Appendix 1

LAND APPLICATION OF MANURE
A supplement to Manure Management for Environmental Protection

MANURE APPLICATION RATE TABLES

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

MANURE APPLICATION RATE TABLE INSTRUCTIONS

How to use Manure Application Rate Tables to determine the manure application rate:

To use the Manure Application Rate Tables, the operator must know at least the type of manure, the crop to be grown and the realistic optimum crop yield. These charts have only been developed for the maximum annual phosphorous removal rate application of common manure types and crops found in Pennsylvania. If the operator would like to apply nutrients above the phosphorous removal rate (not to exceed the nitrogen needs of the crop), other manure types, or to other crops not included in the charts, the **Nitrogen or Phosphorus Balance Worksheets (NBS)** or the **Phosphorus Index (Option 3 on the Balance Sheet)** (developed by an authorized planner**)** must be used. The NBS is available from the DEP regional office, county conservation district, Penn State Extension office, Certified Nutrient Management Specialist or at https://extension.psu.edu/programs/nutrient-management/tools/sheet.

The guidance below provides a step-by-step example for determining manure application rates as a part of Manure Management Plan (MMP) development. See example Manure Application Rate Table (Figure 1).

1. Find the Manure Application Rate Table with the Crop Group that will receive the manure application identified in the upper left corner of the table.
    - In the example, the manure is being applied to Corn Silage. Therefore, the Corn Silage Manure Application Rate Table is used.
2. Identify the Manure Type being applied.
    - In the example, the manure being applied is Liquid Dairy.
3. Determine the realistic expected yield for the crop group. Then find the corresponding Yield Group at the top of the Manure Application Rate Table.
    - In the example, the corn silage has an expected yield of 23 ton/acre. Therefore, select the 22 ton/A" Yield Group. When the expected yield is between two yield groups, round down to the lower yield group.
4. Determine the intersection of the Manure Type row and the Expected Yield Group Column. This intersection is the maximum annual manure application rate for the crop group.
    - In this example the maximum manure application rate is 7,000 gal/acre. See the example Manure Application Rate Table (Figure 1).

IMPORTANT NOTE ABOUT THE MANURE RATE TABLES

No single application can exceed 9,000 gallons unless applied in accordance with § 83.294(e). If any application rates are greater than 9,000 gallons, then split the application into multiple applications with no evidence of pooling between applications.

Figure 1:

Corn Silage			**Expected Yield (T/ac, 65% moisture)**				
P removal rate	4	lbs. P_2O_5/T	17	22	27	33	38
Manure Type	**P_2O_5 Analysis**	**Analysis Units**	**Manure Application Rate (T/ac or gal/ac)**				
Solid Dairy	4	lbs./Ton	17	22	27	33	38
Liquid Dairy	13	lbs./1000 gal	5000	7000	8000	10000	12000
Solid Swine	10	lbs./Ton	7	9	11	13	15
Liquid Swine	20	lbs./1000 gal	3000	4000	5000	7000	8000
Layer	58	lbs./Ton	1	2	2	2	3
Broiler	43	lbs./Ton	2	2	3	3	4
Beef Cow/Calf	7	lbs./Ton	10	13	15	19	22
Beef Steer	5	lbs./Ton	14	18	22	26	30
Horse	5	lbs./Ton	14	18	22	26	30
Sheep and Goats	8	lbs./Ton	9	11	14	17	19
Turkey	55	lbs./Ton	1	2	2	2	3
Veal	13	lbs./1000 gal	5000	7000	8000	10000	12000

MANURE APPLICATION RATE TABLES - CORN

Corn Silage			**Expected Yield (T/ac, 65% moisture)**				
P removal rate	4	lbs. P_2O_5/T	17	22	27	33	38
Manure Type	**P_2O_5 Analysis**	**Analysis Units**	**Manure Application Rate (T/ac or gal/ac)**				
Solid Dairy	4	lbs./Ton	17	22	27	33	38
Liquid Dairy	13	lbs./1000 gal	5000	7000	8000	10000	12000
Solid Swine	10	lbs./Ton	7	9	11	13	15
Liquid Swine	20	lbs./1000 gal	3000	4000	5000	7000	8000
Layer	58	lbs./Ton	1	2	2	2	3
Broiler	43	lbs./Ton	2	2	3	3	4
Beef Cow/Calf	7	lbs./Ton	10	13	15	19	22
Beef Steer	5	lbs./Ton	14	18	22	26	30
Horse	5	lbs./Ton	14	18	22	26	30
Sheep and Goats	8	lbs./Ton	9	11	14	17	19
Turkey	55	lbs./Ton	1	2	2	2	3
Veal	13	lbs./1000 gal	5000	7000	8000	10000	12000

Corn Grain			**Expected Yield (Bu/ac)**				
P removal rate	0.4	lbs. P_2O_5/bu	110	150	190	230	270
Manure Type	**P_2O_5 Analysis**	**Analysis Units**	**Manure Application Rate (T/ac or gal/ac)**				
Solid Dairy	4	lbs./Ton	11	15	19	23	27
Liquid Dairy	13	lbs./1000 gal	3000	5000	6000	7000	8000
Solid Swine	10	lbs./Ton	4	6	8	9	11
Liquid Swine	20	lbs./1000 gal	2000	3000	4000	5000	5000
Layer	58	lbs./Ton	1	1	1	2	2
Broiler	43	lbs./Ton	1	1	2	2	3
Beef Cow/Calf	7	lbs./Ton	6	9	11	13	15
Beef Steer	5	lbs./Ton	9	12	15	18	22
Horse	5	lbs./Ton	9	12	15	18	22
Sheep and Goats	8	lbs./Ton	6	8	10	12	14
Turkey	55	lbs./Ton	1	1	1	2	2
Veal	13	lbs./1000 gal	3000	5000	6000	7000	8000

MANURE APPLICATION RATE TABLES – SMALL GRAIN

Small Grains (wheat/rye/oats/barley)			**Expected Yield (Bu/ac)**				
P removal rate	1	lbs. P_2O_5/bu	40	60	80	100	120
Manure Type	**P_2O_5 Analysis**	**Analysis Units**	**Manure Application Rate (T/ac or gal/ac)**				
Solid Dairy	4	lbs./Ton	10	15	20	25	30
Liquid Dairy	13	lbs./1000 gal	3000	5000	6000	8000	9000
Solid Swine	10	lbs./Ton	4	6	8	10	12
Liquid Swine	20	lbs./1000 gal	2000	3000	4000	5000	6000
Layer	58	lbs./Ton	1	1	1	2	2
Broiler	43	lbs./Ton	1	1	2	2	3
Beef Cow/Calf	7	lbs./Ton	6	9	11	14	17
Beef Steer	5	lbs./Ton	8	12	16	20	24
Horse	5	lbs./Ton	8	12	16	20	24
Sheep and Goats	8	lbs./Ton	5	8	10	13	15
Turkey	55	lbs./Ton	1	1	1	2	2
Veal	13	lbs./1000 gal	3000	5000	6000	8000	9000

Small Grain Silage			**Expected Yield (T/ac, 65% moisture)**				
P removal rate	7	lbs. P_2O_5/T	4	6	8	10	12
Manure Type	**P_2O_5 Analysis**	**Analysis Units**	**Manure Application Rate (T/ac or gal/ac)**				
Solid Dairy	4	lbs./Ton	7	11	14	18	21
Liquid Dairy	13	lbs./1000 gal	2000	3000	4000	5000	6000
Solid Swine	10	lbs./Ton	3	4	6	7	8
Liquid Swine	20	lbs./1000 gal	1000	2000	3000	4000	4000
Layer	58	lbs./Ton	0	1	1	1	1
Broiler	43	lbs./Ton	1	1	1	2	2
Beef Cow/Calf	7	lbs./Ton	4	6	8	10	12
Beef Steer	5	lbs./Ton	6	8	11	14	17
Horse	5	lbs./Ton	6	8	11	14	17
Sheep and Goats	8	lbs./Ton	4	5	7	9	11
Turkey	55	lbs./Ton	1	1	1	1	2
Veal	13	lbs./1000 gal	2000	3000	4000	5000	6000

MANURE APPLICATION RATE TABLES – COOL-SEASON GRASS HAY

Cool-Season Grass Hay			**Expected Yield (T/ac, dry hay equivalent, 10% moisture)**				
P removal rate	15	lbs. P_2O_5/T	3	4	5	6	7
Manure Type	**P_2O_5 Analysis**	**Analysis Units**	**Manure Application Rate (T/ac or gal/ac)**				
Solid Dairy	4	lbs./Ton	11	15	19	23	26
Liquid Dairy	13	lbs./1000 gal	3000	5000	6000	7000	8000
Solid Swine	10	lbs./Ton	5	6	8	9	11
Liquid Swine	20	lbs./1000 gal	2000	3000	4000	5000	5000
Layer	58	lbs./Ton	1	1	1	2	2
Broiler	43	lbs./Ton	1	1	2	2	2
Beef Cow/Calf	7	lbs./Ton	6	9	11	13	15
Beef Steer	5	lbs./Ton	9	12	15	18	21
Horse	5	lbs./Ton	9	12	15	18	21
Sheep and Goats	8	lbs./Ton	6	8	9	11	13
Turkey	55	lbs./Ton	1	1	1	2	2
Veal	13	lbs./1000 gal	3000	5000	6000	7000	8000