N Contributions from cover crops, composts and soil

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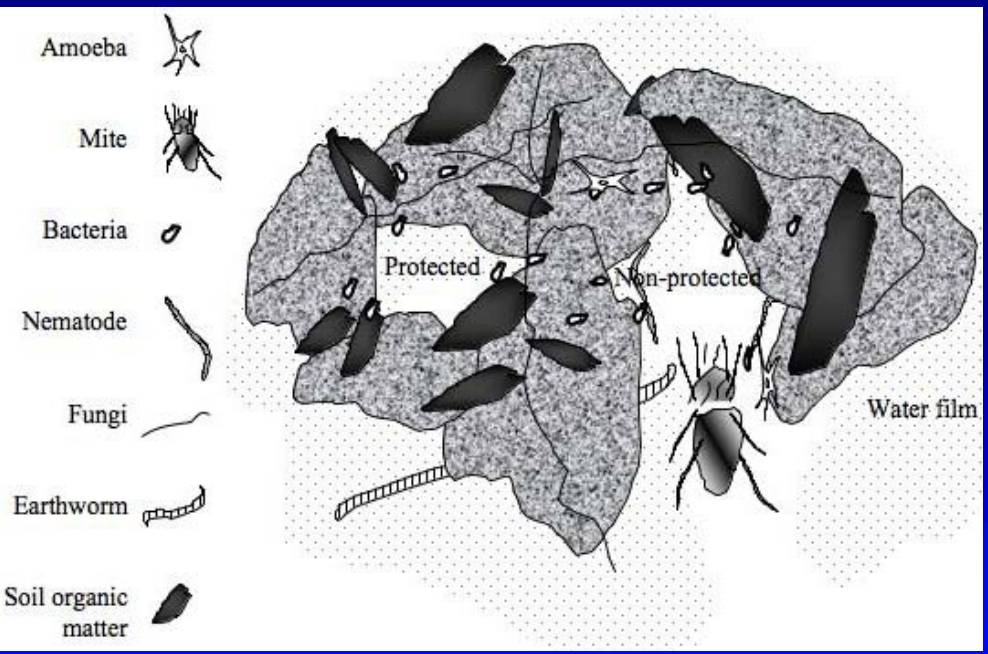
Soil Organic Matter



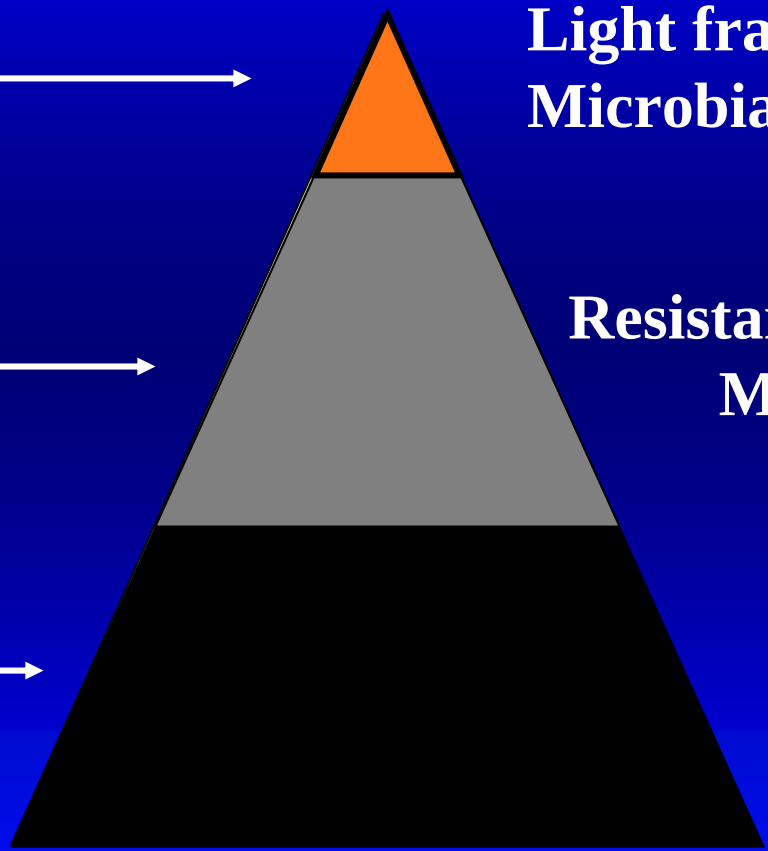
- Cation Ion Exchange capacity
  - 300 to 700 cmol(+)/kg
- Capacity to chelate metals
- Enhance soil physical properties
  - Water Holding capacity
- Source of nutrients
  - C/N/S/P = 100/10/1/1
- Positive influence on soil properties

Soil Organic Matter

Labile SOM
Active fraction
~2 year old

Resistant SOM
~5 to 100 years old

Stable SOM
>1000 years old

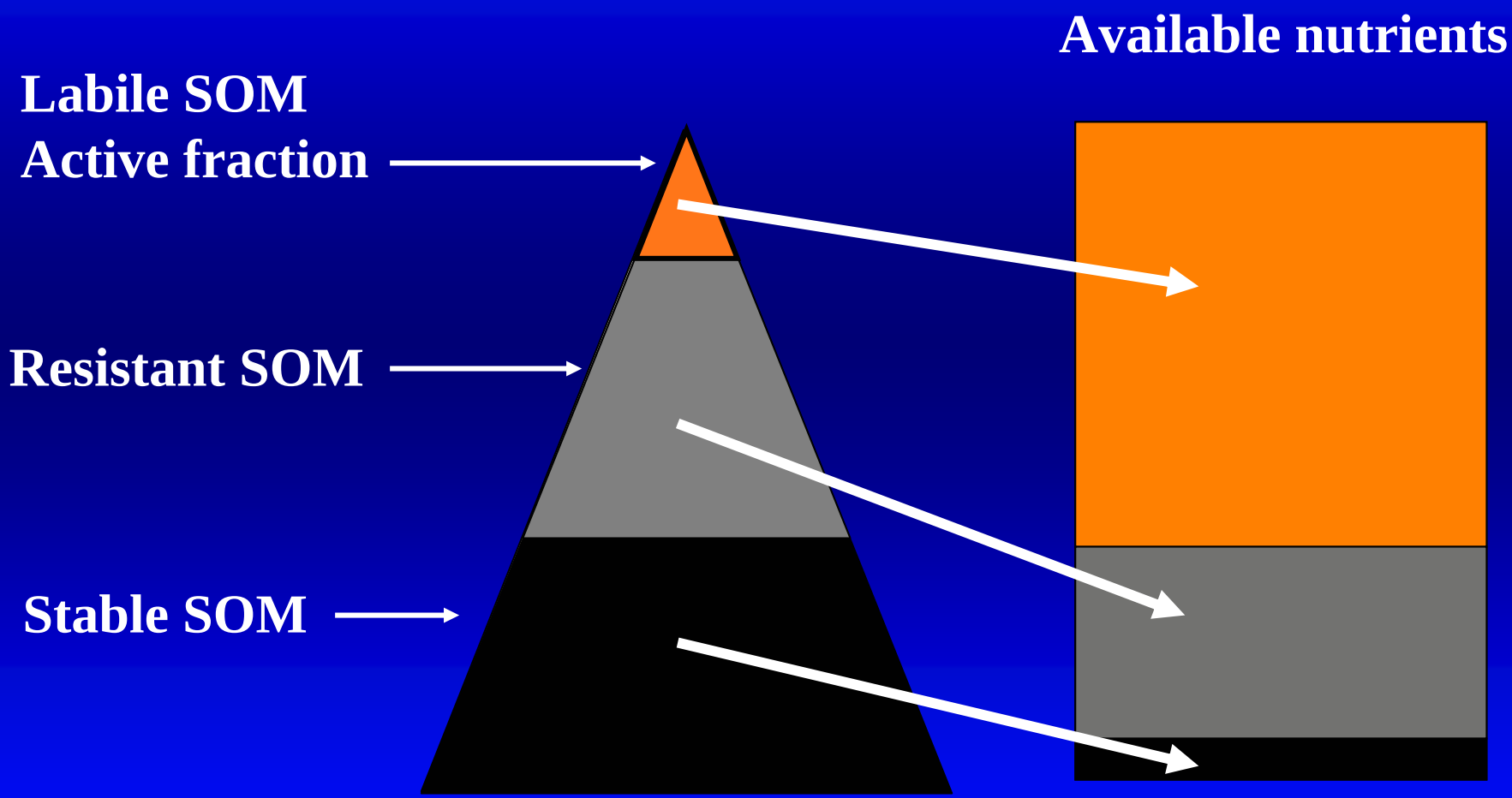


Light fraction/ Microbial biomass

Resistant Organic Matter

Very Stable Organic Matter

Contribution of Soil Organic Matter Fractions To available soil nitrogen



Crop rotation effects

Conventional Four-year Rotation

	Fall	Winter	Spring	Summer
Year 1	fallow		tomatoes	
Year 2	fallow		safflower	
Year 3	fallow		corn	
Year 4	wheat		beans	

K. Klonsky, DARE, UC Davis, 5-99

Organic & Low Input Rotations

	Fall	Winter	Spring	Summer
Year 1	cover crop		tomatoes	
Year 2	cover crop		safflower	
Year 3	cover crop		corn	
Year 4	oats/vetch		beans	

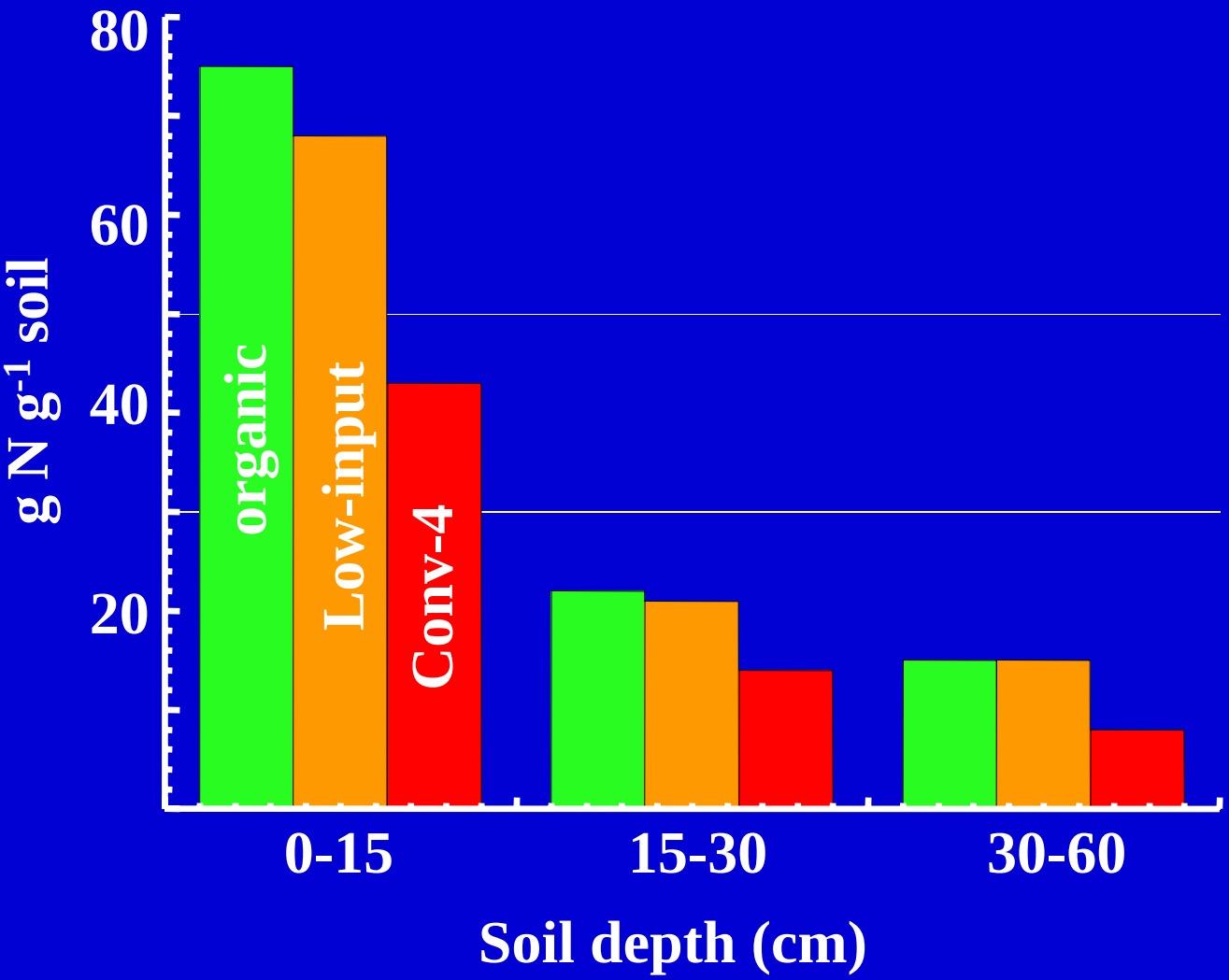
K. Klonsky, DARE, UC Davis, 5-99

Soil C and N in Sustainable Agriculture Farming System project under different management.

System	*Soil %C* Fall 1988	Fall 1996	Fall 2000	*Soil %N* Fall 1996	Fall 2000
Organic	0.83	1.08	1.13	0.117	0.116
Low-input	0.83	1.03	1.04	0.111	0.107
Conv-4	0.83	0.90	0.92	0.094	0.095
Conv-2	0.83	0.84	0.88	0.092	0.094

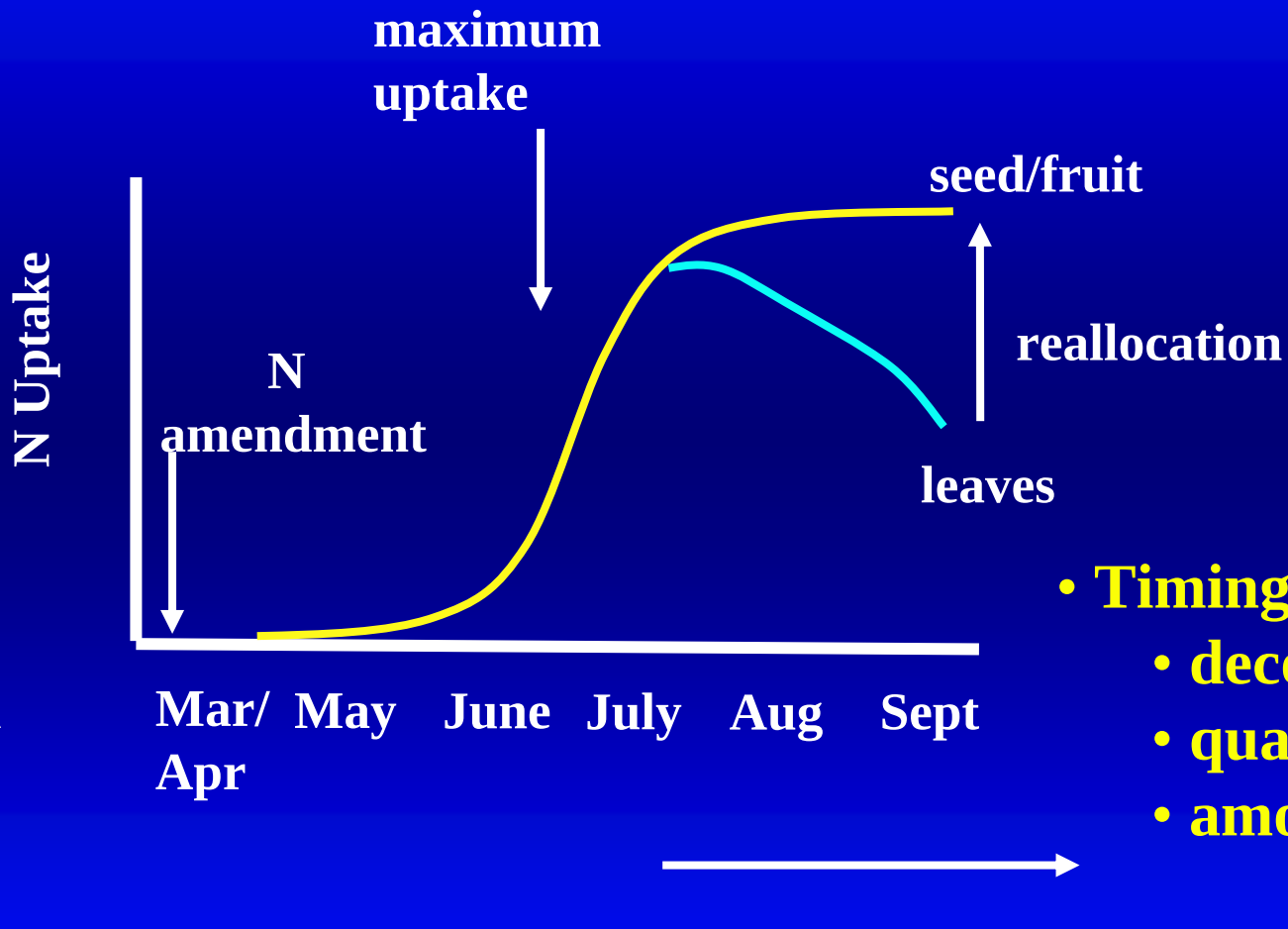
Carbon		Nitrogen	
Organic	5.3 t C ha^{-1}	Organic	462 kg N ha^{-1}
Cover crop	3.4 t C ha^{-1}	Cover crop	273 kg N ha^{-1}

Microbial Biomass after 10 years of management at SAFS



Nutrient availability

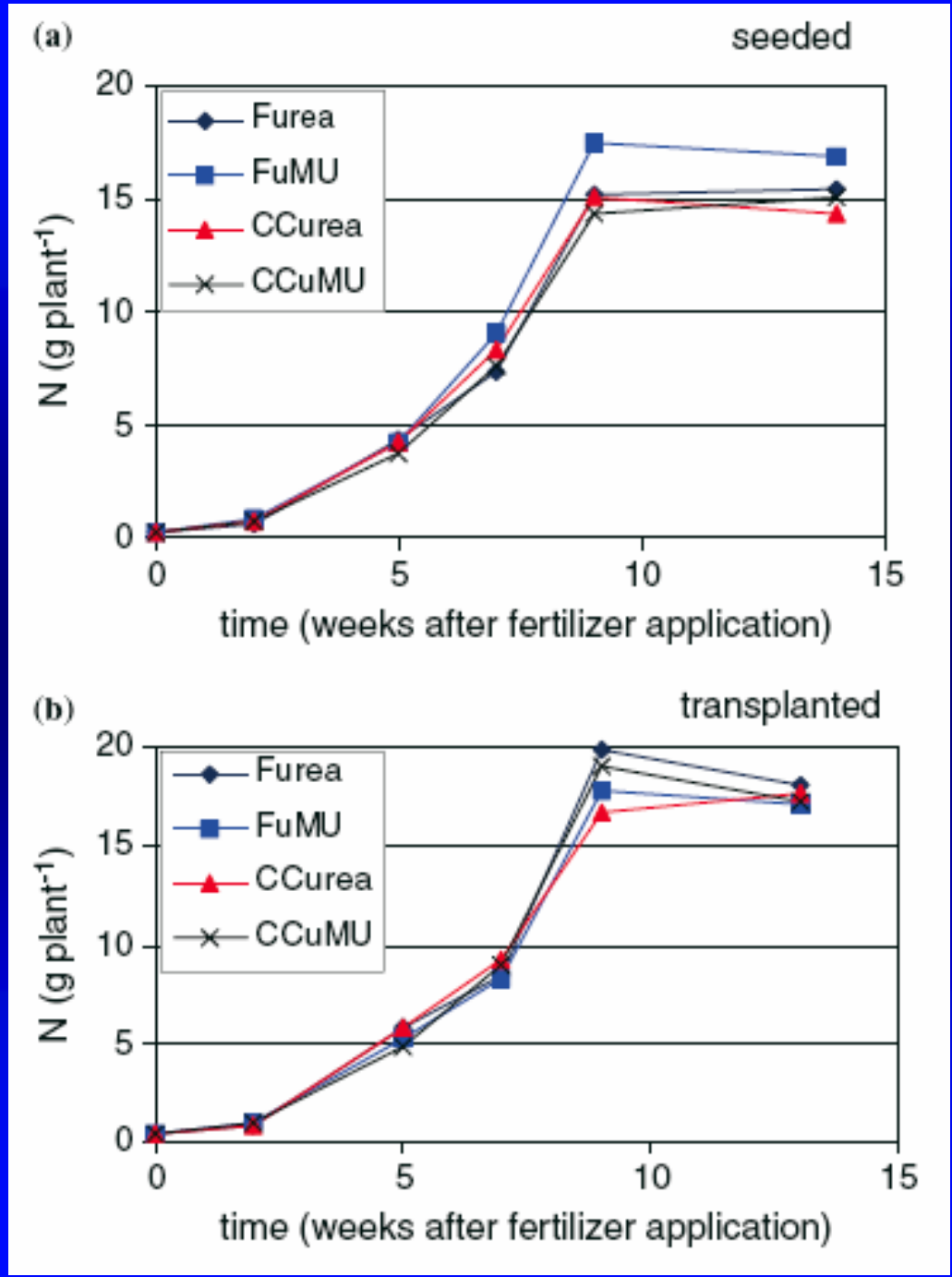
Fertilizer & Soil N availability and synchrony



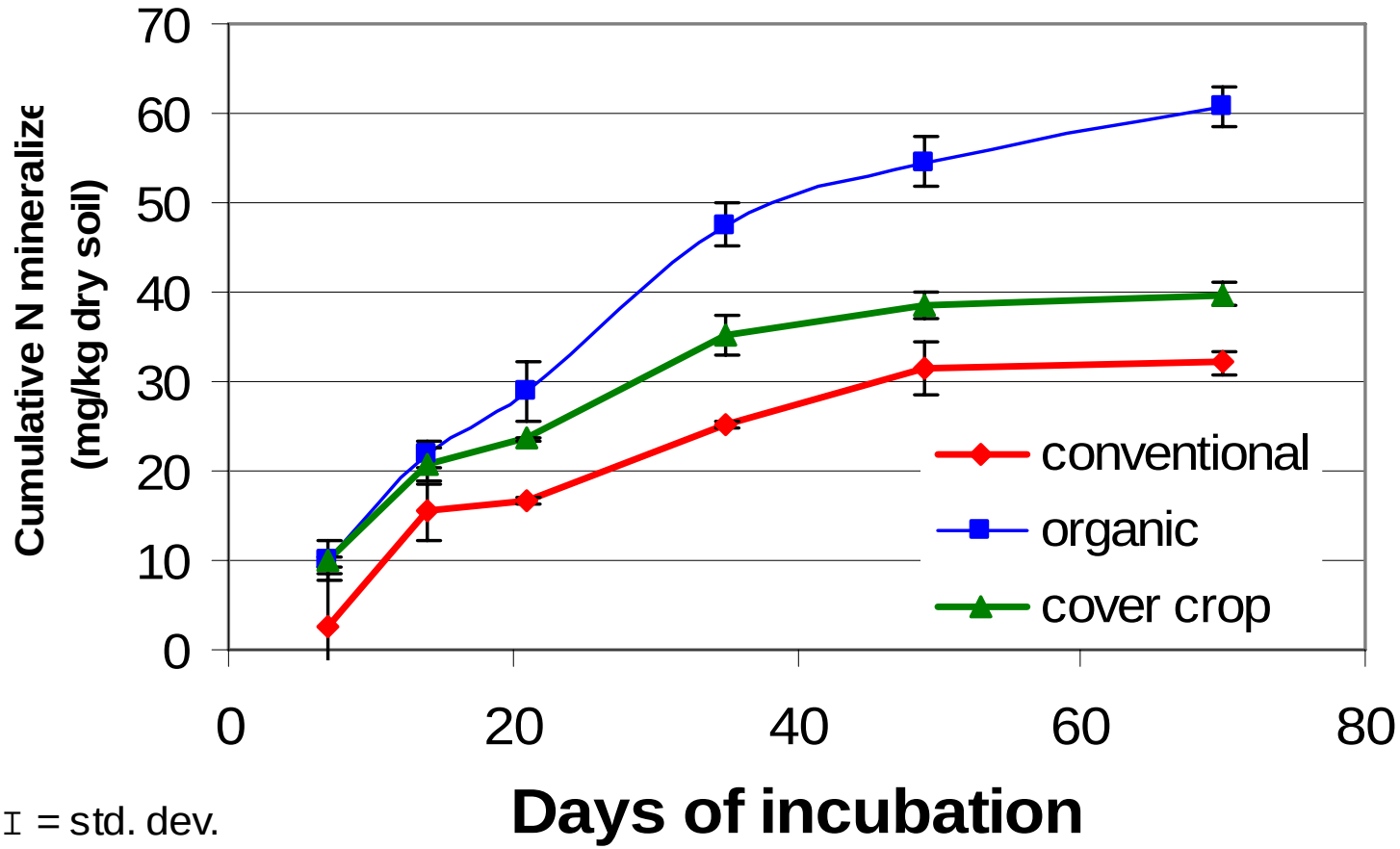
- Timing of incorporation
  - decomposition
  - quality (C/N)
  - amount

Cover crop/organic amendment

Uptake of N of seeded and transplanted tomato

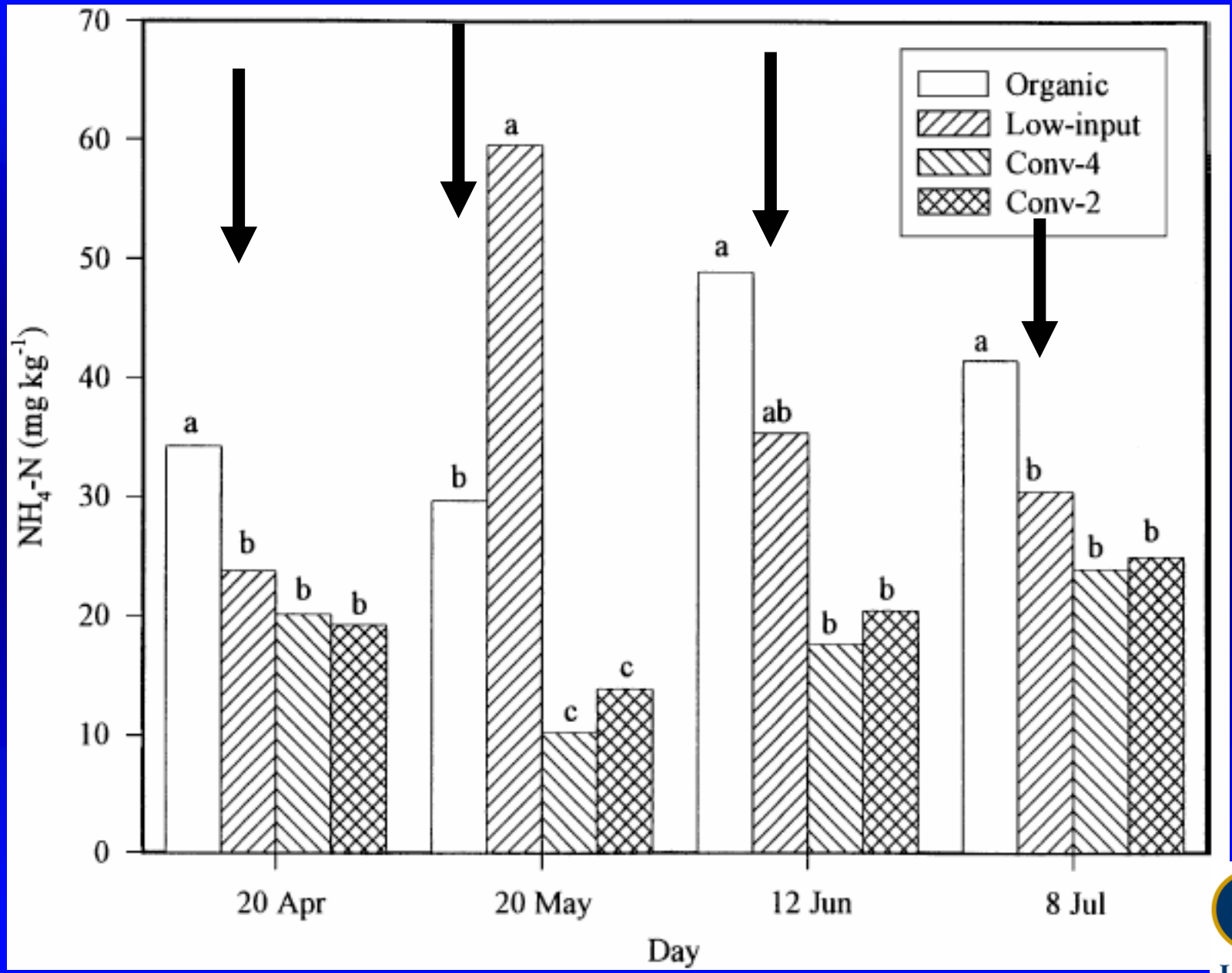


Nitrogen mineralization potential in different Farming Systems

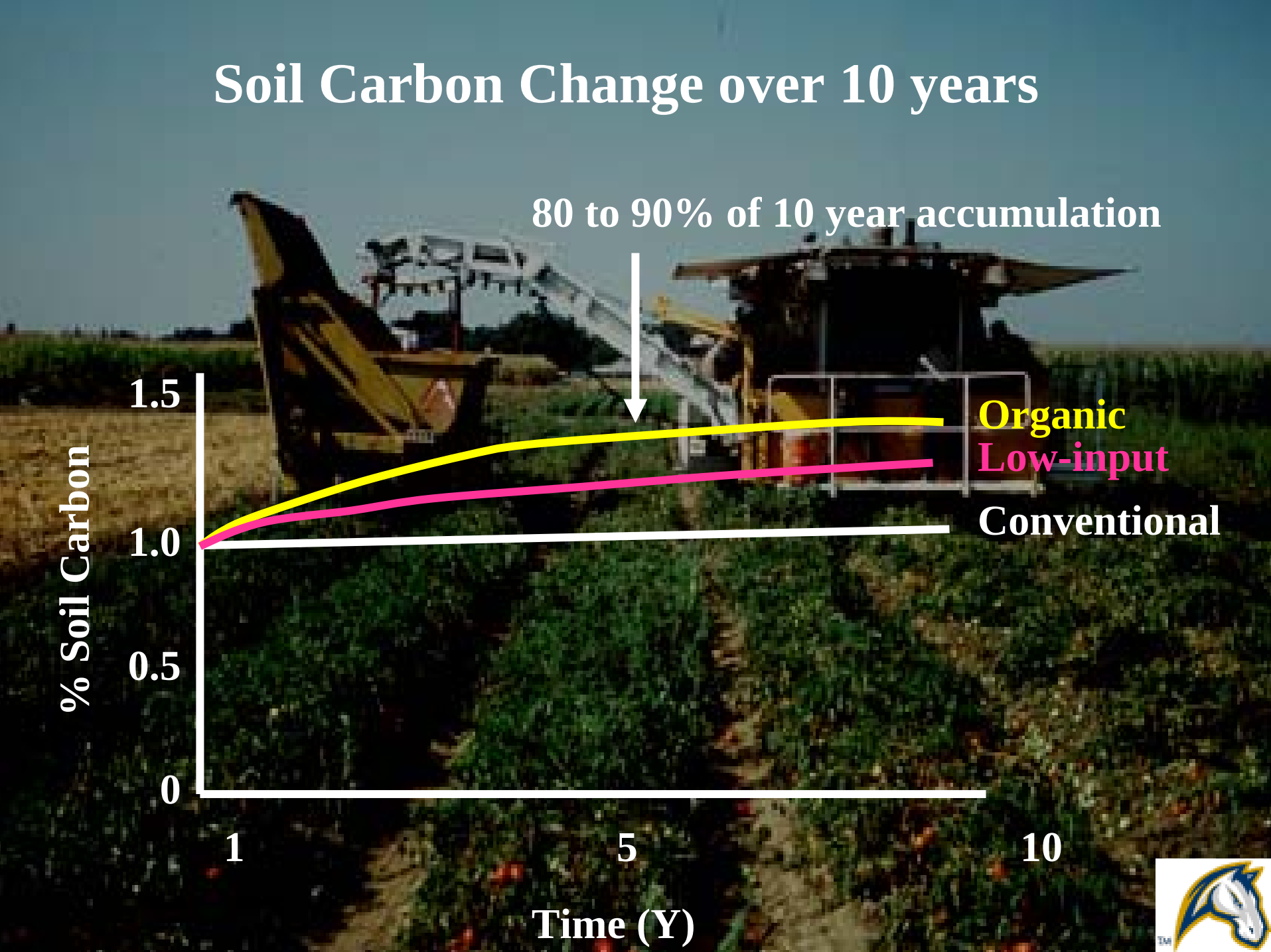


I = std. dev.

Mineralizable N over growing season



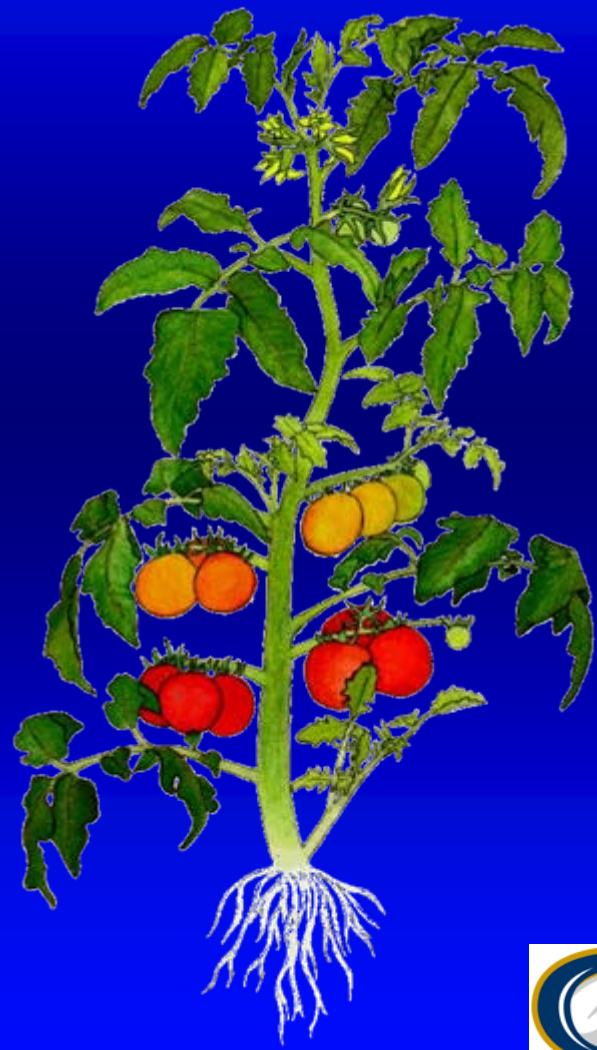
Soil Carbon Change over 10 years



Interaction among soil organic fractions

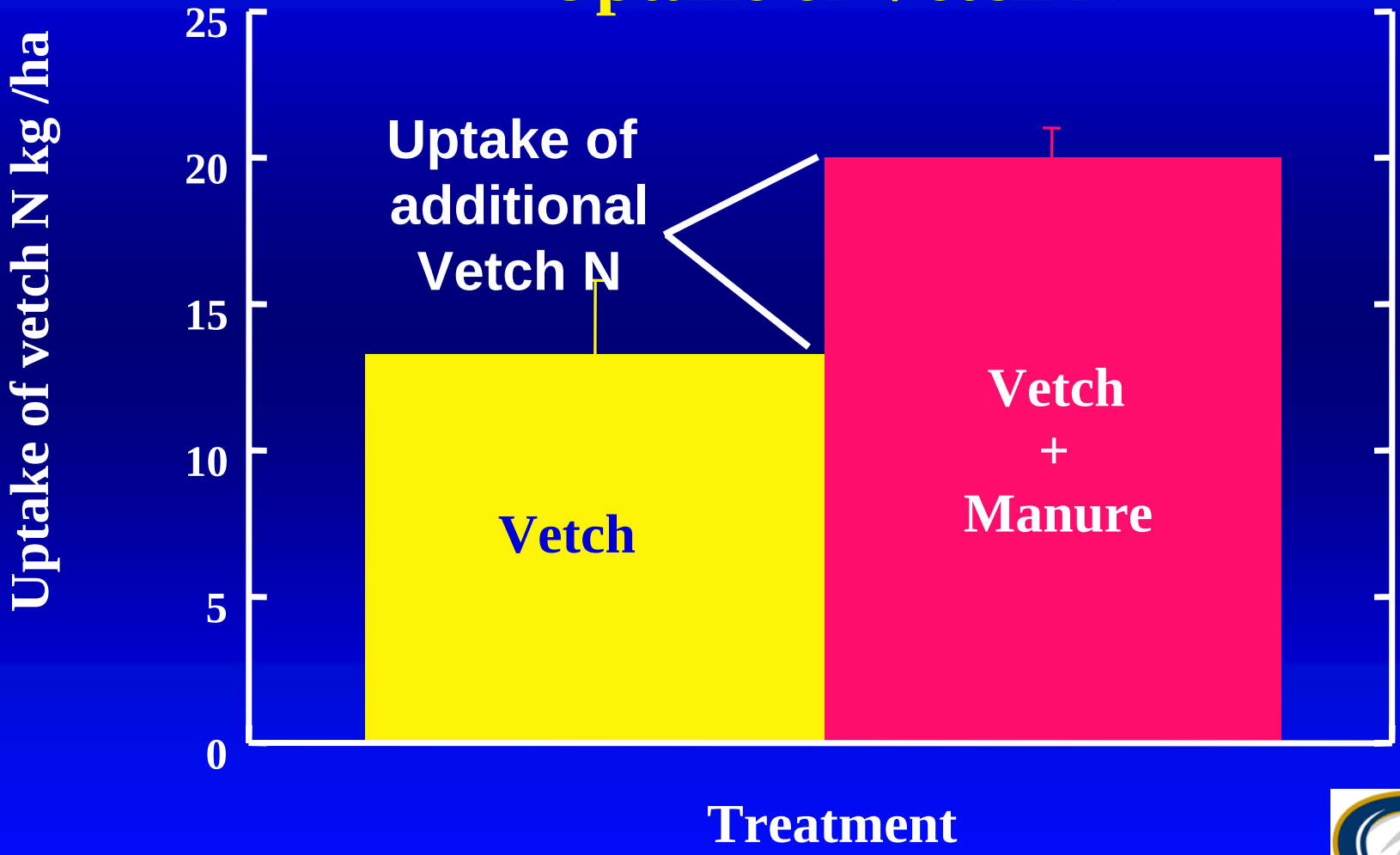
Fertilizer and Soil N Availability

N amendment



SAFS

Organic Rotation
Uptake of Vetch N



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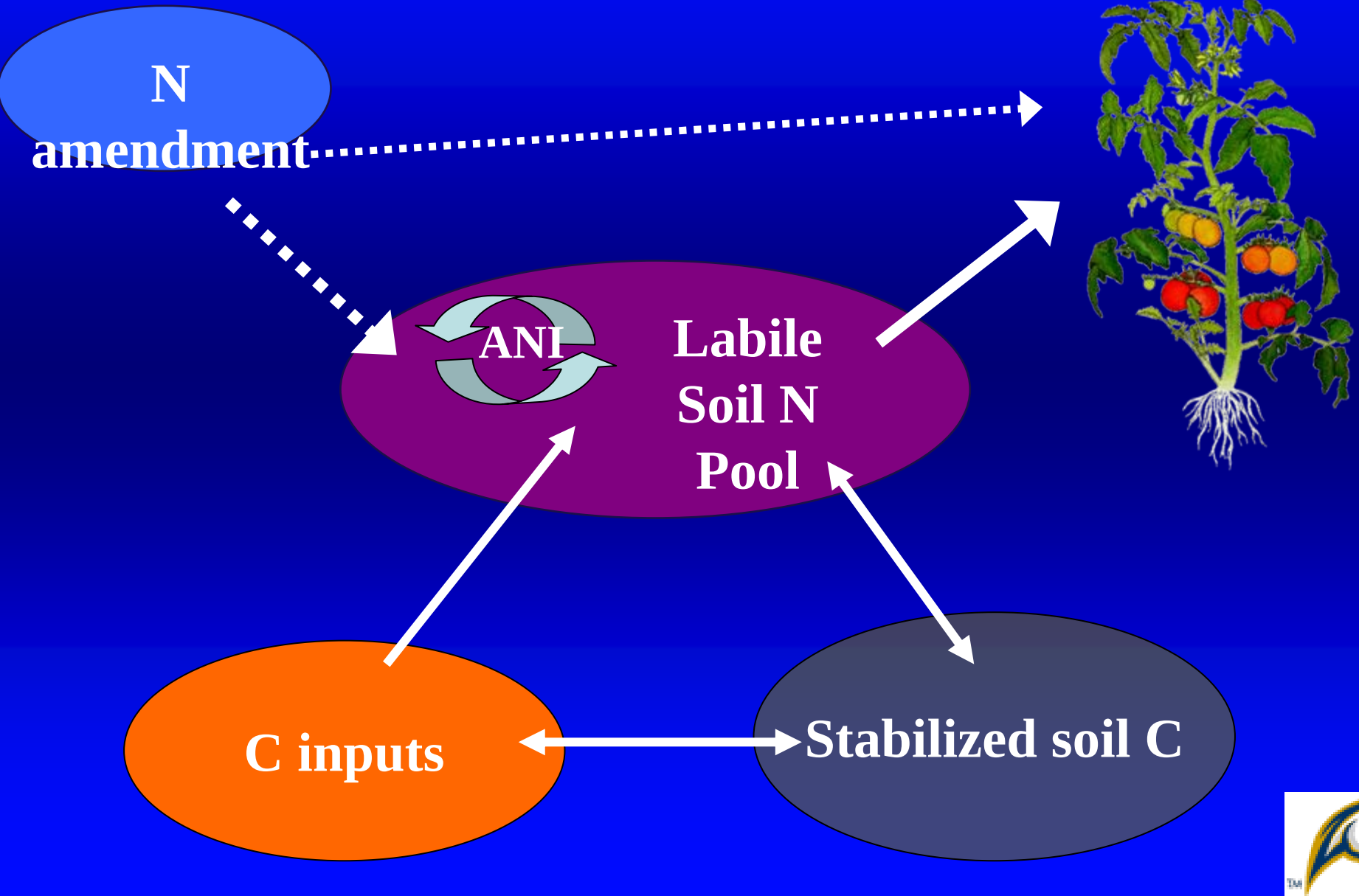
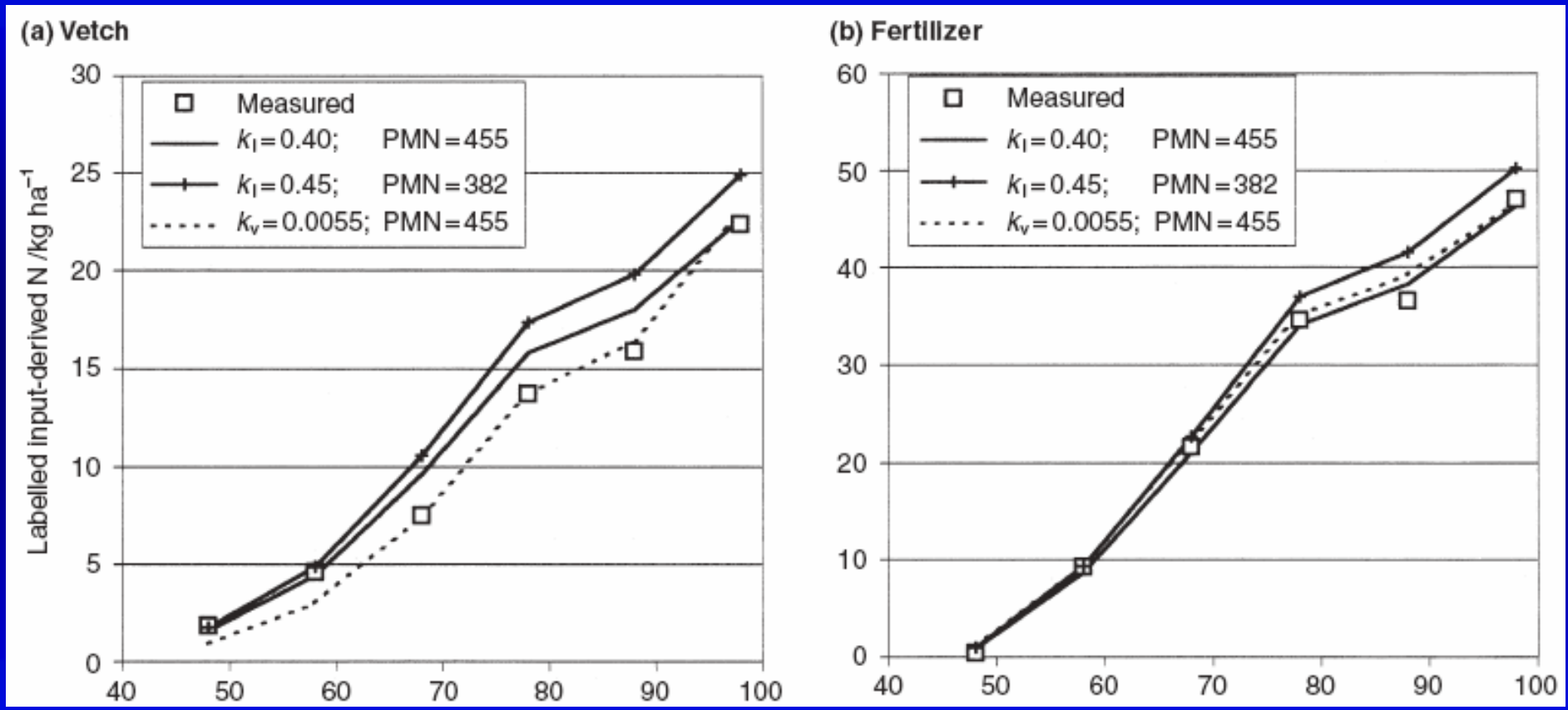
Fertilizer and Soil N Availability



Uptake of vetch N compared to fertilizer N



Some problems with nutrient availability

Average yield (ton ha^{-1}) of tomato among different cropping systems.

Cropping System	Marketable Yield	Unmarketable Yield	Total Yield
Conventional	72.2	19.7	91.9
Low-input	72.6	25.4	98.0
Organic	69.0	26.9	95.9

Summary

- With appropriate combination of amendments sufficient amount and synchrony of nutrient delivery can be achieved
  - Limiting factor is the soil can only store finite N
  - Key is to manipulate the size of mineralizable N pool
- Interactions of amendments with other amendments and soil nutrient pools needs further research to fine tune nutrient delivery