22	15	11	9	7	6	26	17	13	10	9	7	30	20	15	12	10	9	35	23	17	14	12	10
2500'	14	9	7	6	5	4	17	12	9	7	6	5	21	14	10	8	7	6	24	16	12	10	8	7	28	19	14	11	9	8
3000'	12	8	6	5	4	3	15	10	7	6	5	4	17	12	9	7	6	5	20	14	10	8	7	6	23	15	12	9	8	7

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