Estimating N Availability in Compost

Monday November 9, 2020

Margaret Lloyd

UCCE Small Farms Advisor

Yolo, Solano and Sacramento Counties


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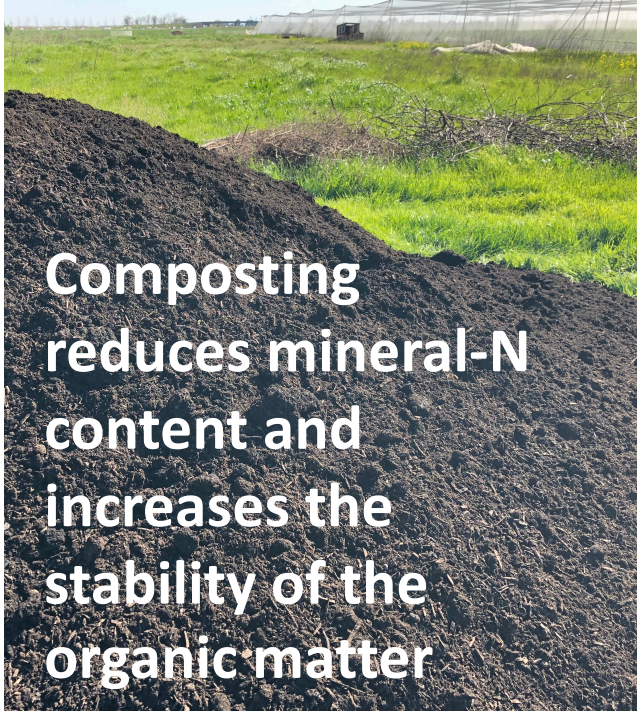
Composting reduces mineral-N content and increases the stability of the organic matter


950F

Table 5. *Potential N availability from different types of organic amendments under warm, moist conditions.*

Material	Typical %N	Typical C:N ratio	N available after 12 weeks	Releases in:
Municipal yard trimmings composts	0.5 - 2	13 - 20	-3% - 4%	Years
Poultry manure composts	2 - 5	6 - 8	30 - 35%	Weeks-months

Compost


Yard trimming
Manure

Availalble N
(% of amendment N)
100
80
60
40
20
0
Composted poultry manure
Composted yard trimmings
0
3
6
9
12
Weeks after incorporation

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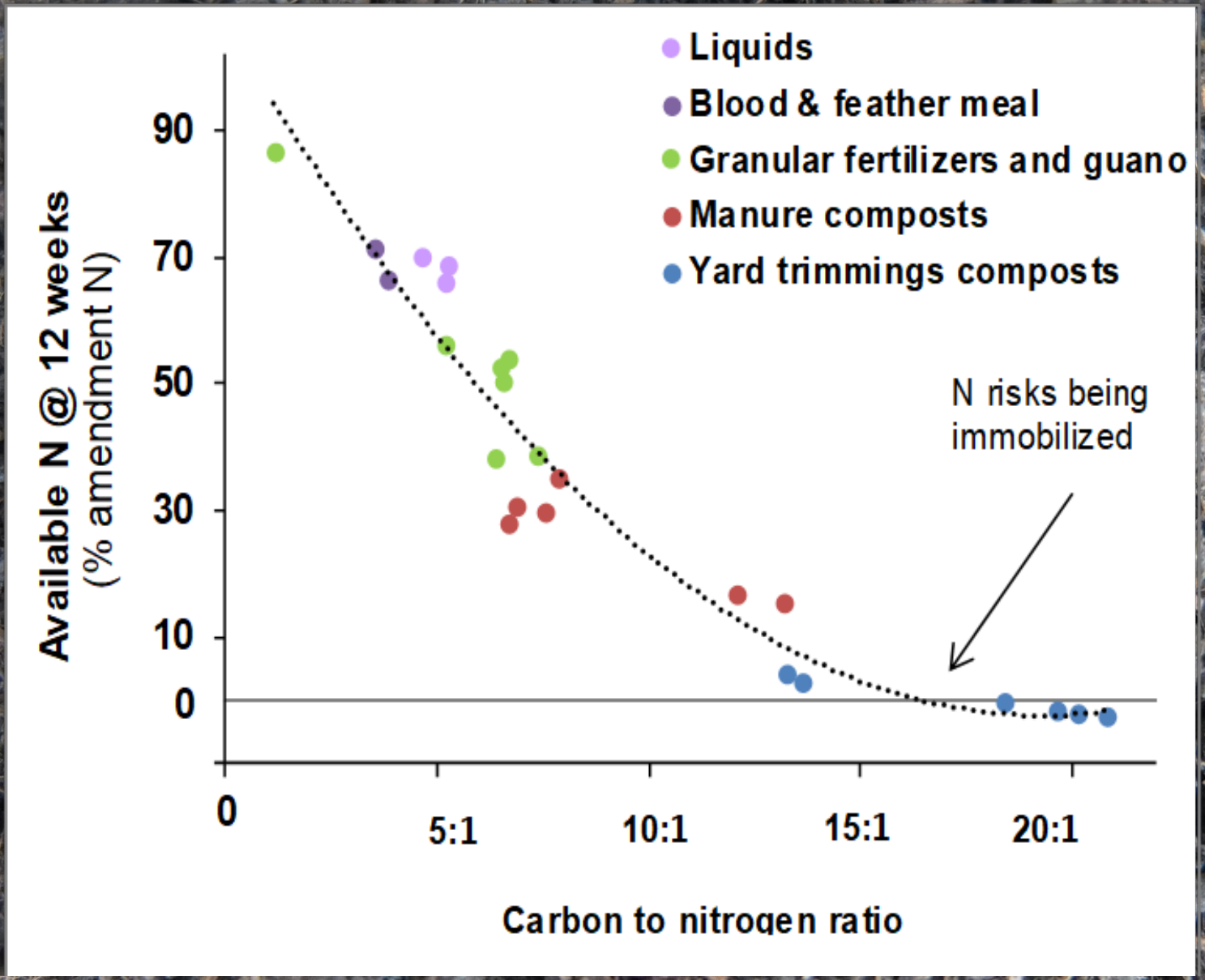
Liquids
Blood & feather meal
Granular fertilizers and guano
Manure composts
Yard trimmings composts
Available N @ 12 weeks
(% amendment N)
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N risks being
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5:1
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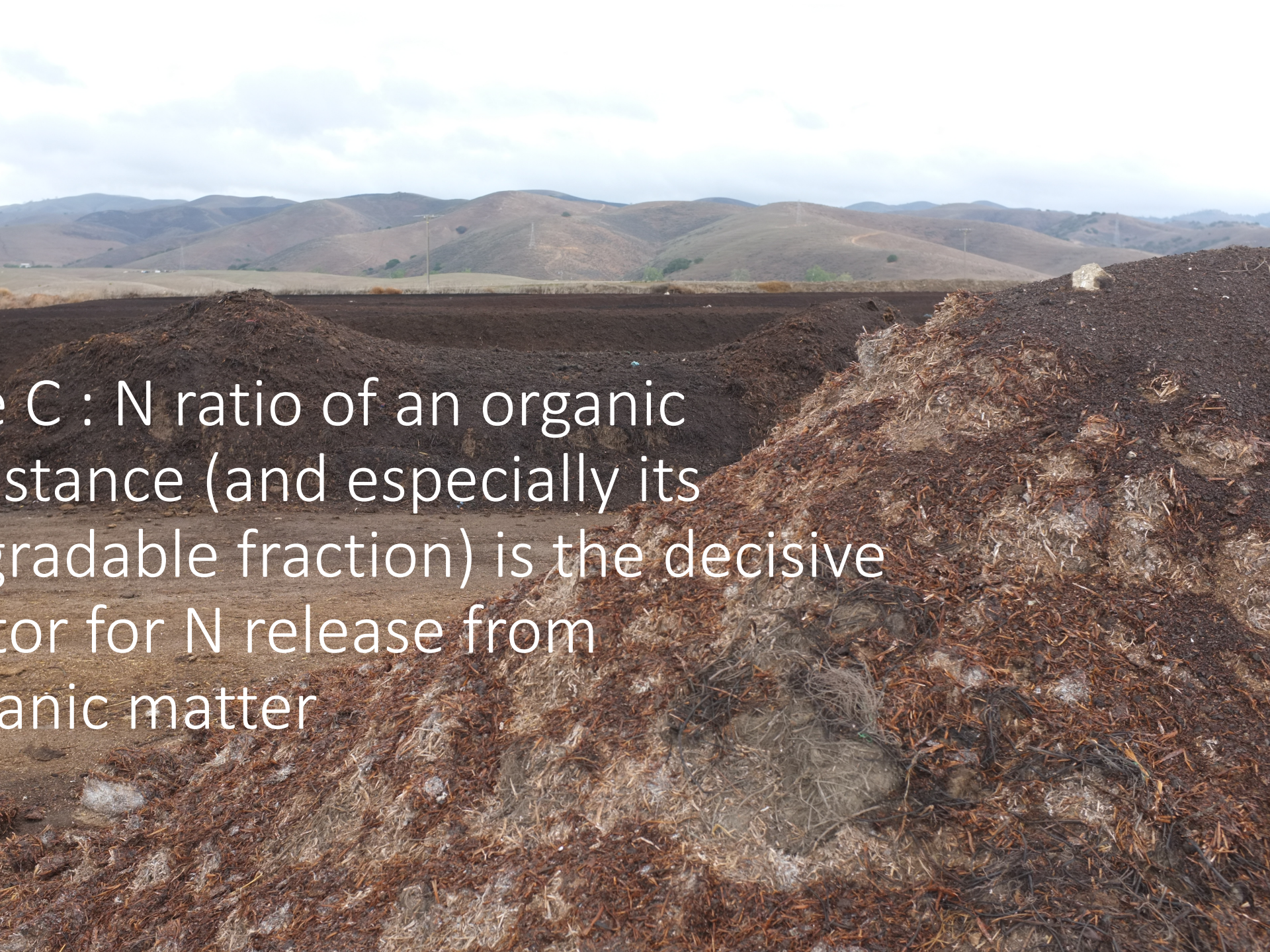
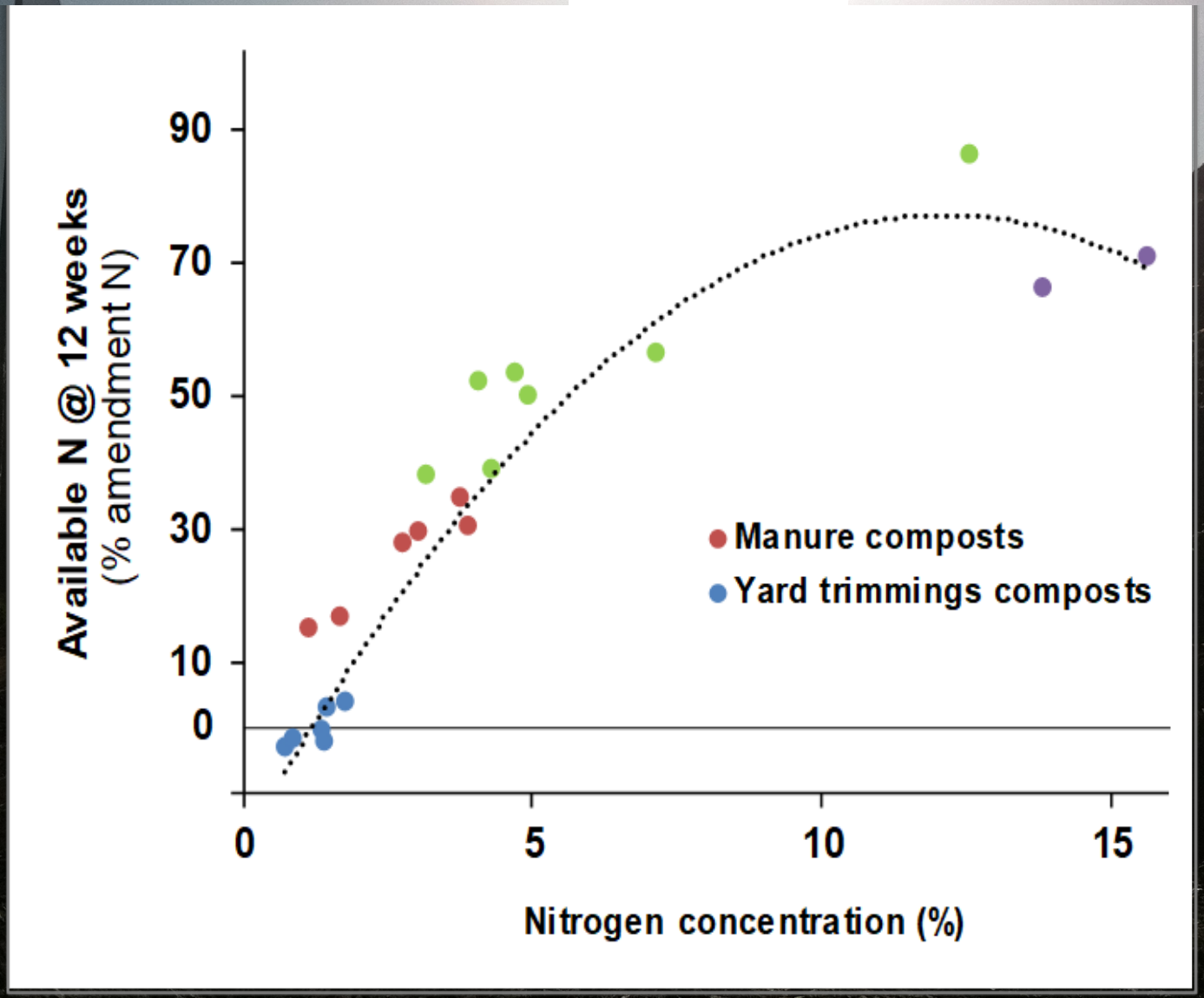
15:1
20:1
Carbon to nitrogen ratio


e C : N ratio of an organic
stance (and especially its
gradable fraction) is the decisive
tor for N release from
anic matter


Available N @ 12 weeks
(% amendment N)
90
70
50
30
10
0
0
5
10
15
Nitrogen concentration (%)
Manure composts
Yard trimmings composts

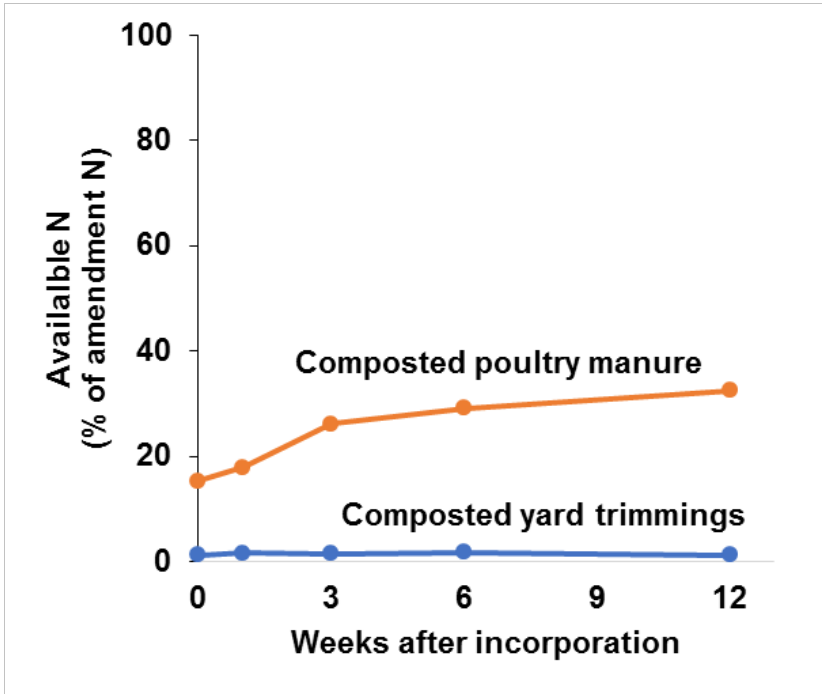
High mineral-nitrogen contents usually lead to good short-term N availability

Mineral nitrogen = ammonium (NH_4^+) and nitrate (NO_3^-).

↑ ammonium content of compost

II

↑ N availability (short term)



Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Spent mushroom compost

Date Reported 12/22/2017
Date Submitted 12/19/2017

Total N: 1.75%
1.22 lb ammonia-N per 35lb total N = 3.5%
C:N 22:1
58.5% moisture

The reported analysis was requested for the following:
Location : MUSHROOM COMPOST Site ID : 12/19/17.
Thank you for your business.

* For future reference to this analysis please use SUN # 75864-158259.

TOTAL NUTRIENT ANALYSIS FOR COMPOST

Physical Characteristics

pH	7.63	
Electrical Conductivity	13.53	mmho/cm
Total Disolved Salts	8659.20	ppm
Percent Moisture	58.50	%
Bulk Density (Dry)	322	lb/cu.yd

Sample analysis is based on dry weigh

Chemical Analysis	Analytical Results		Results in lb/ton (Dry)
Total-N	1.75	%	35.00
Ammonia-N	607.8	ppm	1.22
Phosphorus-P	0.89	%	17.80
Phosphorus-P2O5	2.04	%	40.76
Potassium-K	2.05	%	41.00
Potash-K2O	2.46	%	49.20
Sulfur-S	0.78	%	15.60
Magnesium	0.69	%	13.80
Calcium	7.83	%	156.60
Sodium	17356.2	ppm	34.71
Copper-Cu	134.05	ppm	0.27
Iron-Fe	2811.17	ppm	5.62
Manganese-Mn	479.87	ppm	0.96
Zinc-Zn	260.33	ppm	0.52
% Organic Matter	76.5		
C/N Ratio	22.7		

A & L WESTERN AGRICULTURAL LABORATORIES

1311 WOODLAND AVE #1 • MODESTO, CALIFORNIA 95351 • (209) 529-4080 • FAX (209) 529-4736

Part manure, part yard trimmings compost

LAB NO: 20231 DATE: 07/06/2018

ORGANIC FERTILIZER REPORT

SAMPLE ID	REPORT OF ANALYSIS IN PERCENT									REPORT OF ANALYSIS IN PARTS PER MILLION						
	Nitrogen N	Phosphorus P	Phosphate P_2O_5	Potassium K	Potash K_2O	Sulfur S	Magnesium Mg	Calcium Ca	Sodium Na	Iron Fe	Aluminum Al	Manganese Mn	Copper Cu	Zinc Zn	B	
AB	2.09	0.72	1.65	0.990	1.193	0.910	0.700	4.570	0.170	10180	3521	502	100	286	28.0	

SAMPLE ID	POUNDS OF NUTRIENTS / TON															
	Nitrogen N	Phosphorus P	Phosphate P_2O_5	Potassium K	Potash K_2O	Sulfur S	Magnesium Mg	Calcium Ca	Sodium Na	Iron Fe	Aluminum Al	Manganese Mn	Copper Cu	Zinc Zn	B	
AB	41.8	14.4	33.0	19.8	23.9	18.2	14.0	91.4	3.4	20.4	7.0	1.0	0.2	0.6	<0.1	

☐ Reported on an as-received basis Moisture =

☒ Reported on a dry basis Moisture = 38.21%

pH = 6.9
C:N Ratio = 11:1
Soluble Salts = 14.5 dS/m
Organic Matter = 42.45 %
Chloride = 0.29 %

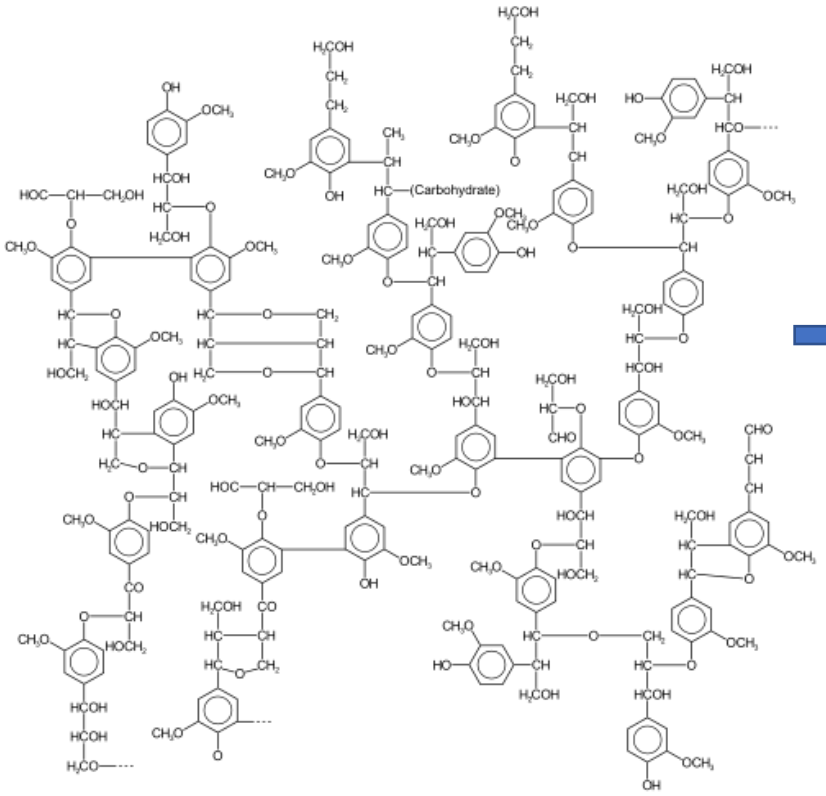
Remarks: To convert to pounds of nutrients/ton as received, multiply pounds of nutrients/ton as reported by (100 - moisture %)/100.

Robert Butterfield
A & L WESTERN LABORATORIES, INC.

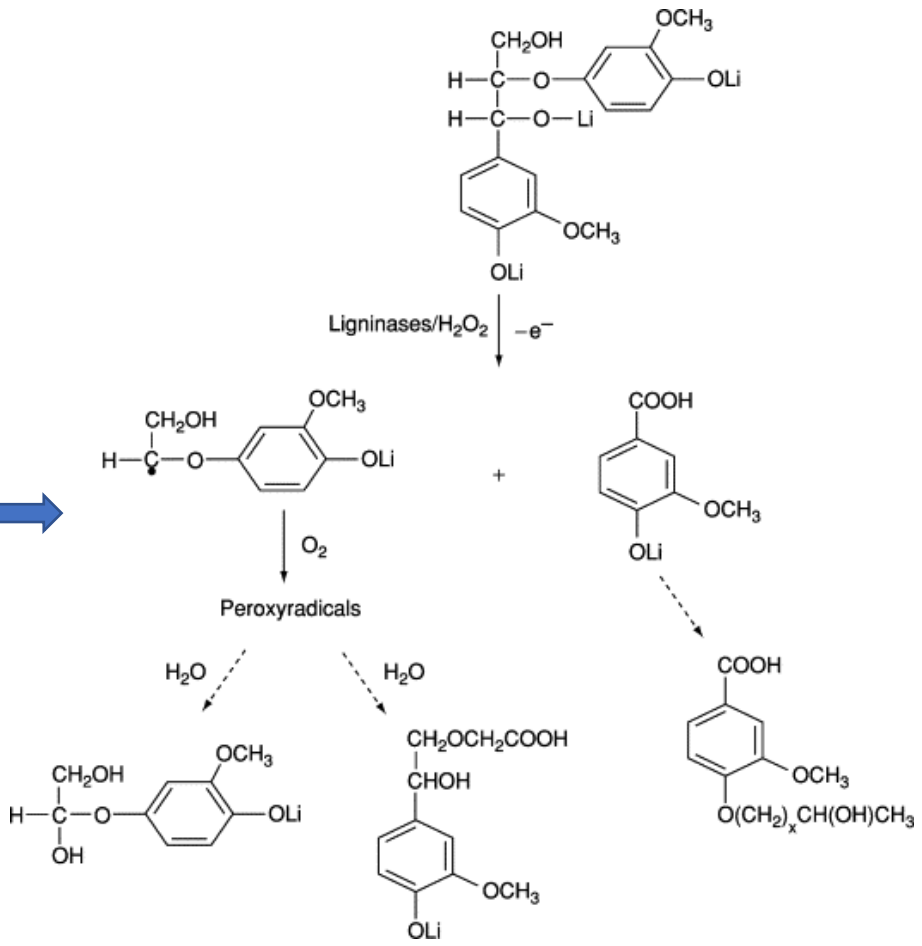
Why do some of the high N products have lower availability rates?

- Consider the amount of lignin… which is still the C:N
- It is suggested that N in lignin fraction is resistant to mineralization as lignin/N ratio is negatively correlated with mineralization rate

Lignin affects the enzymatic hydrolysis of biomass because it forms a physical barrier to attack by enzymes. Lignin is covalently bonded to polysaccharides in the intact plant cell wall, thus reducing accessible surface area of cellulose.



Lignin example



Structural features of a microbially attacked lignin. Li, residues of lignin; •, radical (unpaired electron).

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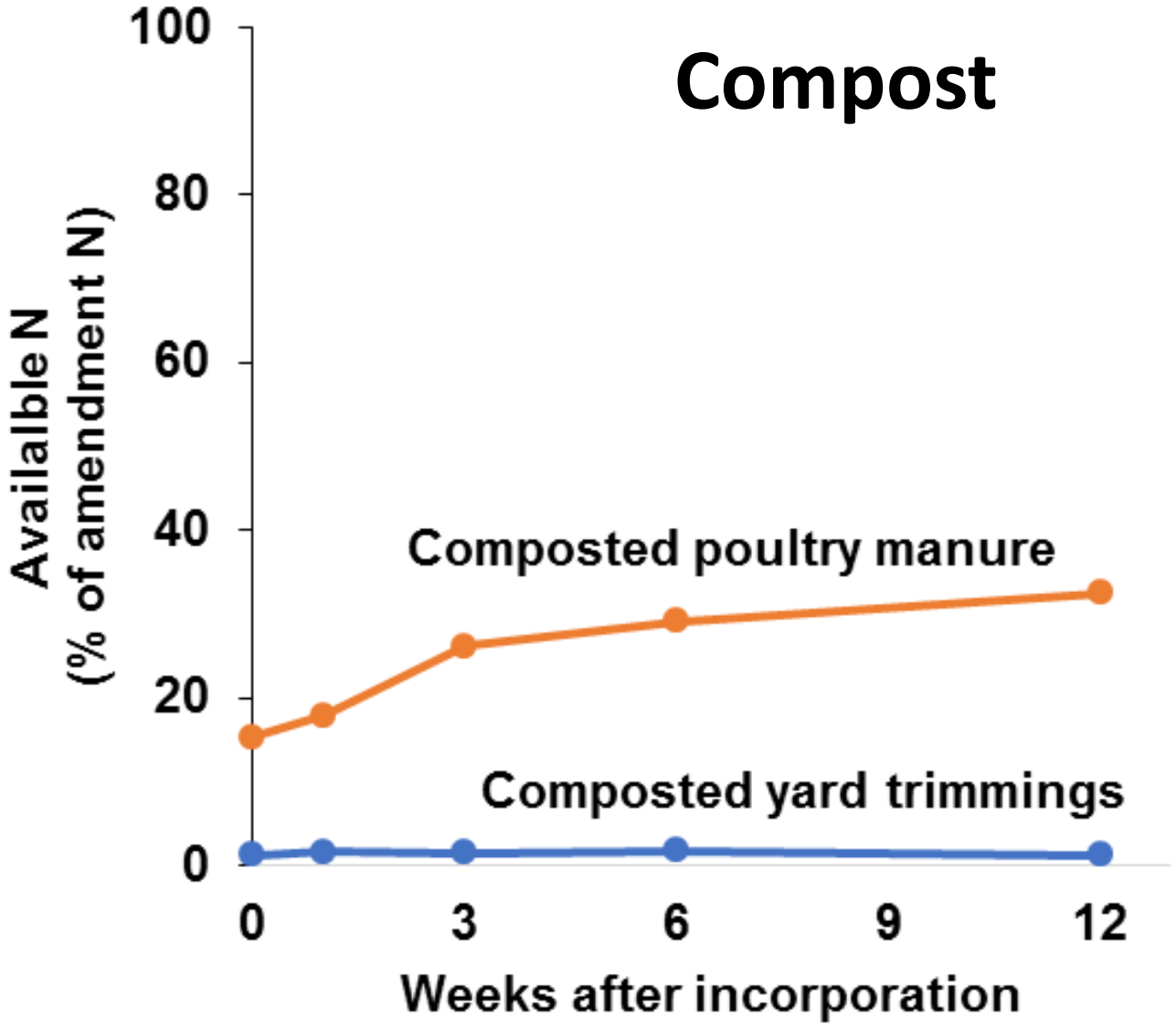
- It is suggested that N in lignin fraction is resistant to mineralization as lignin/N ratio is negatively correlated with mineralization rate
- The lignin/N ratio was higher with
  - Alfalfa pellets (2.63)
  - Than partially composted manure (0.62)
  - whereas bloodmeal, being an animal tissue, does not contain lignin

Sufficient water availability for the microbes

Compost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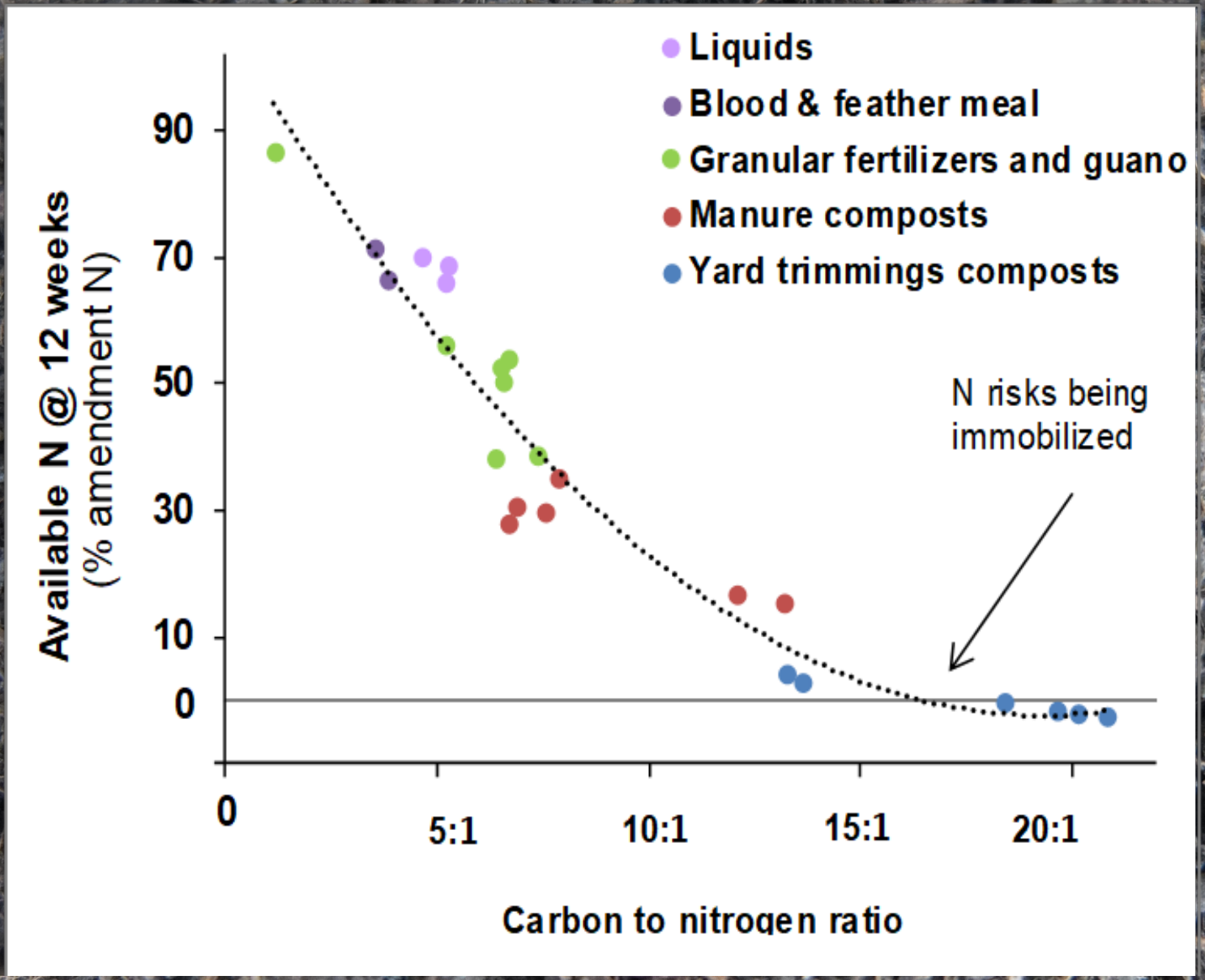
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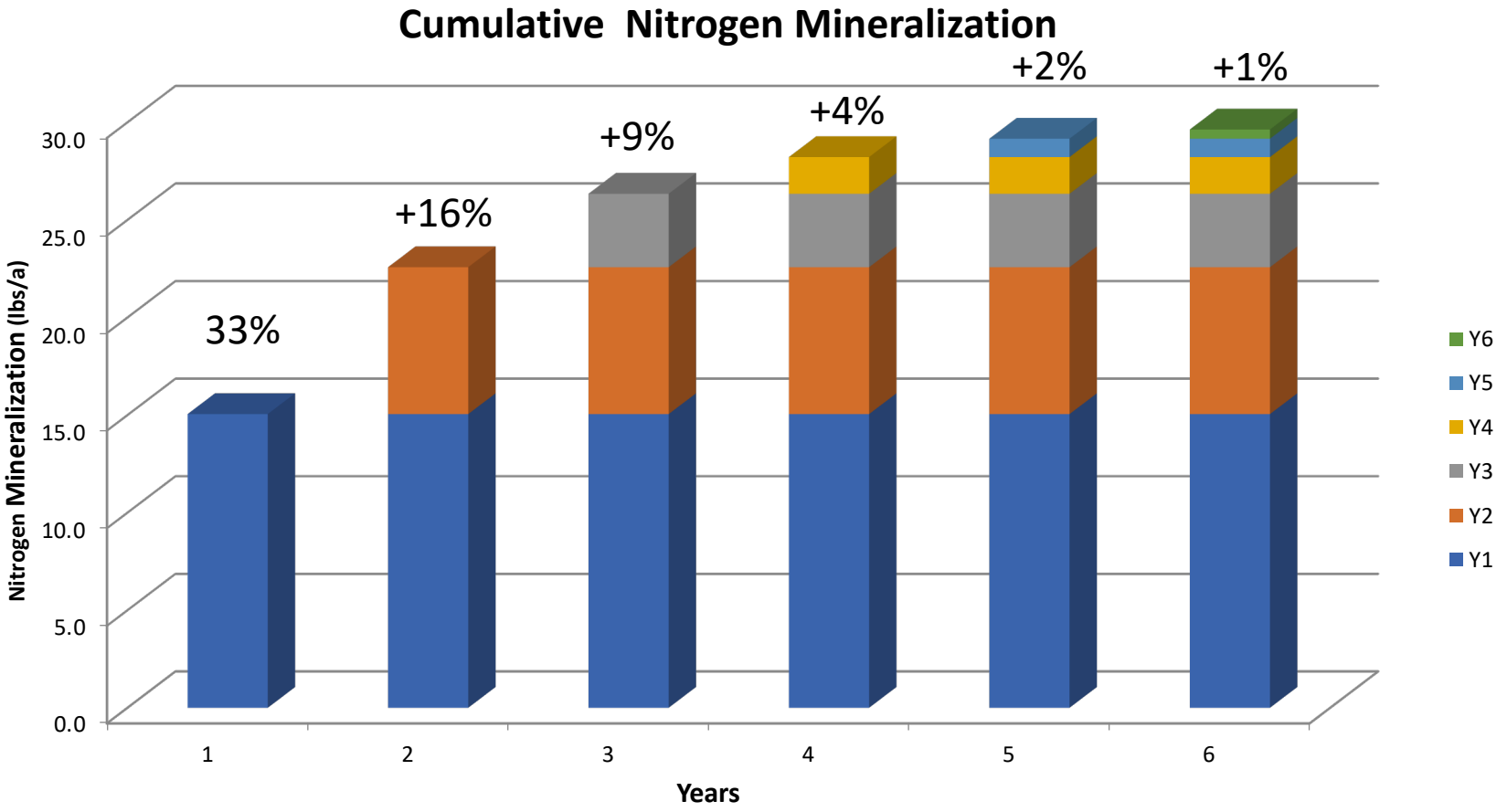
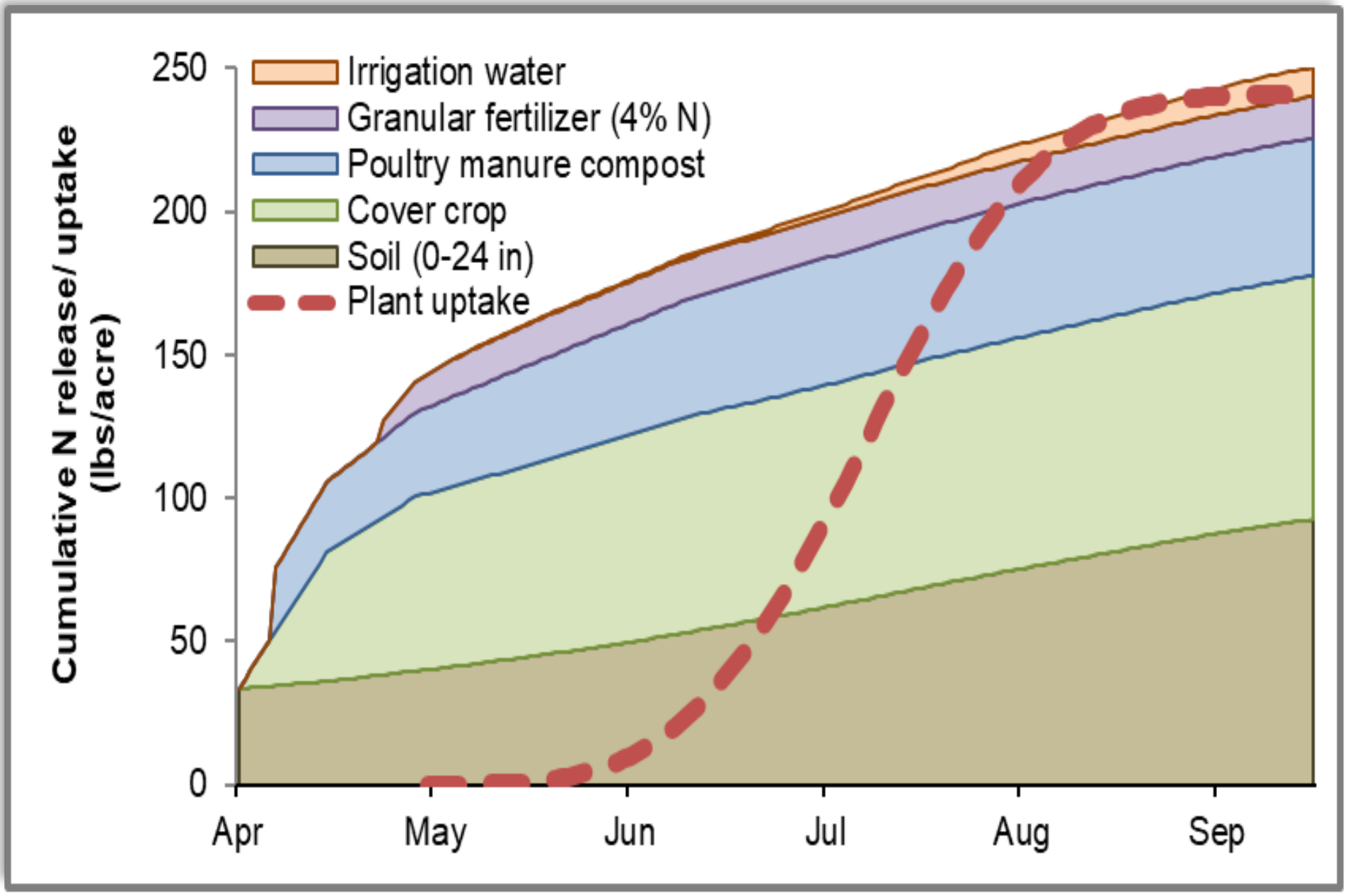
Continual application of the same amount of organic N each year 43 lb N / acre



In each subsequent year of application the available mineral N increases and a steady state is approached after about 4 years.

David Crohn Proceedings, National Alfalfa Symposium, 2004


Cumulative N release/ uptake (lbs/acre)
250
200
150
100
50
0
Irrigation water
Granular fertilizer (4% N)
Poultry manure compost
Cover crop
Soil (0-24 in)
Plant uptake
Apr
May
Jun
Jul
Aug
Sep

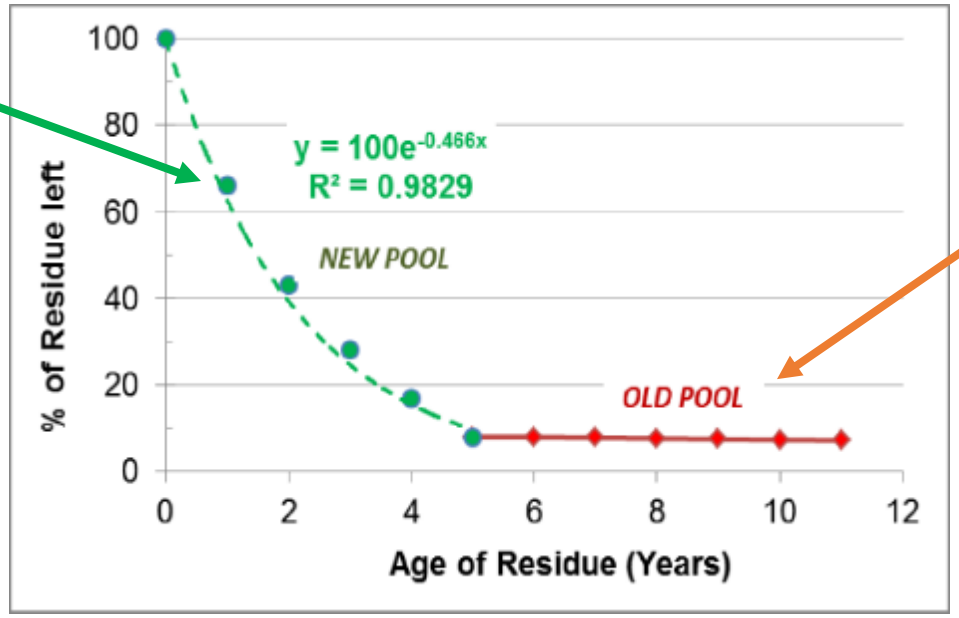
N Mineralized in the Soil

- Soil organic matter is available in new/active pool for mineralization

Active OM

Crop residues
Manure
Compost
Cover crop

Relatively quick breakdown



Stable OM

Very Slow to breakdown

Notes:
Slide from Dr. Lucas, Ohio State