

AE-1187 (Revised)



Manure Application

PLANNING WORKBOOK

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USEFUL MANURE MANAGEMENT DATA

Table 1. Typical nutrient concentration of animal manures.

Species/Form	N	P ₂ O ₅	K ₂ O
Beef			
<i>Solid</i> – dirt lot		lb/ton	
– Cows	25	18	22
Dairy			
<i>Solid</i>		lb/ton	
– Cows	11	7	9
<i>Liquid</i>		lb/1000 gal	
– Anaerobic storage	22	14	20
Swine			
<i>Solid</i>		lb/ton	
– Finishing	13	13	9
<i>Liquid</i>		lb/1000 gal	
– Finishing	27	19	15
Sheep^a			
<i>Solid</i>		lb/ton	
– Sheep	20	13	27
Poultry, Turkey			
<i>Solid</i>		lb/ton	
– Turkeys	55	63	40

Source: "Determining Crop Available Nutrients from Manure," G97-1335A, University of Nebraska Cooperative Extension.

^a North Carolina State University

Table 2. Nitrogen availability by method of application and years since spreading.

		Broadcast/Incorporation			Injection	
		< 12 hours	< 4 days	None	Sweep	Knife
		% Total N				
Beef	Year 1	60	45	25	60	50
	Year 2	25	25	25	25	25
	Year 3	10	10	10	10	15
	Lost	5	20	40	5	10
Dairy	Year 1	55	40	20	55	50
	Year 2	25	25	25	25	25
	Year 3	10	15	15	15	15
	Lost	10	20	40	5	10
Swine	Year 1	75	55	35	80	70
	Year 2	10	10	10	10	10
	Year 3	5	5	5	5	5
	Lost	10	30	50	5	15
Poultry	Year 1	70	55	45	–	–
	Year 2	15	15	15	–	–
	Year 3	10	10	10	–	–
	Lost	5	20	30	–	–

Source: "Manure Management in Minnesota", FO-3553-C. University of Minnesota Extension Service.

Table 3. Phosphorus and potassium availability in the year of application.

Nutrient	Availability (%)
P ₂ O ₅	80
K ₂ O	90

Source: "Manure Management in Minnesota", FO-3553-C. University of Minnesota Extension Service.

Table 4. Nutrient removal rates.

Crop	Unit	Nutrient Removed			
		N	P ₂ O ₅	K ₂ O	
Grain crops		— lb/unit of yield (dry weight) —			
Barley	– grain	bu (48 lb)	0.87	0.37	0.25
	– straw	ton	15	5.0	30
Buckwheat	– grain	bu (48 lb)	0.79	0.34	0.26
	– straw	ton	16	2.3	54
Corn	– grain	bu (56 lb)	0.90	0.36	0.27
	– stover	ton	22	9.0	32
Oats	– grain	bu (32 lb)	0.62	0.25	0.19
	– straw	ton	13	7.3	40
Wheat		bu (60 lb)	1.25	0.85	0.37
		ton	13	3.2	23
Oil crops		— lb/unit of yield (dry weight) —			
Flax	– grain	bu (56 lb)	2.3	0.71	0.56
	– straw	ton	25	5.0	42
Canola	– grain	bu (50 lb)	1.8	0.90	0.46
	– straw	ton	90	20	81
Soybeans	– grain	bu (60 lb)	3.75	0.88	1.37
	– stover	ton	45	10	25
Sunflower	– grain	bu (25 lb)	0.89	0.98	0.33
	– stover	ton	30	8.2	70
Other crops		— lb/unit of yield (wet weight) —			
Sugar beets		ton	4.0	1.4	3.4
	– tops	ton	8.6	1.8	25
Potatoes		ton	6.6	2.7	12
Sweet corn		ton	18	11	14
Silage crops		— lb/unit of yield (dry weight) —			
Alfalfa haylage		ton	56	15	56
Corn silage		ton	22	11	26
Oat haylage		ton	32	13	23

continued

Crop	Unit	Nutrient Removed		
		N	P ₂ O ₅	K ₂ O
Forage crops		— lb/unit of yield (dry weight) —		
Alfalfa	ton	45	10	45
Big bluestem	ton	20	39	42
Bluegrass	ton	58	20	47
Bromegrass	ton	37	9.6	61
Indiangrass	ton	20	39	29
Little bluestem	ton	22	9.2	35
Orchardgrass	ton	29	9.2	52
Red clover	ton	40	10	40
Reed canarygrass	ton	27	8.2	NA
Ryegrass	ton	33	12	34
Switchgrass	ton	23	4.6	46
Timothy	ton	24	10	38
Wheatgrass	ton	28	12	64

Source: NRCS Agricultural Waste Management Field Handbook

Table 5. Fertilizer conversion factors.

To convert from:	To:	Multiply by:
P	P ₂ O ₅	2.29
P ₂ O ₅	P	0.44
K	K ₂ O	1.20
K ₂ O	K	0.83

Table 6. Commonly required conversions.

To convert from:	To:	Multiply by:
cubic feet	pounds	40 to 55
pounds	cubic feet	0.018 to 0.025
cubic feet	gallons	7.48
gallons	cubic feet	0.134
bushels	cubic feet	1.24

Worksheet 1. Previous manure applications and nitrogen credits.

Date ____/____/____

Field	Nitrogen credit from application before last season's crop				Nitrogen credit from application before crop 2 seasons ago				Previous Manure Credit (PMC) lb/a
	Manure N Analysis	Application Rate	% Available (Year 2)	N Credit	Manure N Analysis	Application Rate	% Available (Year 3)	N Credit	
	lb/ton or lb/1000 gal	ton/a or 1000 gal/a		lb/a	lb/ton or lb/1000 gal	ton/a or 1000 gal/a		lb/a	
CALCULATION/ REFERENCE:	AE-1189 SHEET 1, COL. 1	AE-1189 SHEET 2, COL. 4	TABLE 2	$(1) \times (2) \times (3) \div 100$	AE-1189 SHEET 1, COL. 1	AE-1189 SHEET 2, COL. 4	TABLE 2	$(5) \times (6) \times (7) \div 100$	$(4) + (8)$

COLUMN: (1) (2) (3) (4) (5) (6) (7) (8) (9)

Worksheet 2. Fertilizer recommendations and crop requirements.

Date ____/____/____

Field	Crop	Target Yield	Nitrogen Requirement	Soil Test Nitrogen (STN)	Sampling Date Adjustment (SDA)	Previous Crop Credits (PCC)	Previous Manure Credit (PMC)	Nutrient Requirements		
		bu/a, ton/a or lb/a	lb/a	lb/a			Net N	P ₂ O ₅	K ₂ O	
CALCULATION/ REFERENCE:			SF 882	SF 882	SF 882	SF 882	SHEET 1, COL. 9	(3) - [(4)+(5)+(6)+(7)]	SF 882 or TABLE 4	SF 882 or TABLE 4

COLUMN: (1) (2) (3) (4) (5) (6) (7) (8) (9) (10)

Worksheet 3. Determining the manure application rate.

Date ____/____/____

Field	Nutrient Requirement			Estimated Manure Analysis			% Availability			Nutrient Available			Target Manure Application Rate		
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
	lb/a			lb/ton, or lb/1000 gal			%			lb/ton, or lb/1000 gal			ton/a, or 1000 gal/a		
CALCULATION/ REFERENCE:	SHEET 2, COL. 8	SHEET 2, COL. 9	SHEET 2, COL. 10	AE-1189 SHEET 1, COL. 1	AE-1189 SHEET 1, COL. 4	AE-1189 SHEET 1, COL. 5	TABLE 2	TABLE 3	TABLE 3	(4) x (7) ÷ 100	(5) x (8) ÷ 100	(6) x (9) ÷ 100	(1) ÷ (10)	(2) ÷ (11)	(3) ÷ (12)

COLUMN: (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15)

Worksheet 4. Calculating residual/supplemental nutrient amounts.

Date ____/____/____

Field	Actual App. Rate ton/a or 1000 gal/a	Actual Manure Analysis			Actual Nutrient Application Rate			Difference			Years to Next Application	
		N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	P ₂ O ₅	K ₂ O
	lb/ton, or lb/1000 gal			lb/a			lb/a			lb/a		
CALC./ REF.:	AE-1189				(1) x (2) x SHEET 3, COL. 7 ÷ 100	(1) x (3) x SHEET 3, COL. 8 ÷ 100	(1) x (4) x SHEET 3, COL. 9 ÷ 100	(5) - SHEET 3, COL. 1	(6) - SHEET 3, COL. 2	(7) - SHEET 3, COL. 3	(6) ÷ SHEET 3, COL. 2	(7) ÷ SHEET 3, COL. 3

COLUMN: (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

For more information on this and other topics, see: www.ag.ndsu.nodak.edu



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