
Nutrient value of compost

Theoretical value of compost application :

- ✓ Increase organic matter
- ✓ Improve aggregate stability
- ✓ Reduce bulk density
- ✓ Increase water holding capacity
- ✓ Increase cation exchange capacity
- ✓ Enhance the soil microbial community
- ✓ Suppress soil pests
- ✓ Provide nutrients

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Reality check :

1) Compost application should increase soil organic matter and improve tilth; the practical significance of these and other effects varies on a case-by-case basis

2) Nitrogen contribution likely to be modest, whereas the P and K contribution may be excessive

General nutrient properties of composts :

Nutrient content (dry weight basis) :

	% nutrient content		
Type	N	P	K
Poultry manure	2 - 4	1 - 3	1 - 3
Feedlot manure	2 - 3	1 - 1.5	1 - 2
Dairy manure	1 - 2	0.5 - 1.5	1 - 2
Urban yard waste	1 - 1.5	0.2 - 0.5	0.5 - 1.5
Crop residue	1.5 - 2.5	0.2 - 0.5	1 - 2

Forms of N present :

Organic N > 90%

Mineral N (NH_4-N, NO_3-N) < 10%

How much plant-available N do composts provide ?

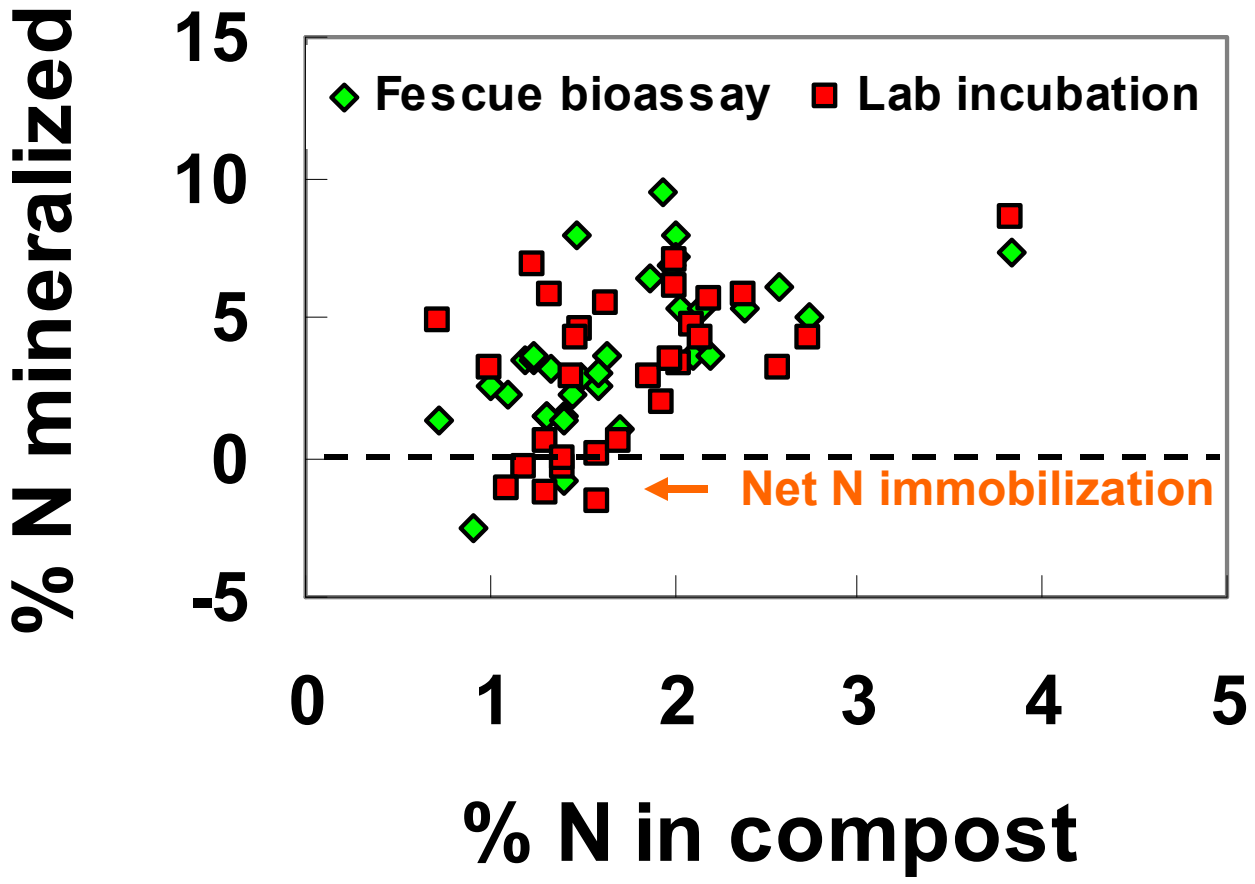
UCD N mineralization studies :

25 composts tested

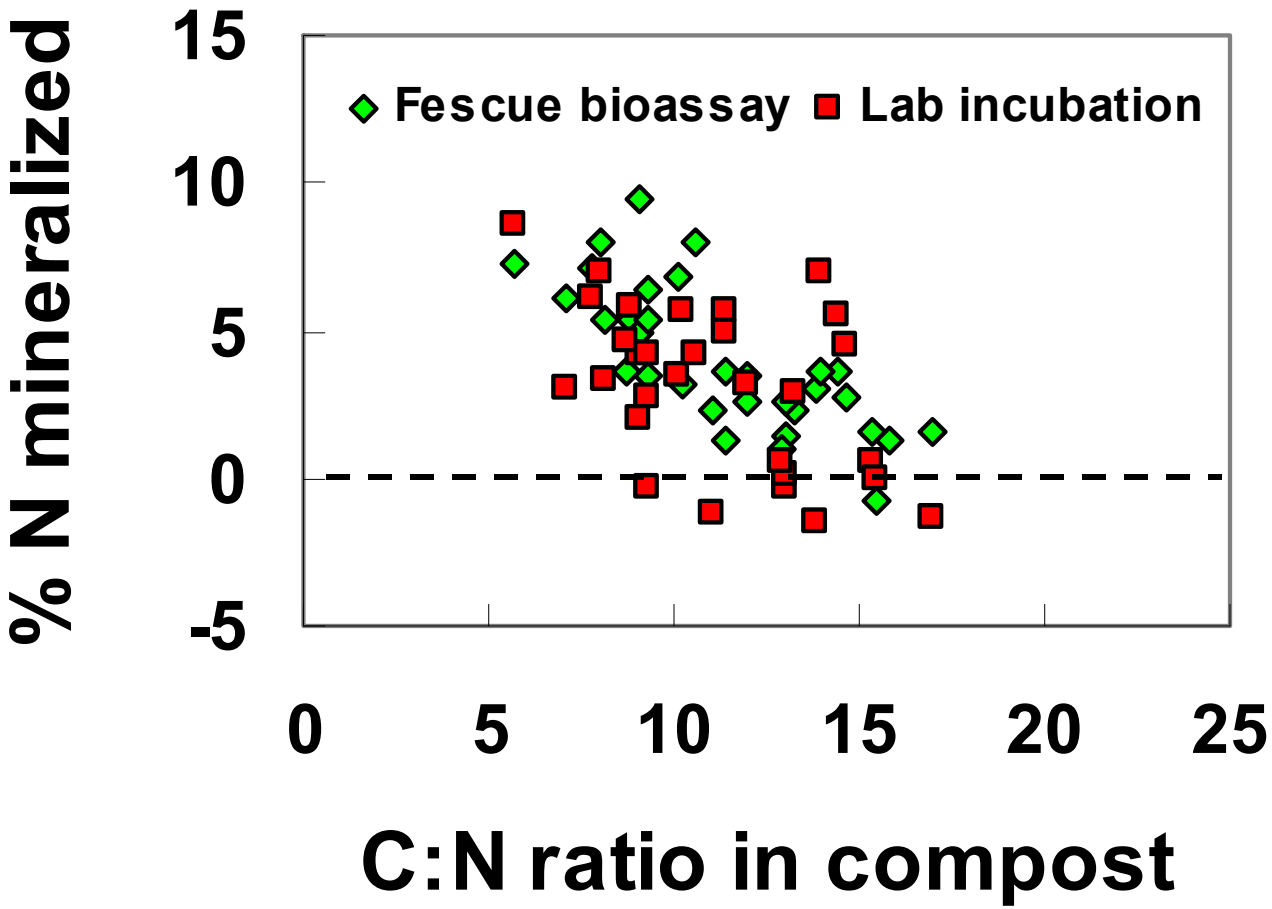
- Poultry manure
- Feedlot manure
- Dairy manure
- Crop residue
- Urban green waste

Blended with moist soils, and net N mineralization was measured by :

- incubation for 12 weeks @ 77 ^{o}F constant temperature
- 18 week greenhouse bioassay measuring N uptake by fescue



Seasonal net N mineralization no more than 10% of initial organic N

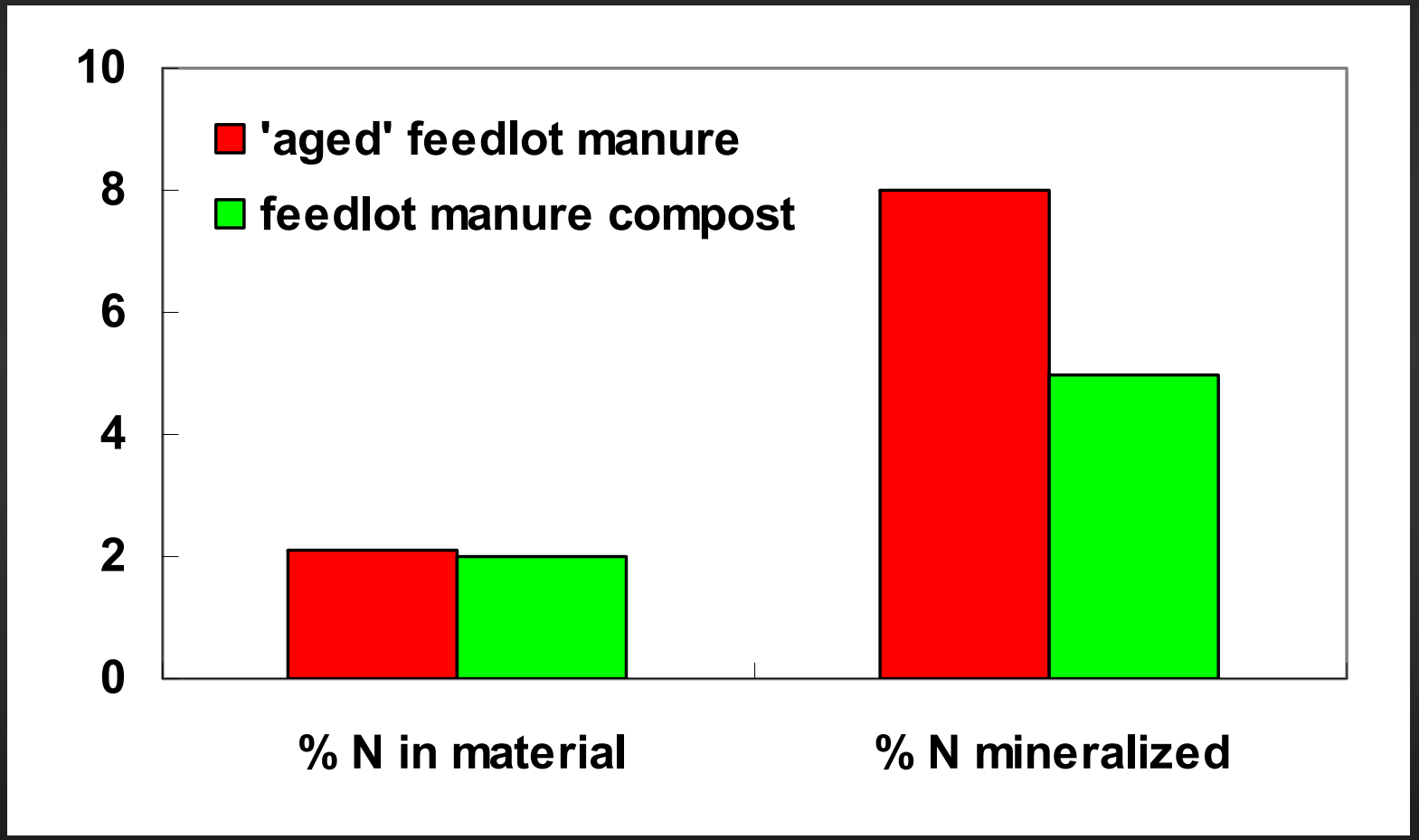

% N mineralized
15
10
5
0
-5
Fescue bioassay
Lab incubation
0
5
10
15
20
25
C:N ratio in compost

Do other researchers agree?

- ✓ These results on the lower end, but recent research generally showed net N mineralization of common types of compost to be < 10% of initial N in the first growing season after application
- ✓ The exception is very high-N manure-based compost (> 3% N), especially if not well composted

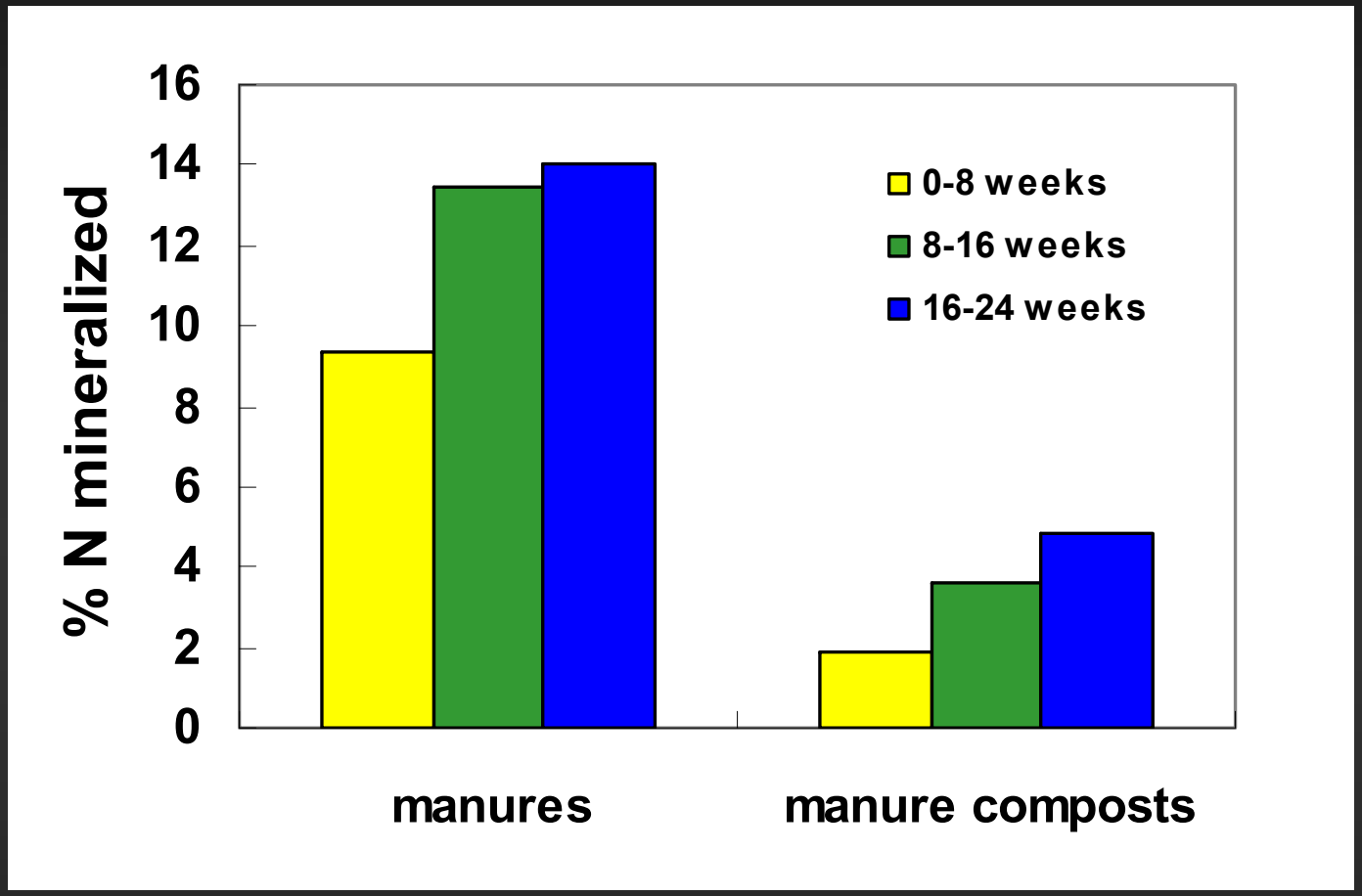
Composting slows down N mineralization :

Average of 4 materials of each type :



18 week UCD lab incubation

N mineralization over time :



- ✓ N mineralization starts fast, slows over time
- ✓ By the end of one season after field application the remaining compost N behaves much like soil organic matter

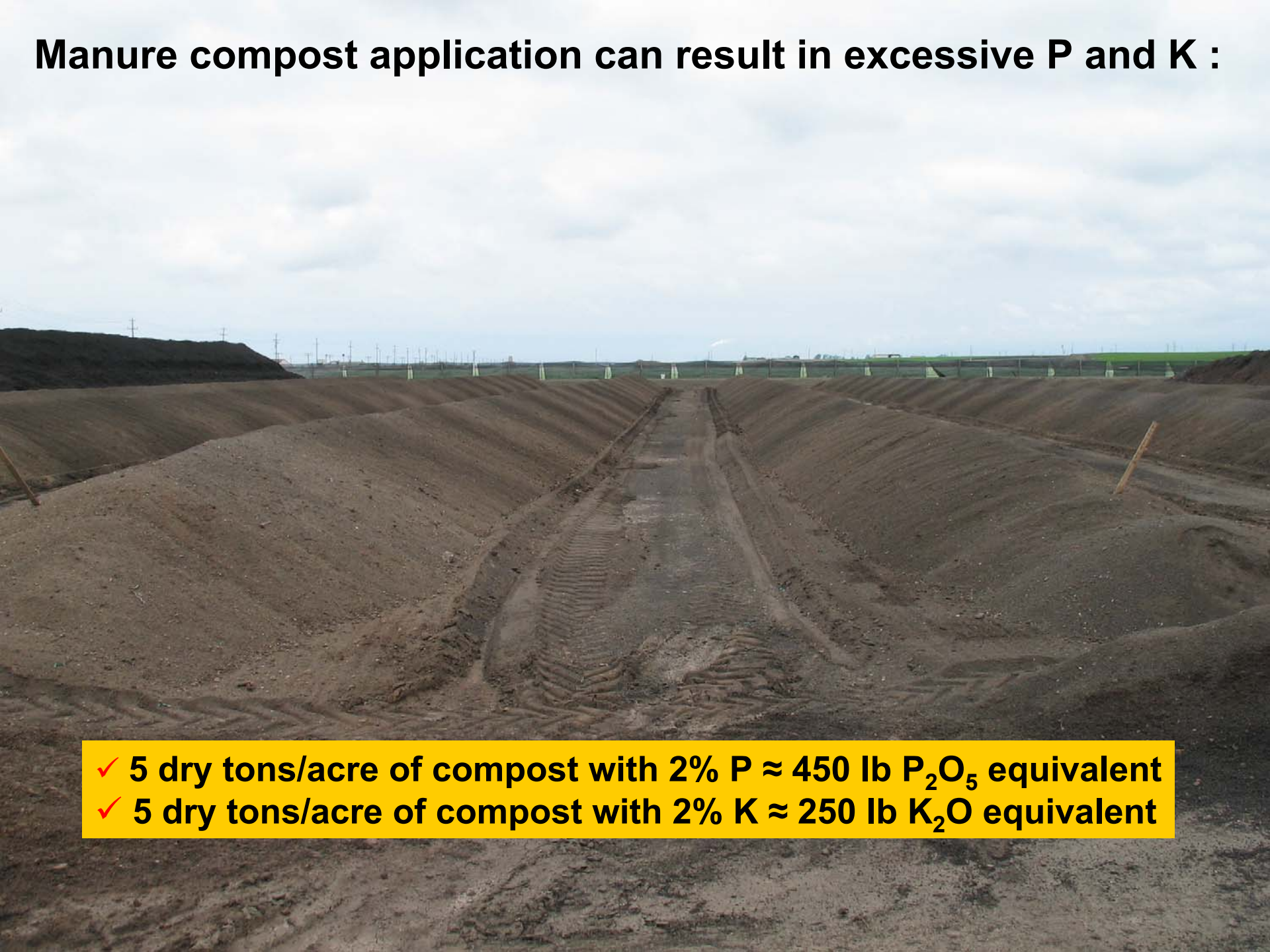
Calculating the N ‘credit’ from compost :

Example: Feedlot manure compost @ 2% N

If the application is 5 dry tons/acre = 200 lb total N/acre

5 to 10% of 200 lb = 10 to 20 lb available N for this season’s crop

Manure compost application can result in excessive P and K :



- ✓ 5 dry tons/acre of compost with 2% P ≈ 450 lb P_2O_5 equivalent
- ✓ 5 dry tons/acre of compost with 2% K ≈ 250 lb K_2O equivalent

How available is P in animal manures and composts ?

Material	% of P content in organic form	% of P content in inorganic form
Feedlot manure	25	75
Composted manure	16	84
Dairy manure	25	75
Poultry litter	10	90
Swine manure	9	91

Studies show that manure or compost P can substitute nearly 1:1 for synthetic fertilizer; the limitation is that it cannot easily be banded unless the material is pelleted

How about K availability ?

K is not incorporated into organic compounds in plants or animals, so K in compost is readily available


Nutrient contribution from
surface-applied compost ?

- ✓ N contribution will be slowed due to surface drying, but heavy rate or repeated application can still cause excessive N availability
- ✓ Excessive P and K loading an issue if the compost is manure-based

Is compost tea a significant nutrient source ?

- ✓ Most teas contain a range of essential nutrients,
  but at *very* low concentration
- ✓ At typical application rates the nutrient effect is insignificant
  - a spray application of a typical compost tea @ 30 GPA
    would apply < 0.1 lb N / P / K per acre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