



# Estimating N mineralization from organic fertilizers, amendments, and cover crop residues



**Daniel Geisseler**

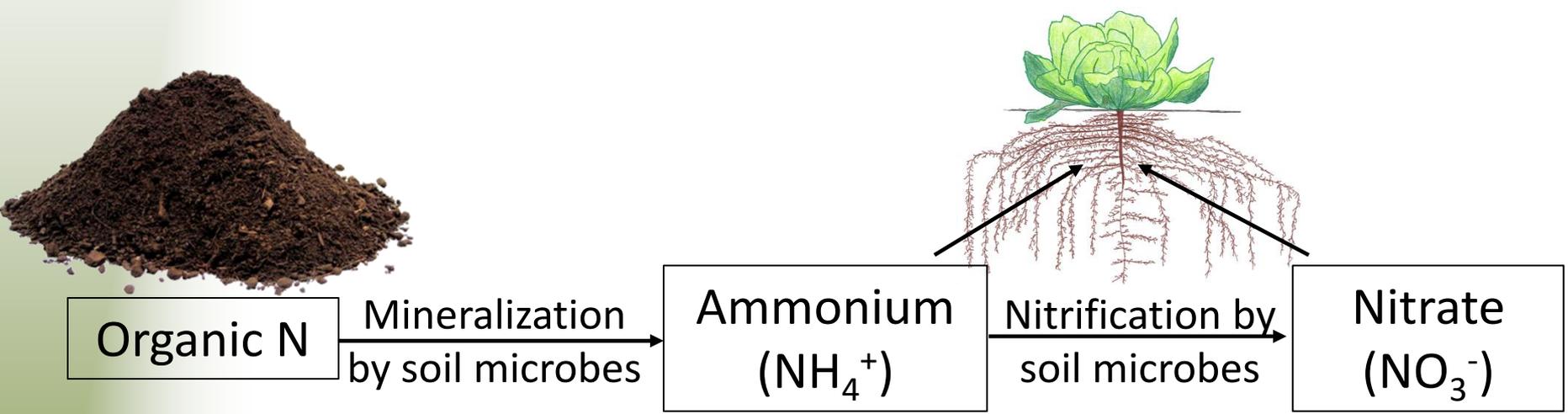
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**Irrigation and Nutrient Management  
Meeting, Salinas**

**February 19, 2026**

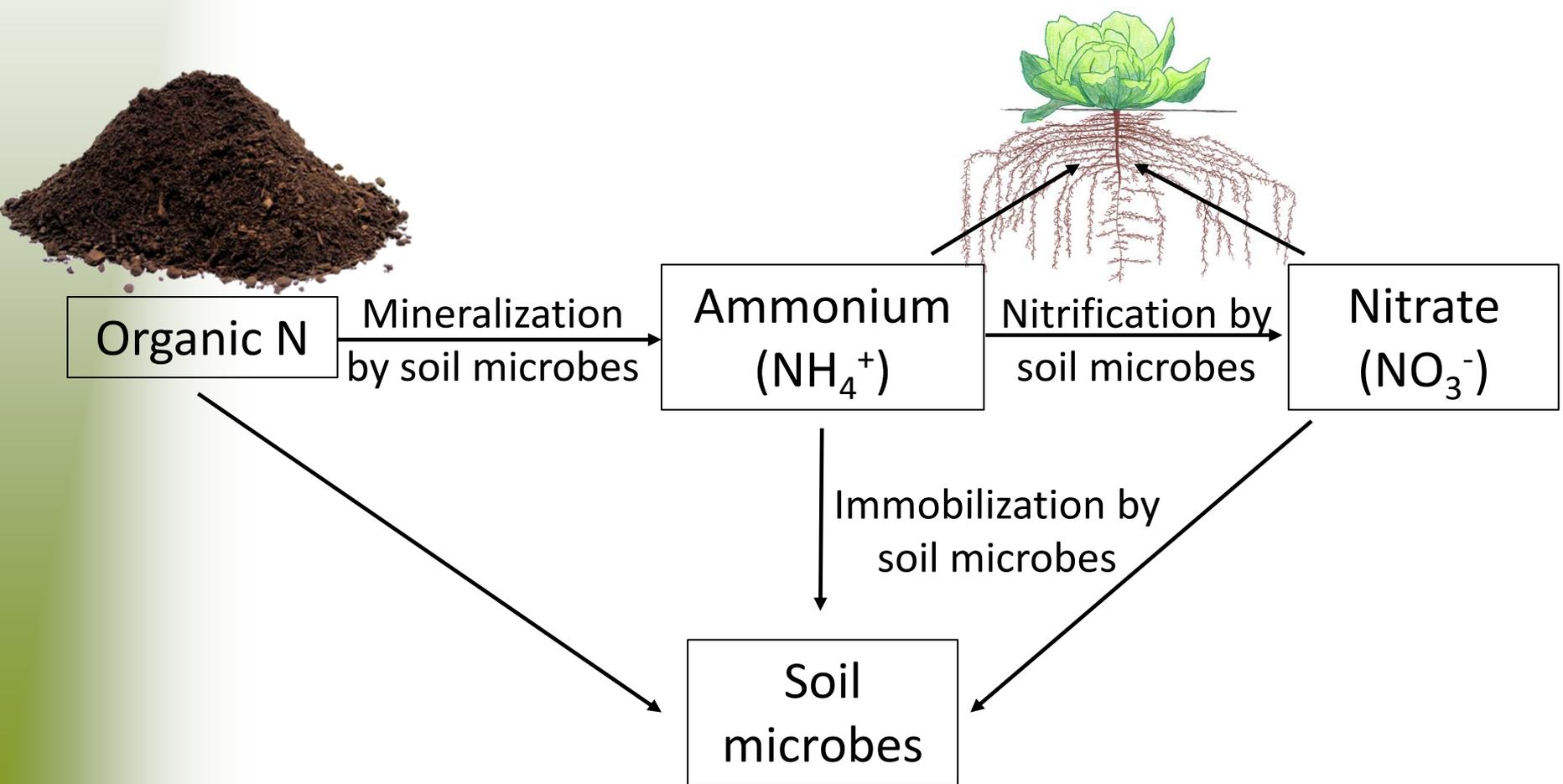


# Nitrogen pools and turnover in soil



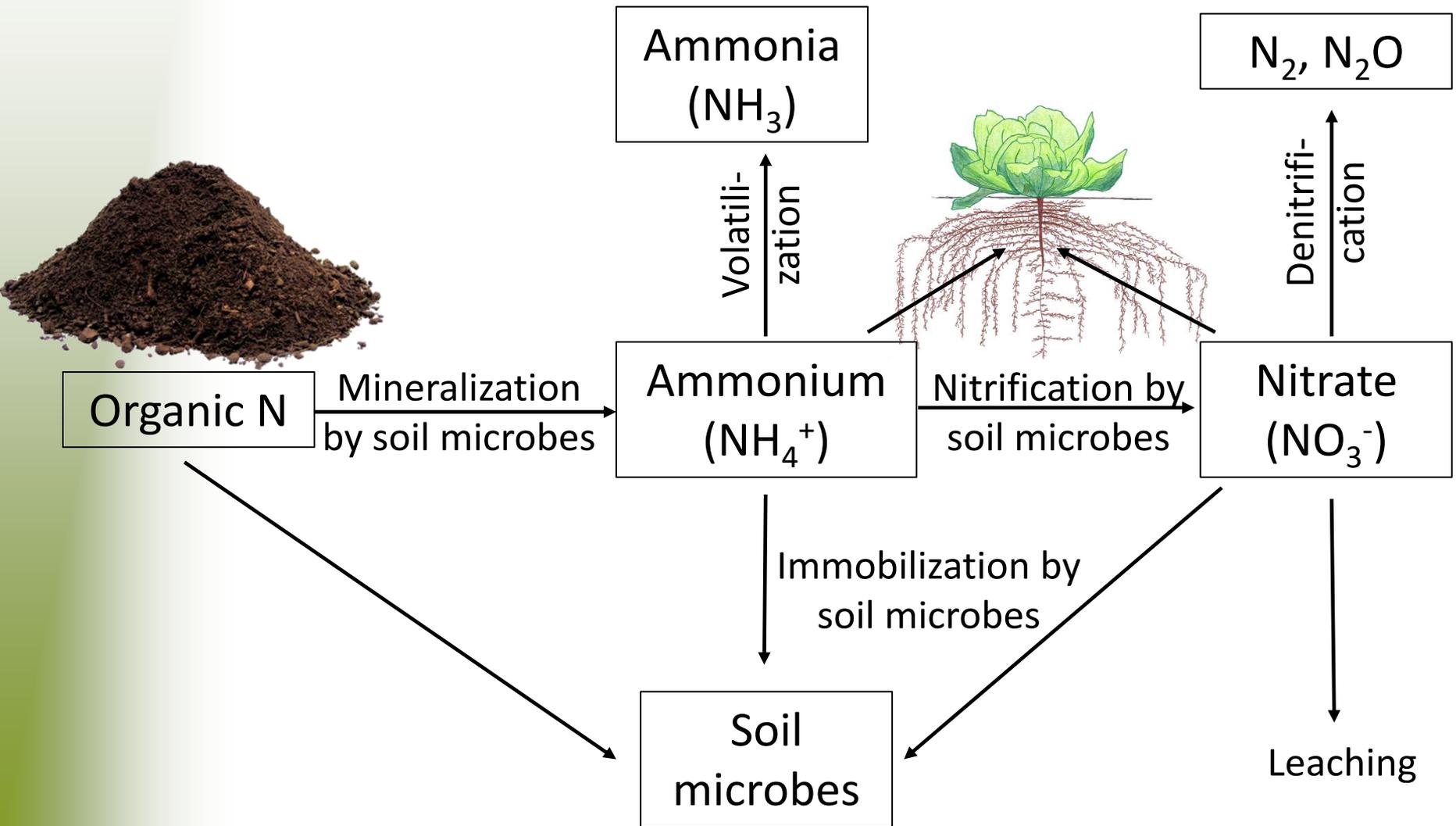


# Nitrogen pools and turnover in soil



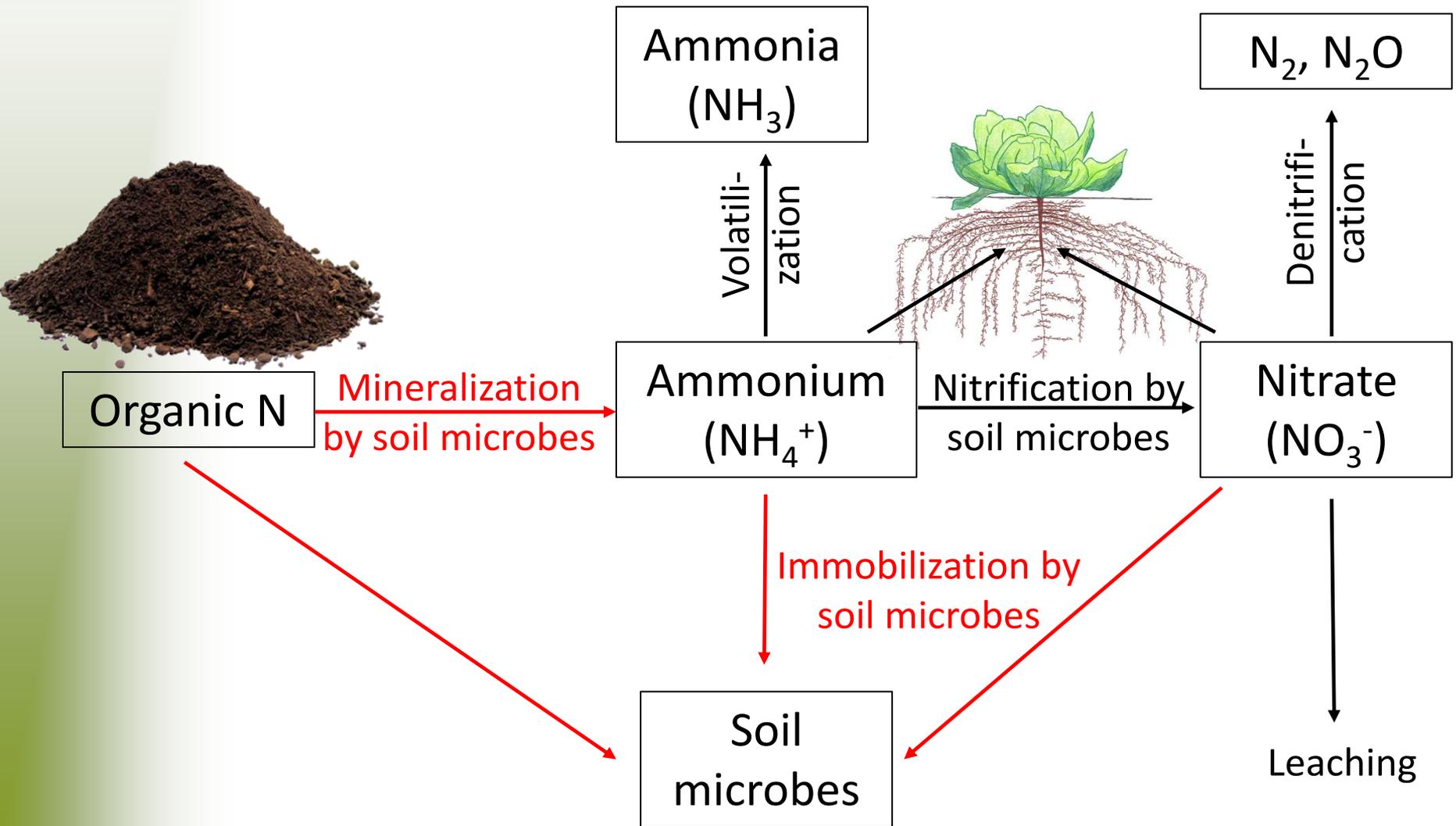


# Nitrogen pools and turnover in soil





# Nitrogen pools and turnover in soil





# Factors affecting decomposition and N mineralization

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- Soil temperature
  - Soil moisture
  - Management
    - Incorporation
  - Quality of organic source
    - Availability of C and N
    - Nitrogen content
    - C to N ratio
- } Environment
- } Management
- } Material properties



# Factors affecting decomposition and N mineralization

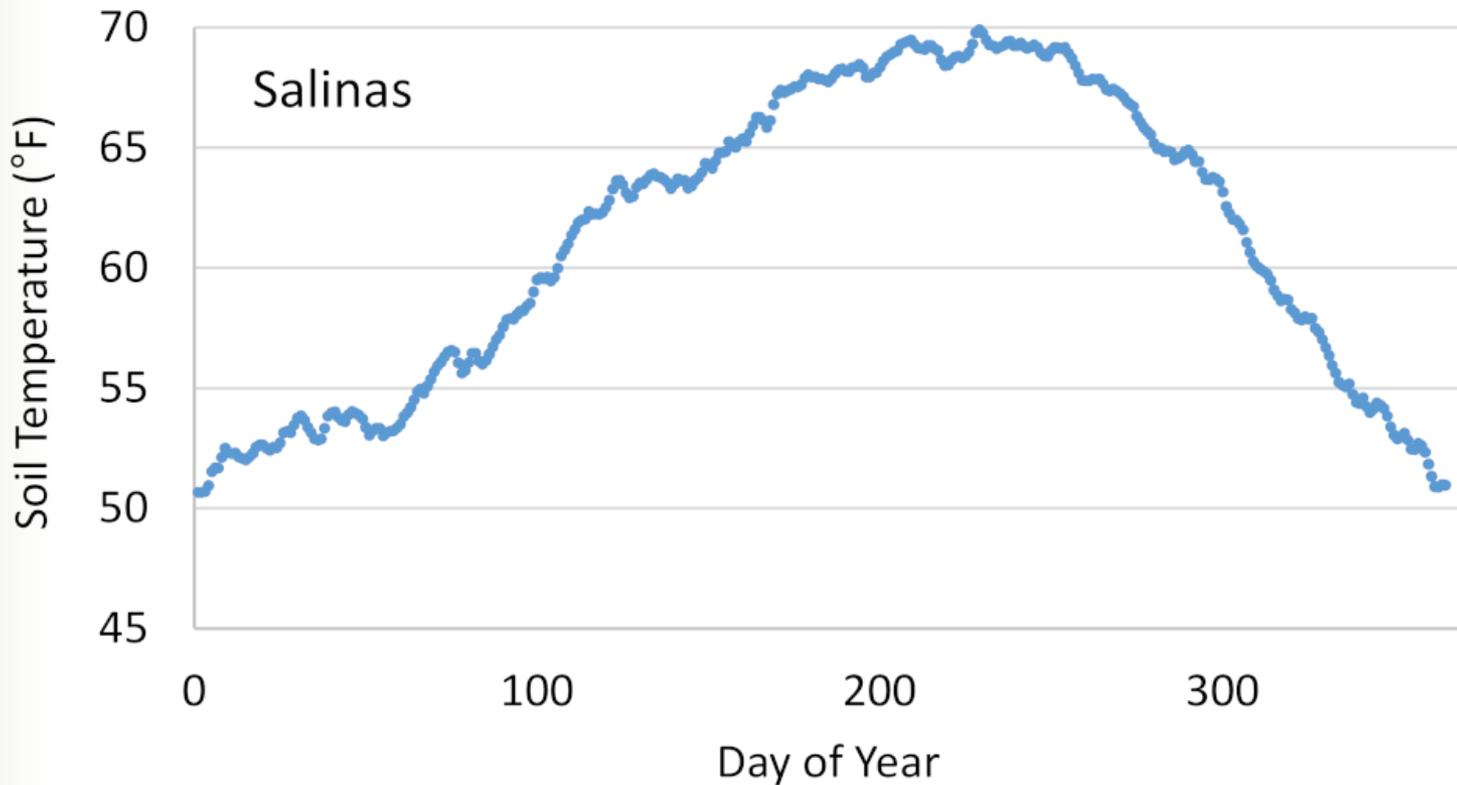
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- **Soil temperature**
- Soil moisture
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- Quality of organic source
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  - C to N ratio



# Temperature effects

## Soil temperature in Salinas (6" depth)





# Factors affecting decomposition and N mineralization

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# Nitrogen mineralization

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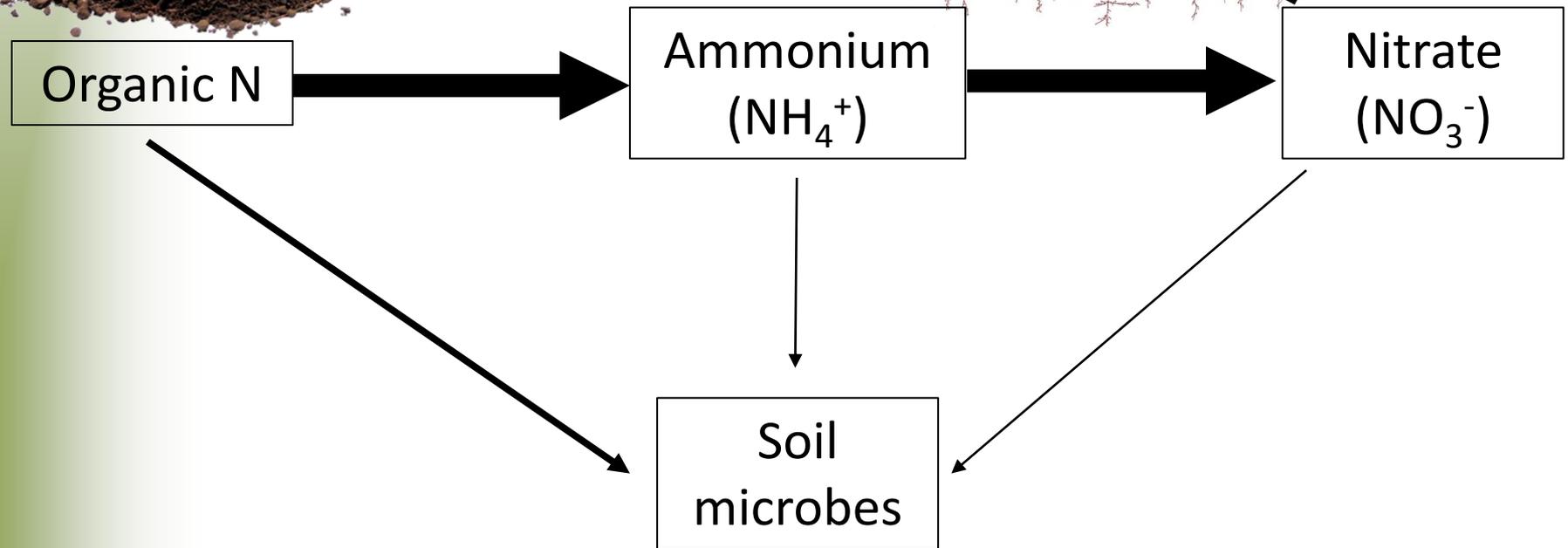
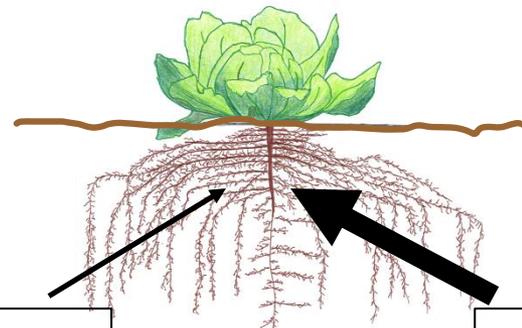
- Soil microorganisms decompose organic materials
- They need N, C and other elements as building blocks for their own biomass
- C is also used as energy source
- **N mineralization:** Release excess N in the form of  $\text{NH}_4^+$  into soil solution
- **N immobilization:** Uptake of  $\text{NO}_3^-$  or  $\text{NH}_4^+$  from soil solution and incorporation into microbial tissue



# Nitrogen turnover in soil: Substrate with a C:N ratio of 5

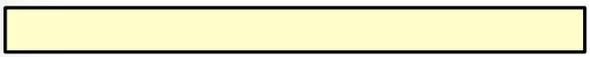
C 

N 

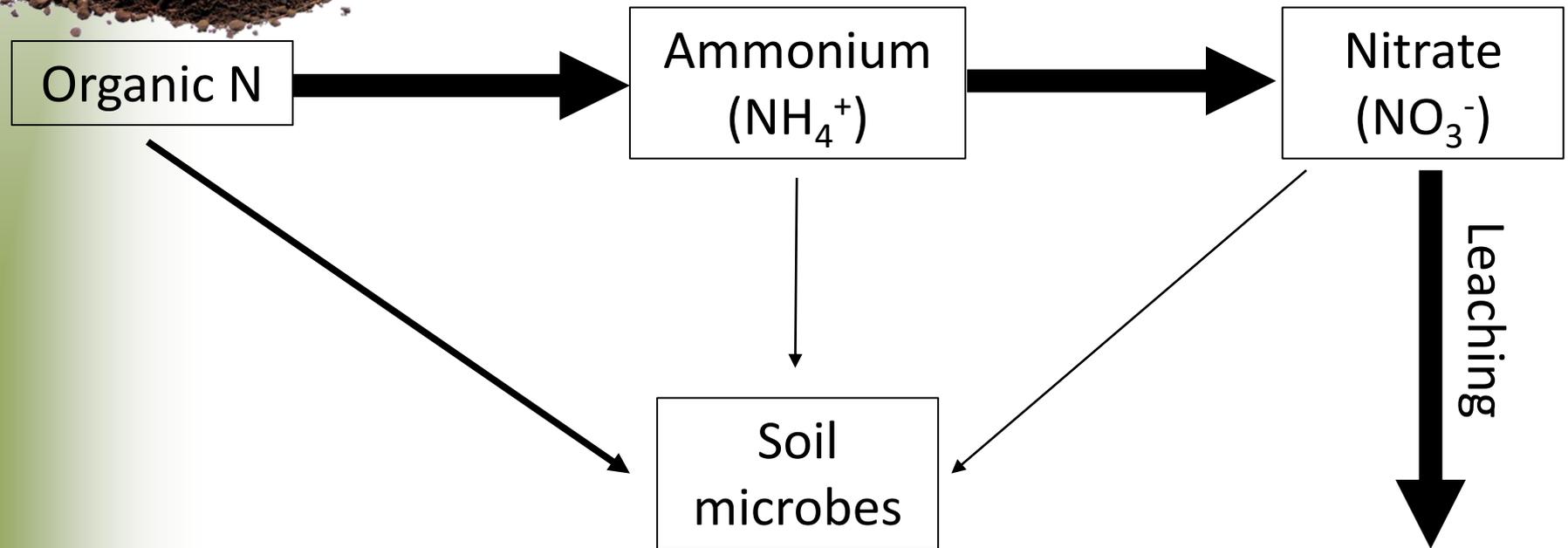




# Nitrogen turnover in soil: Substrate with a C:N ratio of 5

C 

N 

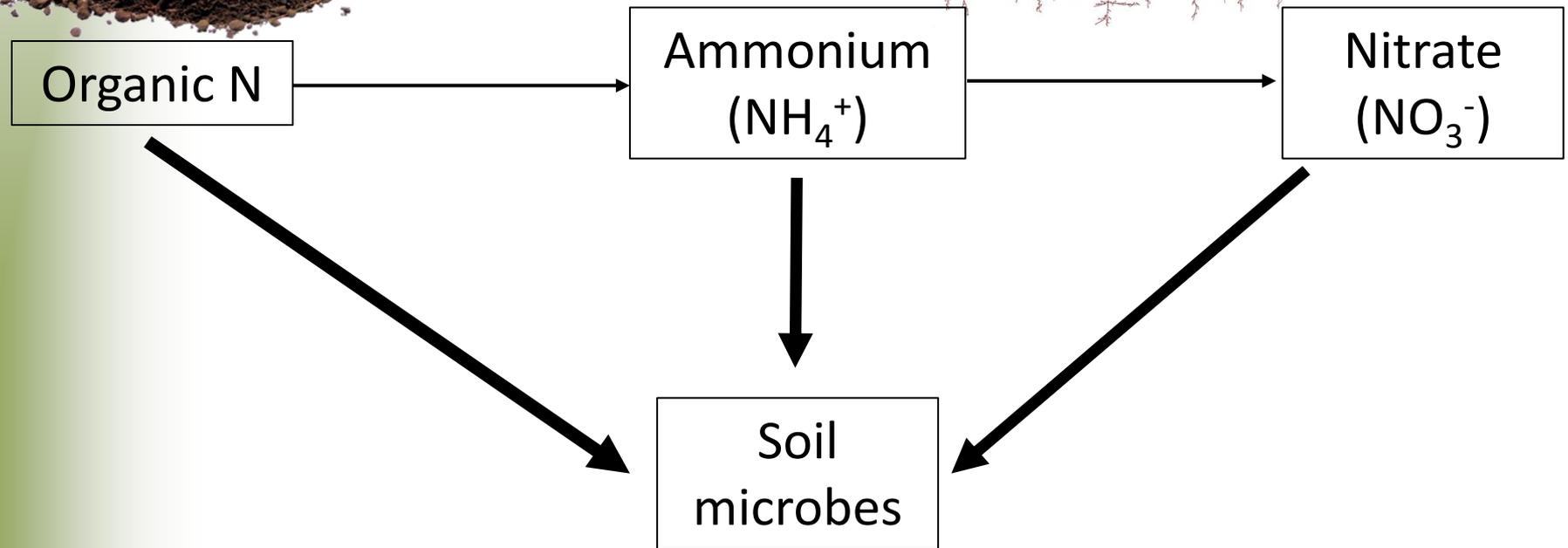
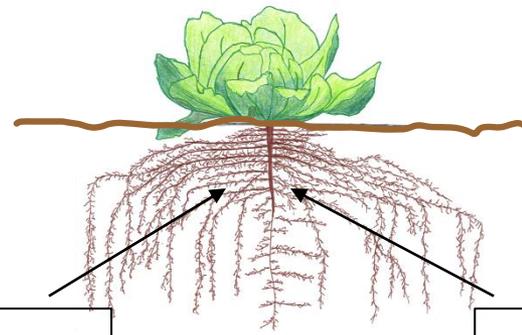




# Nitrogen turnover in soil: Substrate with a C:N ratio of 30

C 

N 

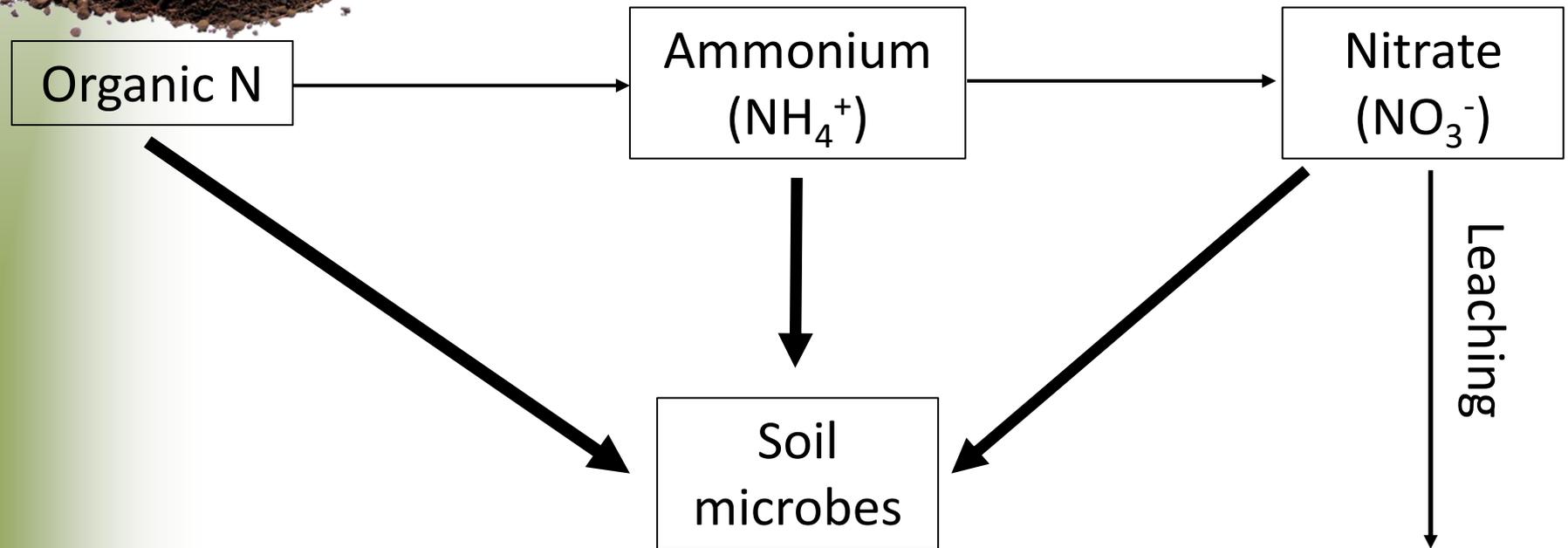




# Nitrogen turnover in soil: Substrate with a C:N ratio of 30

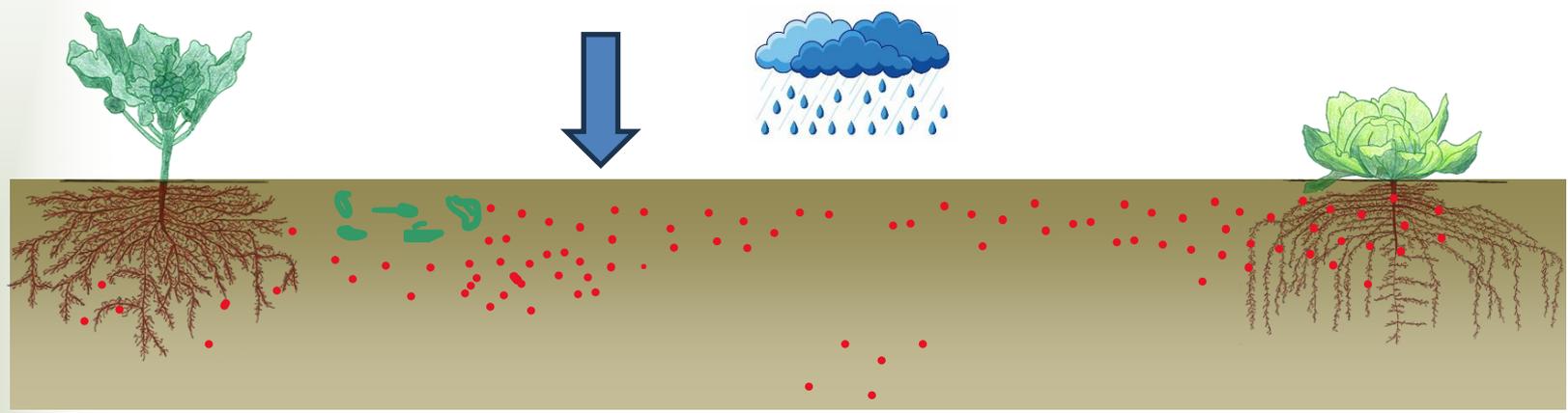
C 

N 



NPK

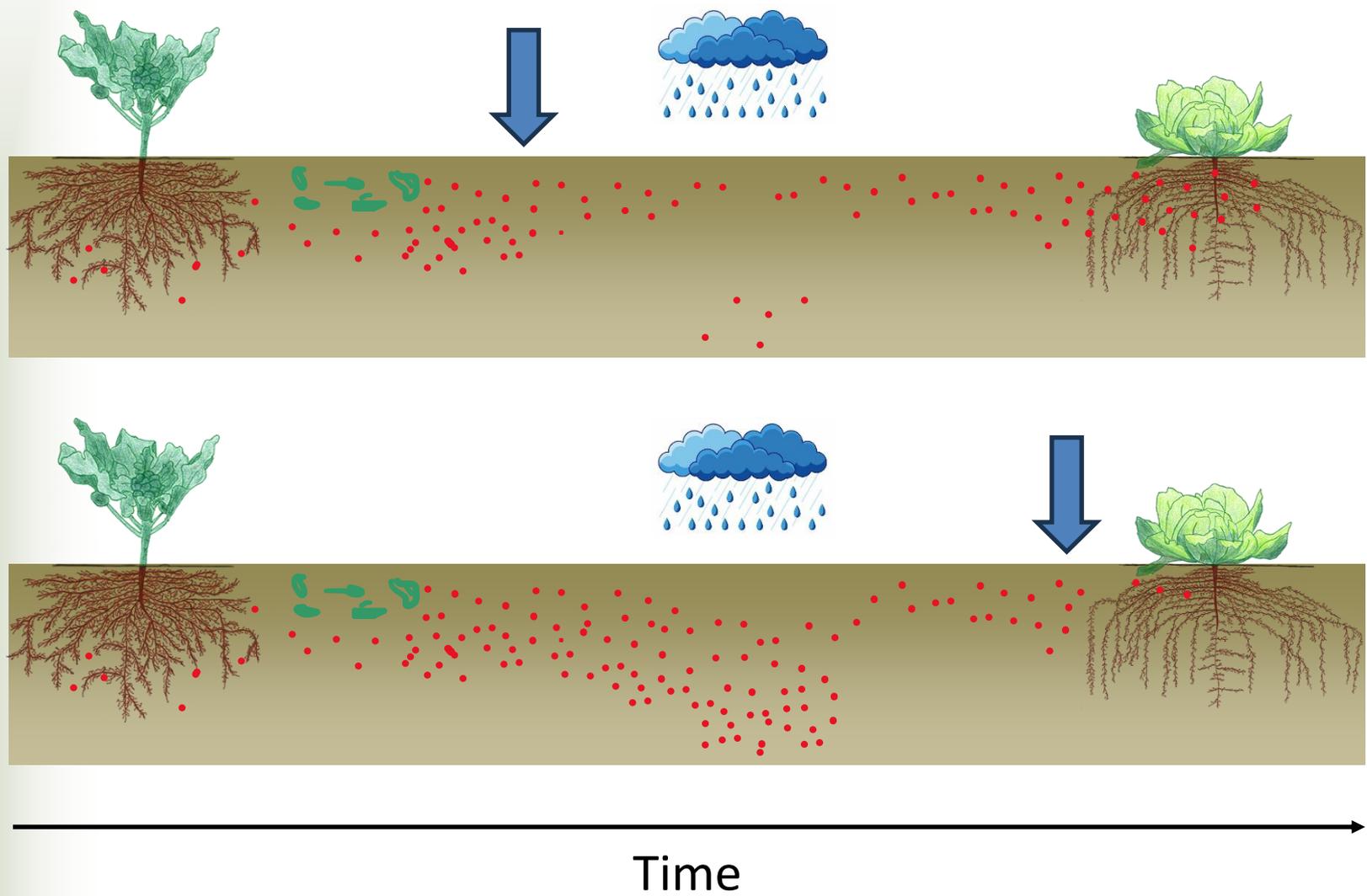
# When to apply amendments that tie up (immobilize) N?



Time

NPK

# When to apply amendments that tie up (immobilize) N?





# Organic amendments: Amendment incubation

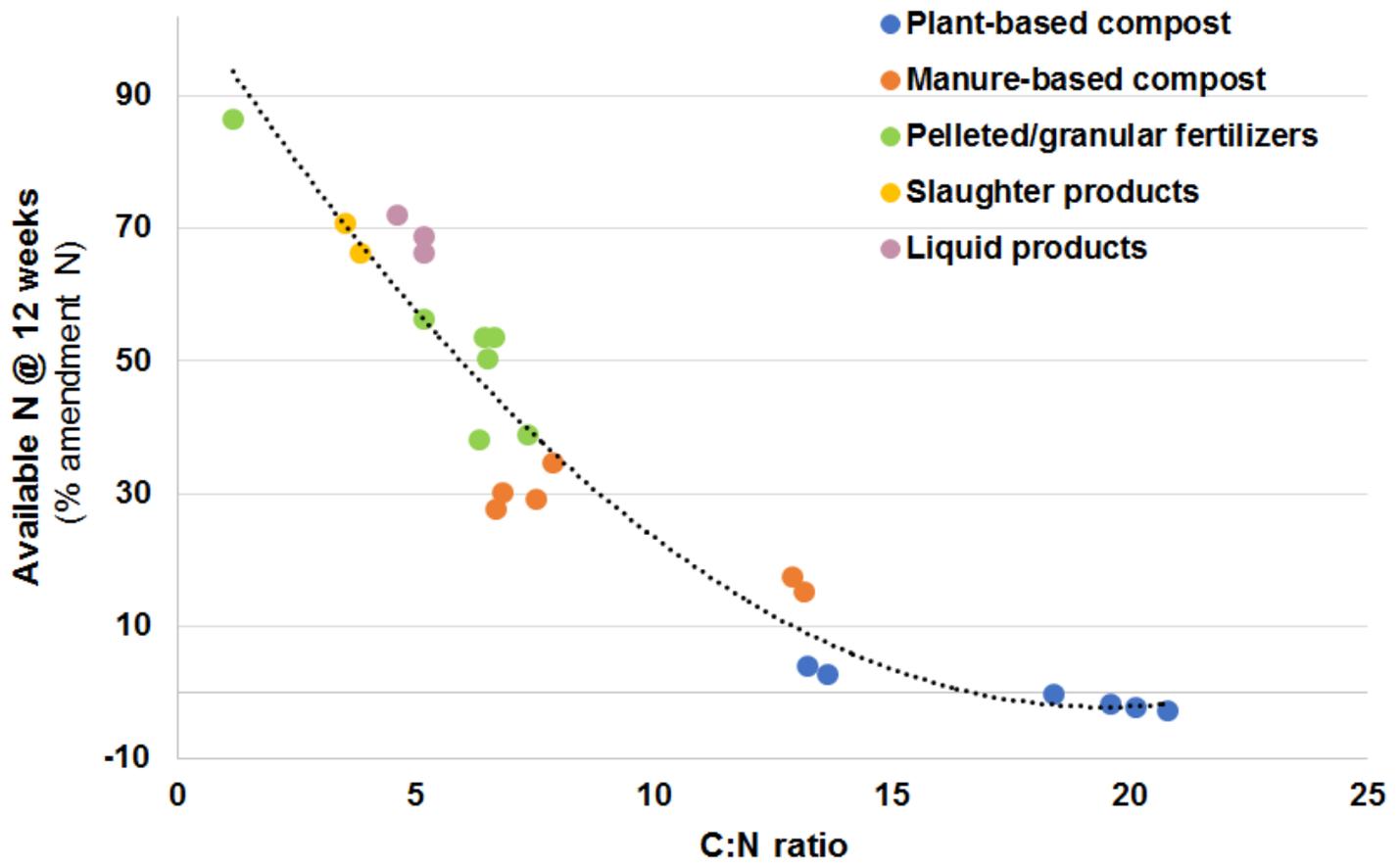
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- Materials sold in California
- Incorporated into moist soil
- Constant temperature 73 °F
- 12-week incubation





# Organic amendments: C:N ratio and N release





# Organic amendments: An online tool

## Input

### Amendment Application

Region\*:

Type of amendment\*:

Application rate\*:  tons/ac

Application date\*:

Period of interest:

Depth of incorporation\*:

\* Required input.

### Amendment Properties

Amendment dry matter:  %

Total nitrogen:  % in dry matter

Carbon to nitrogen ratio:

Mineral nitrogen:  % in dry matter

### Soil Properties

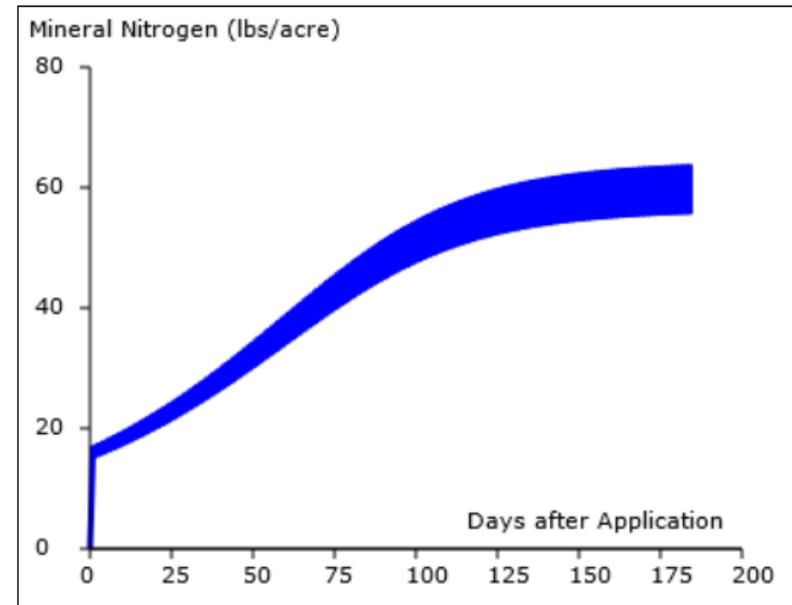
Soil organic matter:  %

Residual soil nitrate:  ppm Nitrate-N

[Display Results/Changes](#)

## Output

### Nitrogen Mineralization



Total N applied:

Total mineral N applied:

Estimated available N from amendment:

Percent available:



# Organic amendments: An online tool

## Input

### Amendment Application

Region\*:

Type of amendment\*:

Application rate\*:  tons/ac

Application date\*:

Period of interest:

Depth of incorporation\*:  inches

### Amendment Properties

Amendment dry matter:  %

Total nitrogen:  % in dry matter

Carbon to nitrogen ratio:

Mineral nitrogen:  % in dry matter

### Soil Properties

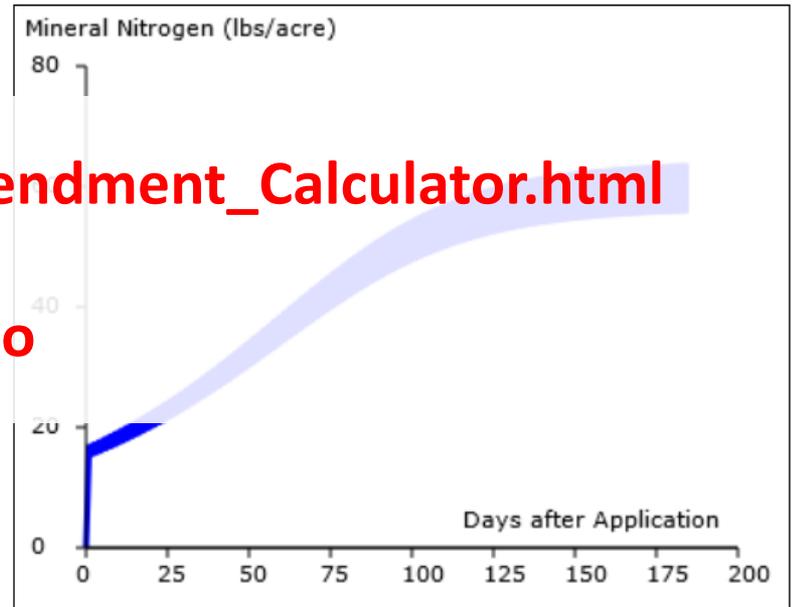
Soil organic matter:  %

Residual soil nitrate:  ppm Nitrate-N

**Display Results/Changes**

## Output

### Nitrogen Mineralization



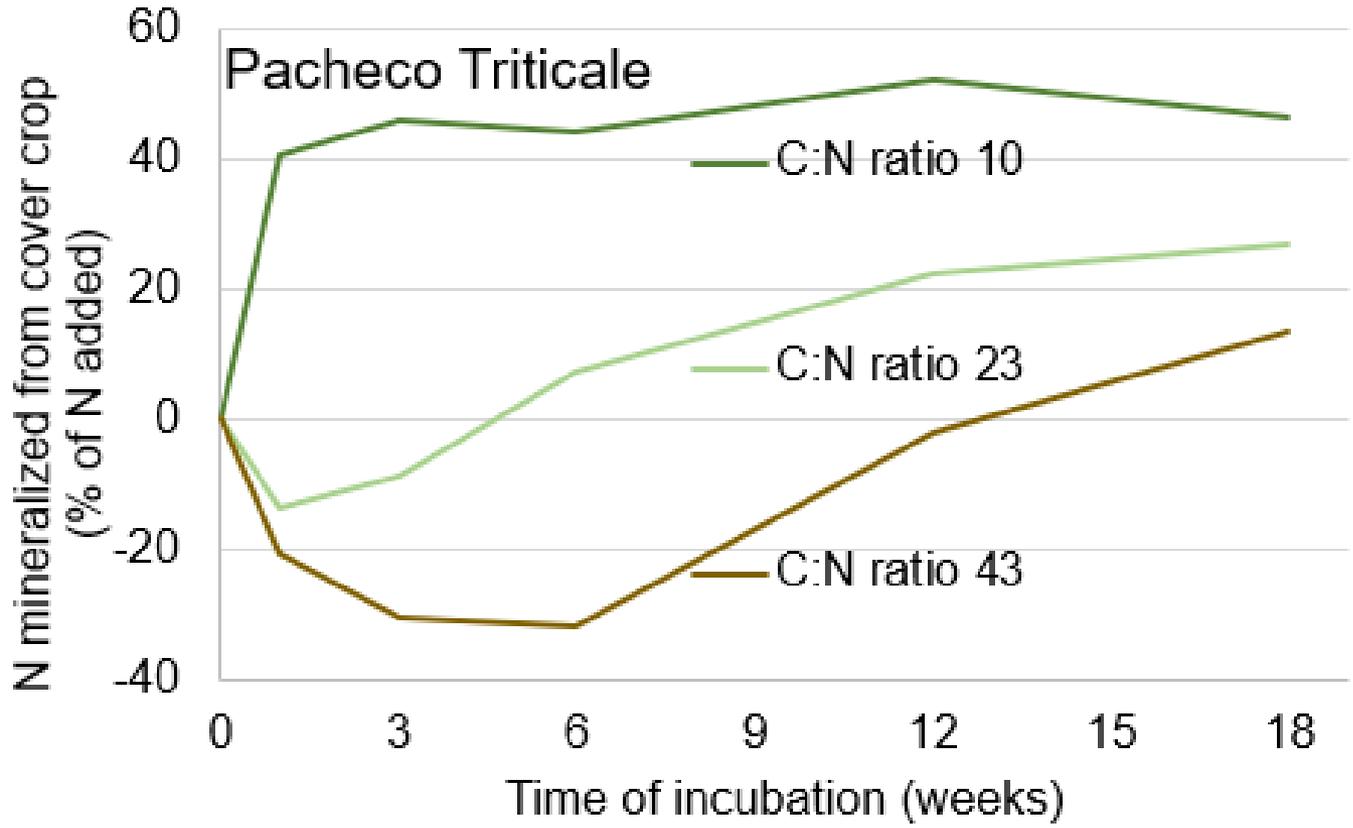
[http://geisseler.ucdavis.edu/Amendment\\_Calculator.html](http://geisseler.ucdavis.edu/Amendment_Calculator.html)

Soon available in CropManage too

Total N applied:	234 lb/ac
Total mineral N applied:	18 lb/ac
Estimated available N from amendment:	56 - 64 lb/ac
Percent available:	24 - 27 %

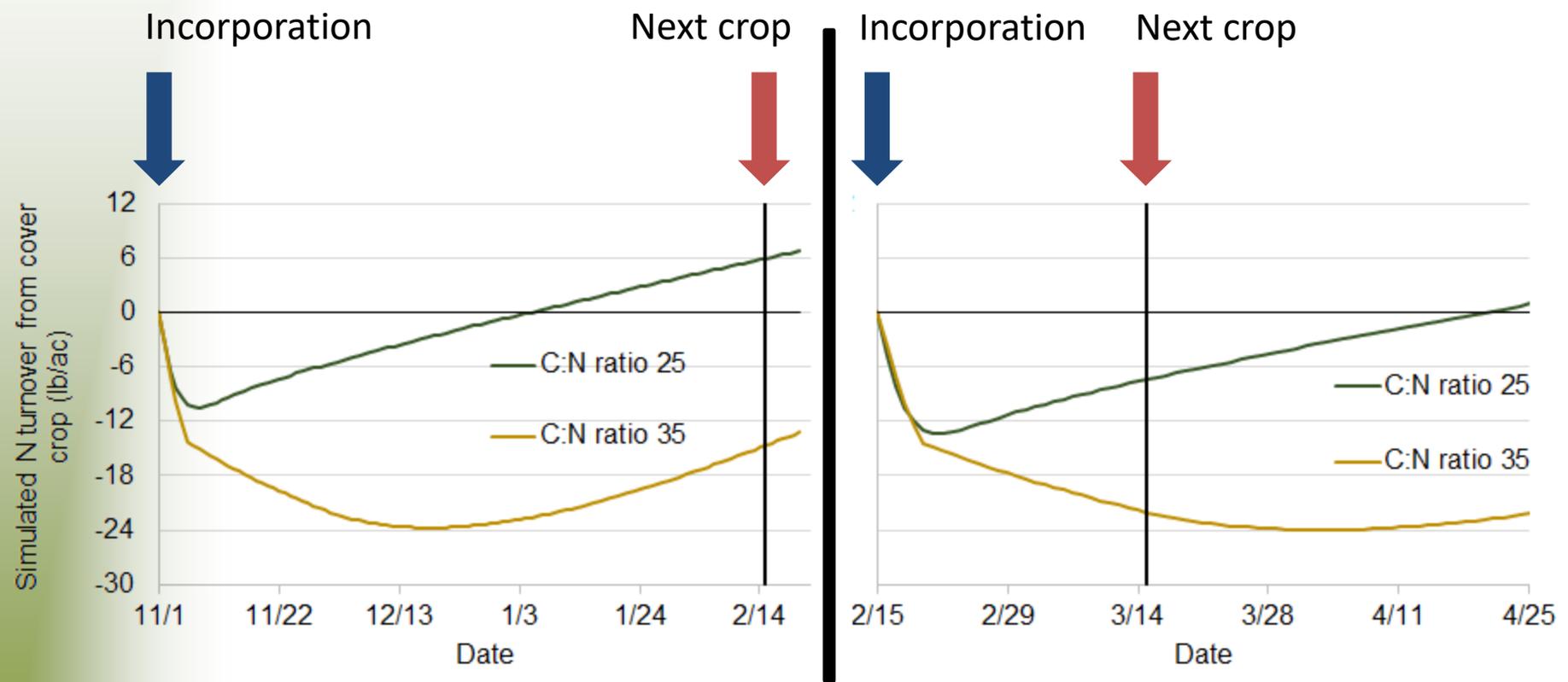


# Cover crops: C:N ratio and N release





# N sequestration with grass cover crop residues



C:N 25: Boot Stage (Feekes 10)

C:N 35: Past flowering (Feekes 10.5.4)



# Summary

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- N mineralization is a microbial process that makes N and other nutrients plant available
- N availability differs considerably across organic materials
- The C:N ratio can be used to estimate N mineralization
- Different batches of the same amendment (e.g. poultry manure, compost) can vary considerably
- It is important to monitor soil nitrate and the N status of the crops during the growing season



# Acknowledgement

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