

Overview

Determining Nutrient Content of Land Applied Milk-Manure Mixtures

Overview: This technical guidance is considered an emergency response due to the COVID-19 event; it is neither offered nor approved for normal, everyday business practice. This planning tool will determine nutrients available for crops from milk and milk-manure solutions. The N-P-K values for liquid dairy manure and milk are based on nutrient values developed by Penn State. Milk and manure have different nitrogen availability factors, the nitrogen in milk is considered to be 100% available. The manure will have a nitrogen availability factor ranging from 20 to 50% based on incorporation timing.

Table 1 shows the N-P-K nutrient content per 1000 gallon of Milk-Manure Mixtures in various concentrations and based on different incorporation timings.

Table 1

Milk in Manure Nutrient Content Chart						
Component		Nutrient Content (pounds per 1000 gallons) Book Values				
		N	P ₂ O ₅	K ₂ O		
Milk Nutrient Content		44	18	15		
Dairy Liquid Manure Nutrient Content		28	13	25		
Manure Total Nitrogen Availability Factor		Manure Incorporation Timing and Nitrogen Availability				
		Same day	Within 1 day	2-4 days	5-7 days	>7 days
		0.50	0.40	0.35	0.30	0.20

Milk-Manure Mixture		Available pounds Nitrogen /1000 gallons Milk-Manure Mix					Pounds	Pounds
		Manure Incorporation Timing and Nitrogen availability					P ₂ O ₅ / 1000gal	K ₂ O / 1000 ga
% Milk	% Manure	Same day	Within 1 day	2-4 days	5-7 days	>7 days	Milk-Manure	Milk-Manure
		0.50	0.40	0.35	0.30	0.20	Mix	Mix
10	90	17	14	13	12	9	14	24
20	80	20	18	17	16	13	14	23
30	70	23	21	20	19	17	15	22
40	60	26	24	23	23	21	15	21
50	50	29	28	27	26	25	16	20
60	40	32	31	30	30	29	16	19
70	30	35	34	34	33	32	17	18
80	20	38	37	37	37	36	17	17
90	10	41	41	41	40	40	18	16
100	0	44	44	44	44	44	18	15

The nutrient available are determined using the following calculations:

Nitrogen Calculation:

$$\left(\frac{\text{Percent Milk}}{100} \times \text{Nitrogen in Milk} \right) + \left(\frac{\text{Percent Manure}}{100} \times \text{Nitrogen in Manure} \times \text{N Availability Factor} \right) = \text{Available Nitrogen} \frac{\text{Nitrogen}}{1000 \text{ gallons}}$$

Phosphate Calculation:

$$\left(\frac{\text{Percent Milk}}{100} \times \text{P2O5 in Milk} \right) + \left(\frac{\text{Percent Manure}}{100} \times \text{P2O5 in Manure} \right) = \frac{\text{P2O5}}{1000 \text{ gallons}}$$

Potash Calculation:

$$\left(\frac{\text{Percent Milk}}{100} \times \text{K2O in Milk} \right) + \left(\frac{\text{Percent Manure}}{100} \times \text{K2O in Manure} \right) = \frac{\text{K2O}}{1000 \text{ gallons}}$$

A planning tool has been developed to simplify the record keeping process of land applying milk and tracking the nutrients applied at a given application rate. The nutrients values applied can be added to a Nutrient Management Plan (NMP) or Nutrient Balance Sheet (NBS) in the starter or other nutrients applied column. This will provide the information needed to adjust the manure application rates planned separately from the milk or milk-manure mixture.

Complete the yellow cells below. Enter the Field Id to receive the manure. Select the percent milk-manure solution from the drop-down list that most closely represents your scenario. Selections are available from 10% milk-manure solution to 100% milk. Select the days to incorporation from the drop-down list. Enter the application rate in Gallons/Acre. This information will provide the total N-P-K nutrients applied. The values can be entered in a Nutrient Management Plan or Nutrient Balance Sheet as starter or other fertilizer to account for the nutrients applied from land application of milk or milk-manure mixture. It is recommend to print and save this for your records.

Milk-Manure Nutrient Calculator

[illegible]

Milk in Manure Nutrient Content Chart

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Milk Nutrient Content	44	18	15		
Dairy Liquid Manure Nutrient Content	28	13	25		
Manure Total Nitrogen Availability Factor	Manure Incorporation Timing and Nitrogen Availability				
	Same day 0.50	Within 1 day 0.40	2-4 days 0.35	5-7 days 0.30	>7 days 0.20

Milk-Manure Mixture		Available pounds Nitrogen /1000 gallons Milk-Manure Mix					Pounds P ₂ O ₅ / 1000gal Milk-Manure Mix	Pounds K ₂ O / 1000 gal Milk-Manure Mix
		Manure Incorporation Timing and Nitrogen availability						
% Milk	% Manure	Same day 0.50	Within 1 day 0.40	2-4 days 0.35	5-7 days 0.30	>7 days 0.20		
10	90	17	14	13	12	9	14	24
20	80	20	18	17	16	13	14	23
30	70	23	21	20	19	17	15	22
40	60	26	24	23	23	21	15	21
50	50	29	28	27	26	25	16	20
60	40	32	31	30	30	29	16	19
70	30	35	34	34	33	32	17	18
80	20	38	37	37	37	36	17	17
90	10	41	41	41	40	40	18	16
100	0	44	44	44	44	44	18	15

Option 1 P Removal	Corn Grain Milk Land Applied Dairy Liq. Spring		
Option 2 Nitrogen Based Nutrient Balance Sheets			
Crop Group Identification			
Fields	DFW-1A		
Acres	10		
NBS Option	Option 2 Nitrogen Requirement		
Mehlich 3 Soil Test P For Option 2 enter maximum Soil Test For Option 3 enter soil test for PI	ppm P		
	121		
P Index Part A Evaluation			
Part A Result			
Crop	Corn for Grain		
Planned Yield	180 bu/A		
Crop Removal Recommendations (lb/A)	N	P2O5	K2O
	180	72	54
Soil Test Recommendation (lb/A)			
Other Nutrients Applied (lb/A) (Nutrients applied regardless of manure)	87	47	60
P Index Application Method			
Double Crop Carry Over N (lb/A)	0		
Manure History Description Residual Manure N (lb/A)	20	Frequently - Summer Crop	
Legume History Description Residual Legume N (lb/A)	0	No Previous Year Legume	
Net Nutrients Required (lb/A)	73	25	-6
Manure Group	Liquid Dairy		
Units	lb/1000 gal		
Manure Nutrient Content (lbs/ton or 1000 gal)	N	P2O5	K2O
	28.00	13.00	25.00
Application Season: Management (Incorporation, cover crops, etc.)	Spring: Spring or summer utilization- Incorporation after 7 days or none		
Availability Factors (Total N or NH4-N & Organic N)	Total N	NH4-N	Org. N
	0.20		
P Index Application Method			
N Balanced Manure Rate (ton; gal/A)	13,036 gal/A		
P Removal Balance Manure Rate (ton or gal/A; If required by P Index)	1,923 gal/A		
	Crop P Removal (lb/A) 25.0		
P Index Value			
Planned Manure Rate (ton or gal/A)	5000 gal/A		
Nutrients Applied at Planned Manure Rate (lb/A)	28	65	125
Nutrient Balance after Manure	45	-40	-131
Supplemental Fertilizer (lb/A)	45	0	0
P Index Application Method			
Final Nutrient Balance (lb/A)	0	-40	-131
Multiple Application			
Soil test or Crop Removal	Nutrient Balances for P2O5 and K2O are based on Crop Removal and SHOULD NOT be used to determine additional fertilizer needs		