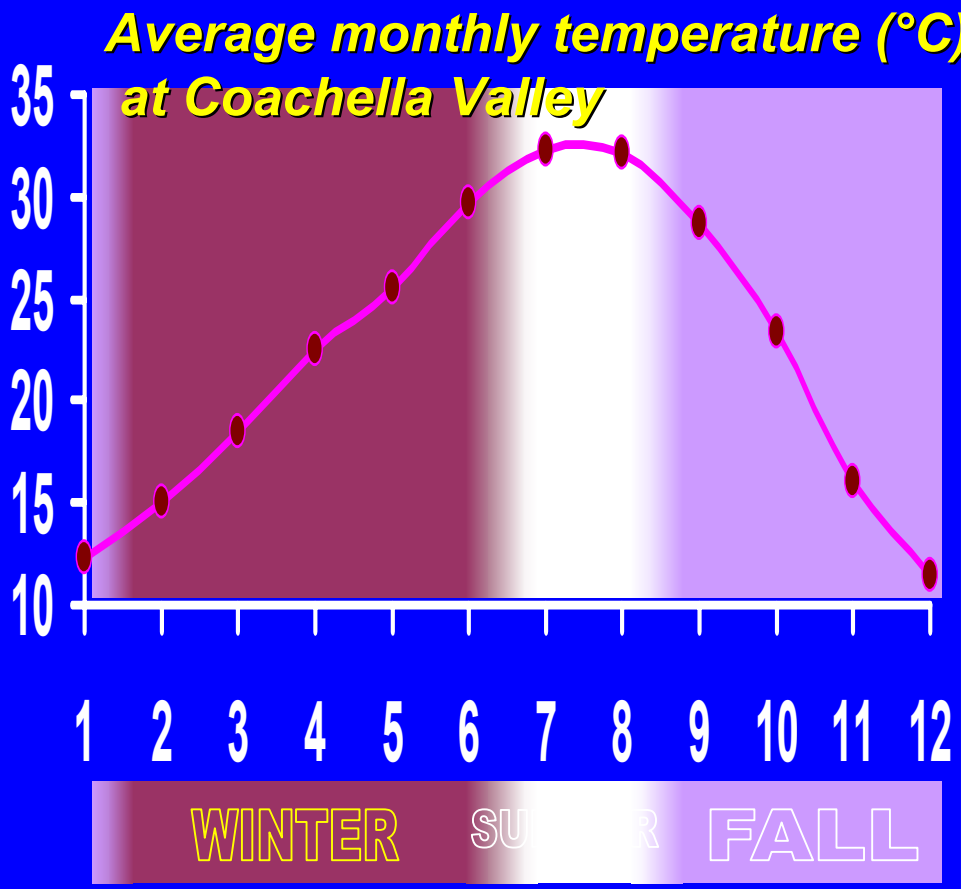
The Organic Decade

- Organic acreage increased
- Loss of many pesticides
- Pressure to decrease synthetic fertilizers and pesticides
- What happens when add organic matter?

WRSARE Lettuce Plots

Characteristics of desert environments



- ***High temperatures***
  - ***High activity of soil micro-organisms***
  - ***Increased rate of organic matter decomposition***
  - ***Low levels of organic matter in desert soils***

Characteristics of desert environments

Soil Series	pH	% Organic Matter
Coachella	*8.0-8.2*	*< 0.7*
Salton	*8.4-9.0*	*<1.0*
Indio	*8.2*	*<1.0*
Imperial	*8.0-8.2*	*<1.0*
Holtville	*8.0*	*<1.0*

The low organic matter content of desert soil leads to

- ***Low aggregate stability***
- ***High erosion potential***
- ***Low water holding capacity***
- ***High nutrient leaching***
- ***Etc.***

Soil Quality = *Ability*

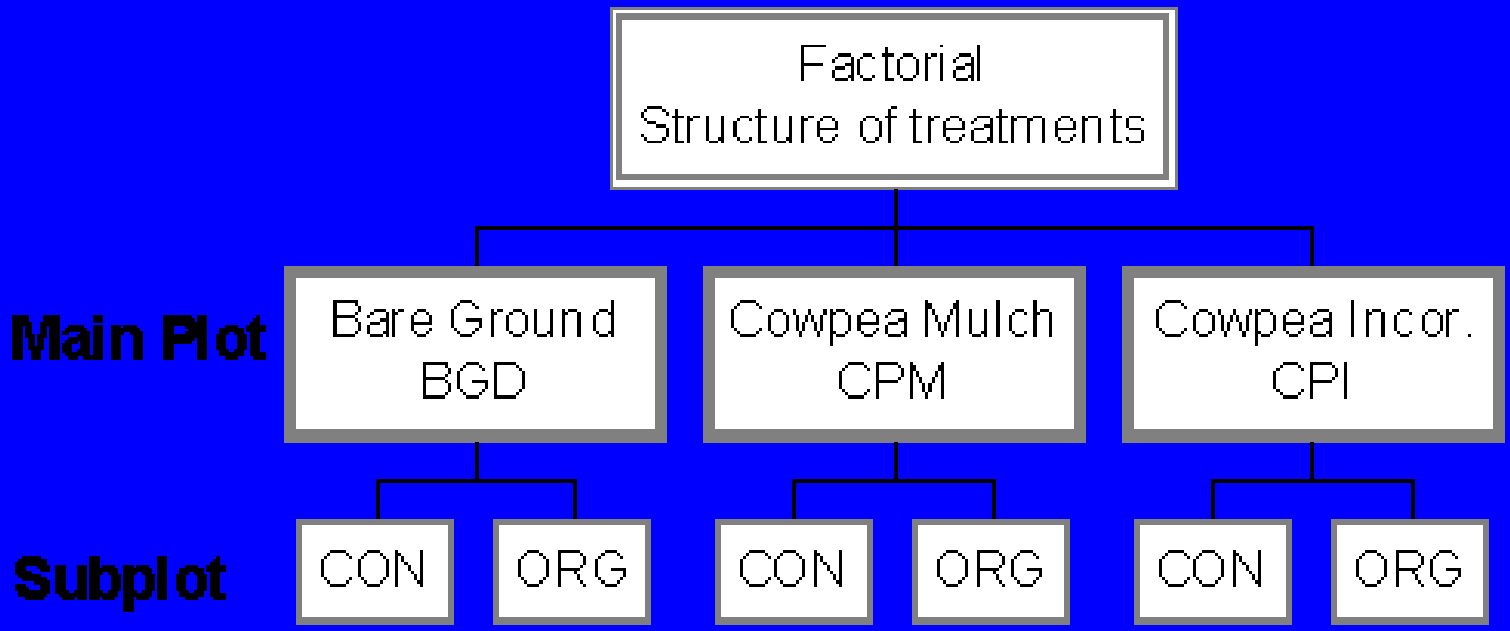
- Accept, hold, & release water & nutrients
- Promote root growth
- Maintain soil diversity
- Respond to management
- Resist degradation

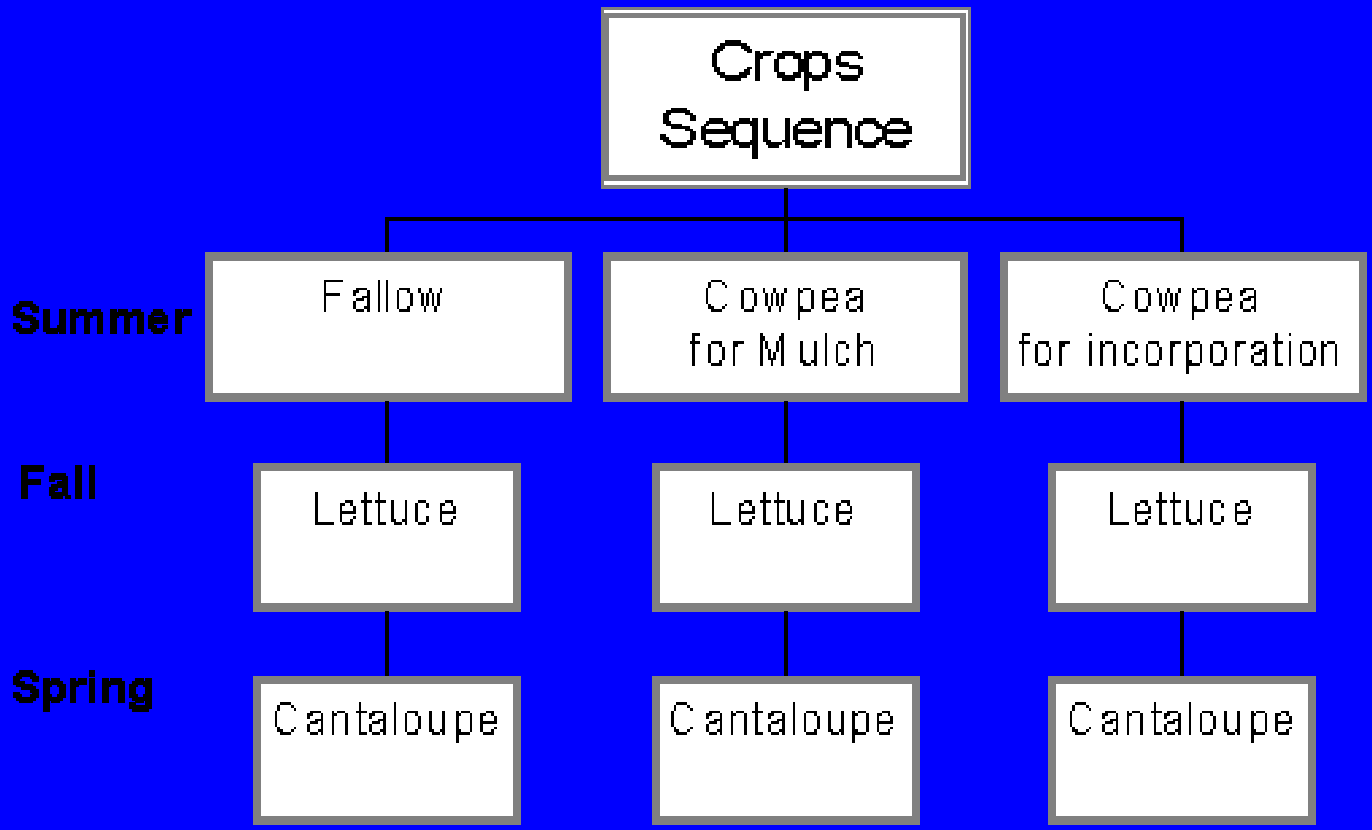
Measures of Soil Quality

- Organic matter
- Water holding capacity
- Infiltration rate
- Microbial biomass
- Structure
- Texture
- Bulk density
- Electrical conductivity
- Nutrient availability and release
- pH
- Balanced diversity

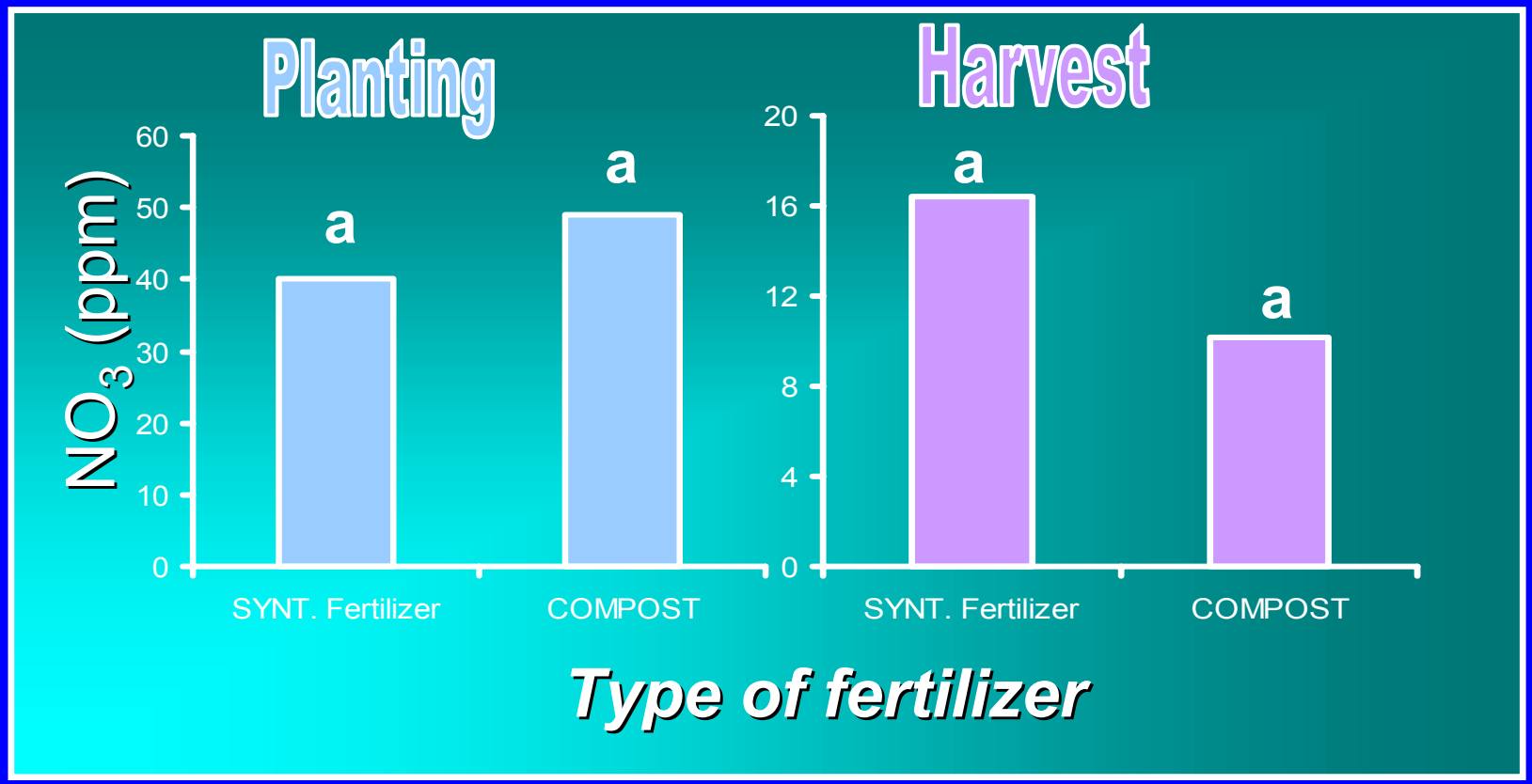
Organic Effect

- Positive changes after several years
- Improvement of soil
- May be fertility or soil chemistry
- Soil microbial changes
- Soil structure?


Factorial
Structure of treatments
Main Plot
Bare Ground
BGD
Cowpea Mulch
CPM
Cowpea Incor.
CPI
Subplot
CON
ORG
CON
ORG
CON
ORG

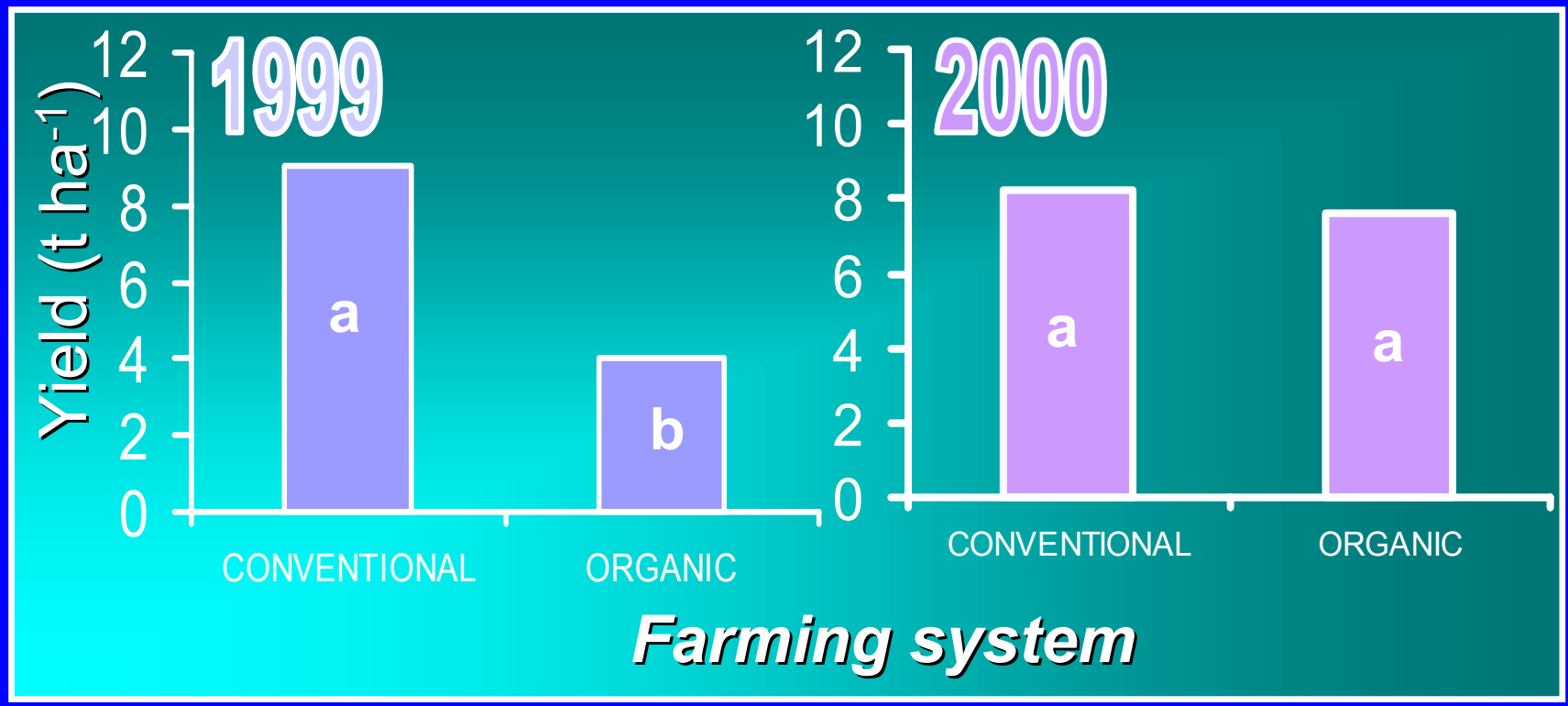

Crops Sequence
Summer
Fallow
Cowpea for Mulch
Cowpea for incorporation
Fall
Lettuce
Lettuce
Lettuce
Spring
Cantaloupe
Cantaloupe
Cantaloupe

Soil NO_3 Content

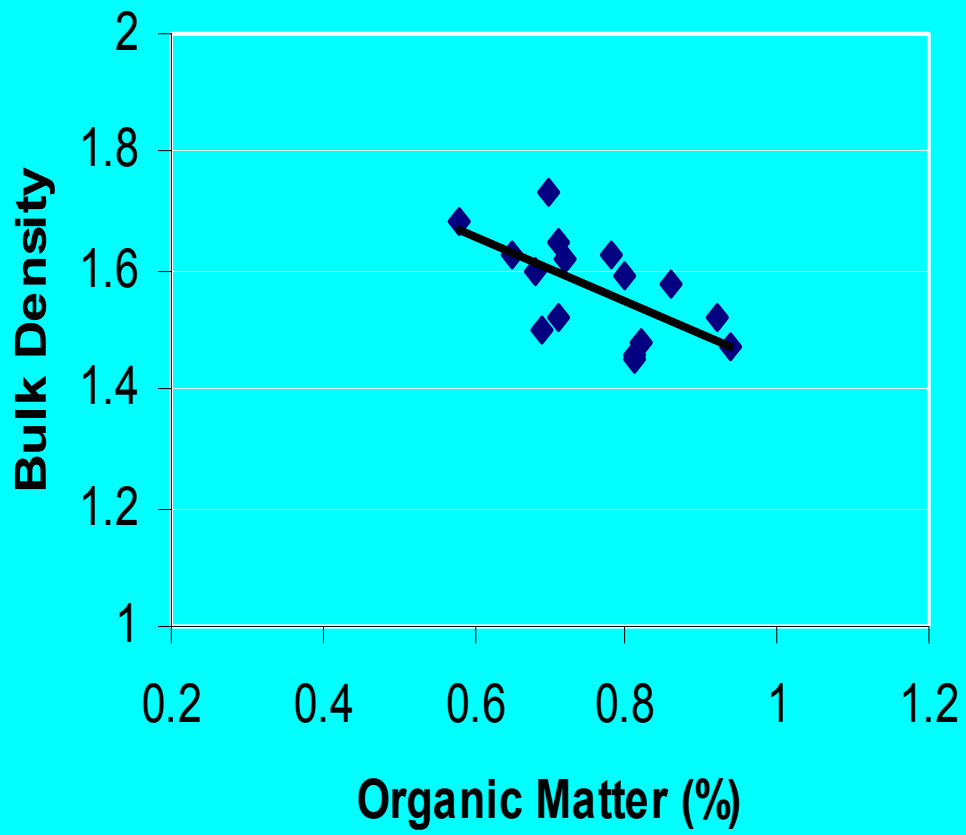


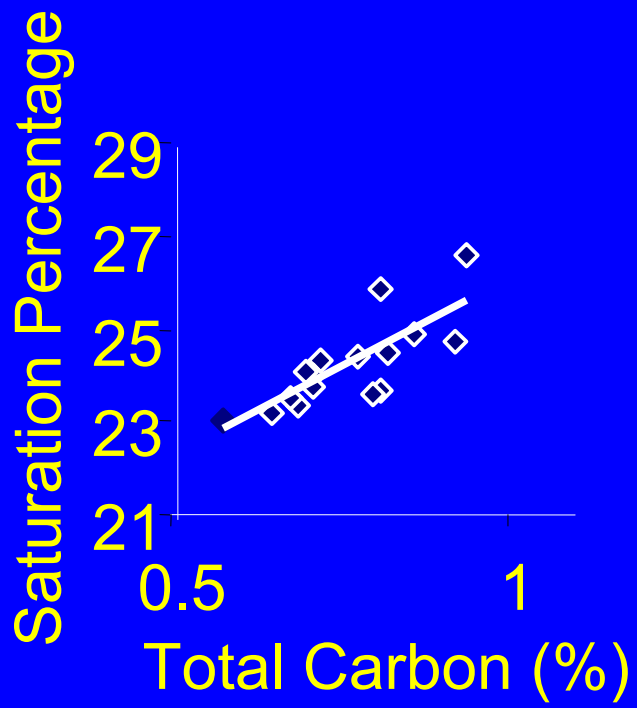
- ***Soil nitrate content was similar at planting and at harvest***

Marketable Yield



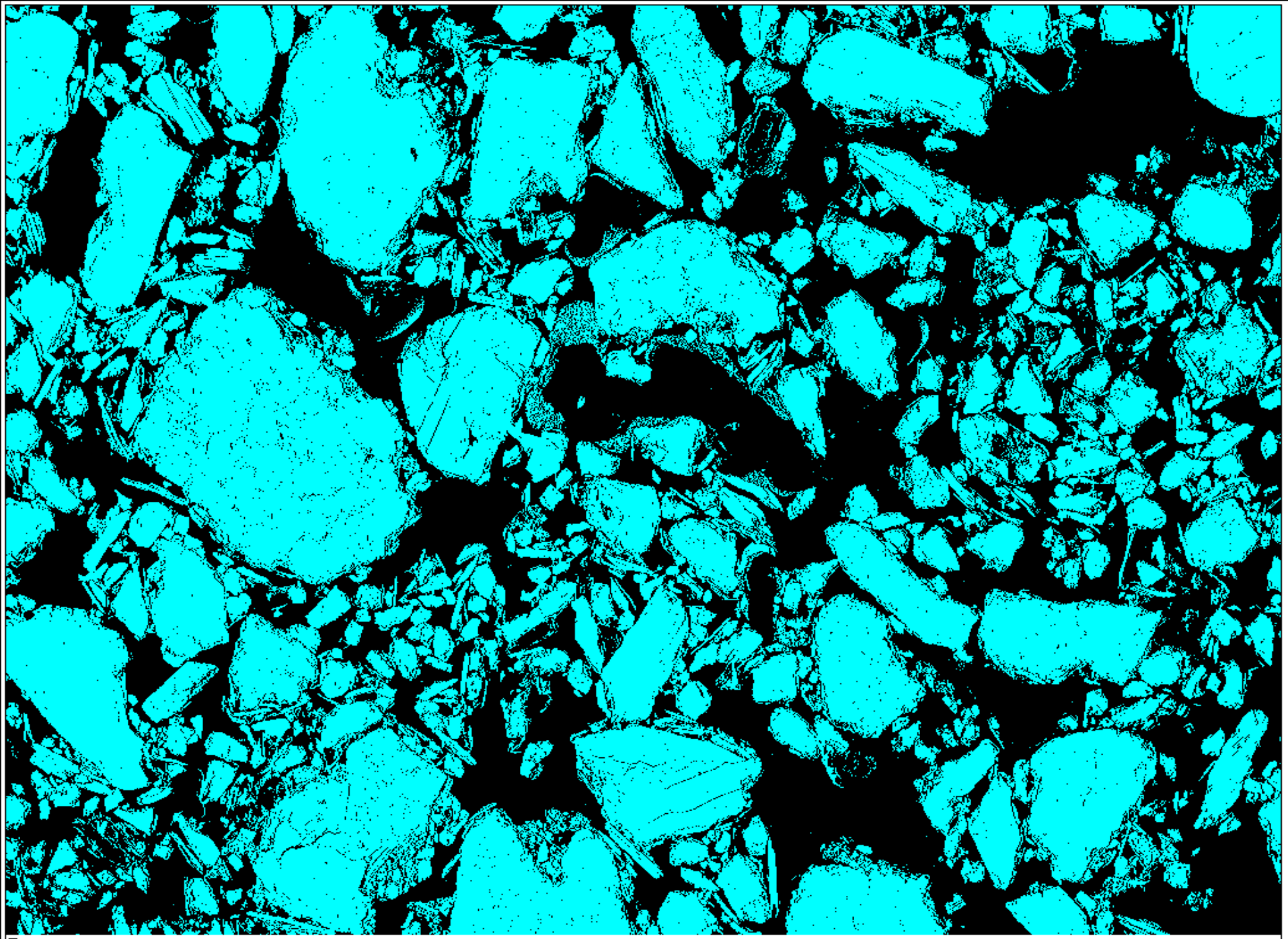
- ***Lettuce yield was lower in the organic system in 1999***
- ***Yields were similar in all systems in 2000***


Bulk Density
2
1.8
1.6
1.4
1.2
1
0.2
0.4
0.6
0.8
1
1.2
Organic Matter (%)

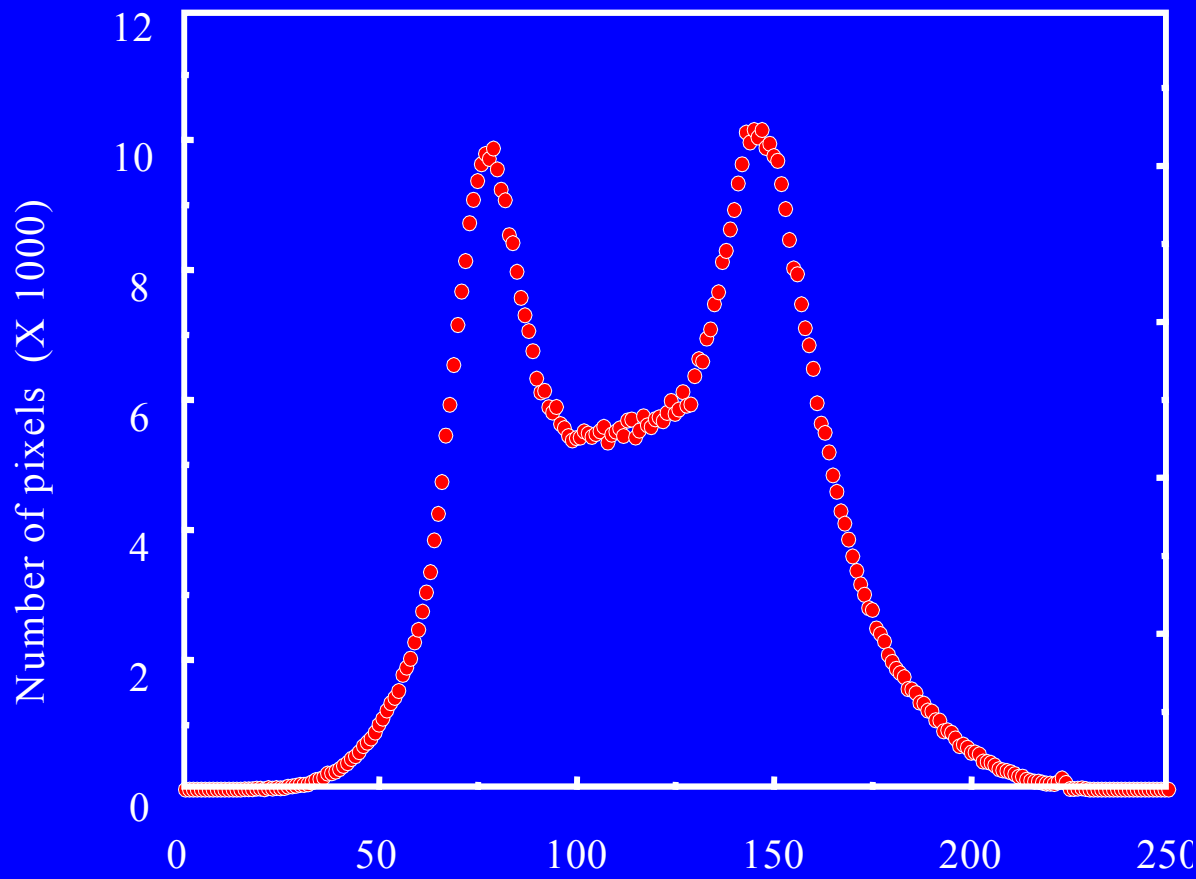

Saturation Percentage
29
27
25
23
21
0.5
1
Total Carbon (%)

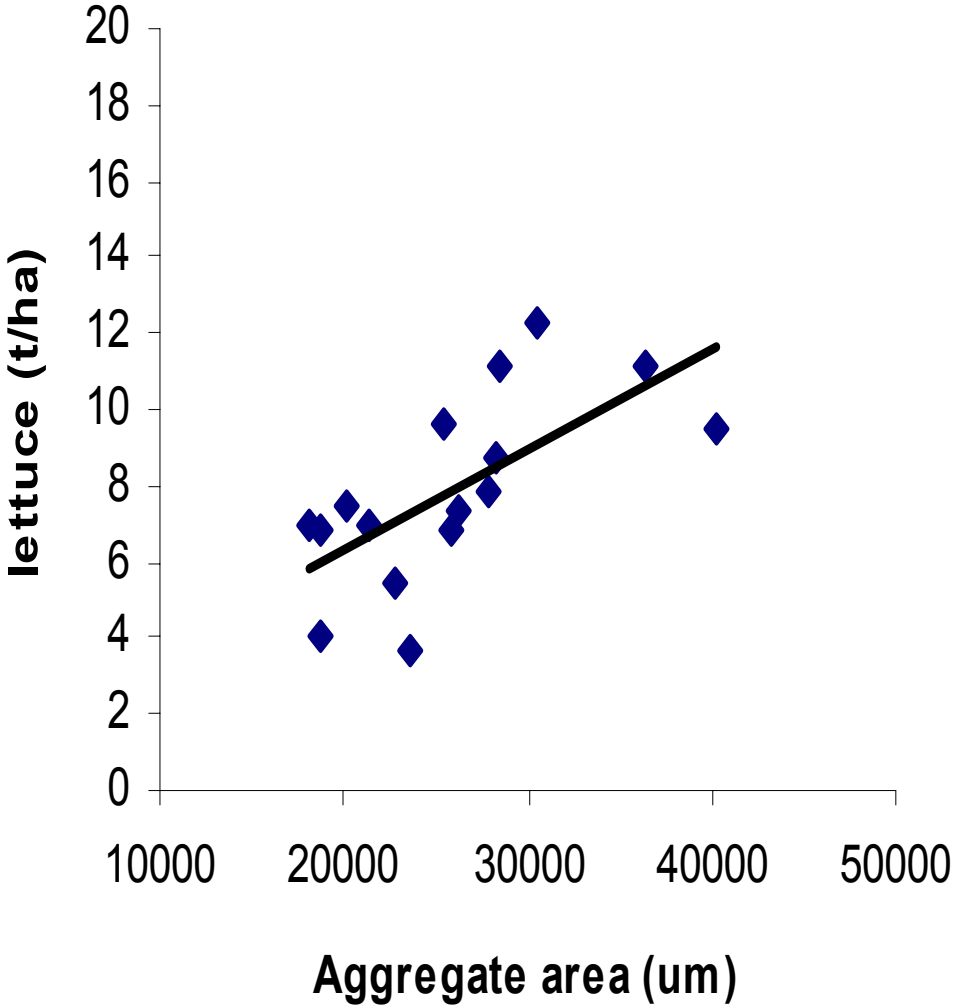
↑ Soil Organic Matter:

- ↑ ↑ Water retention
- ↓ Bulk density = less compaction
- ↑ Melon yield
- No effect on lettuce yield



Image


Number of pixels (X 1000)
12
10
8
6
4
2
0
0
50
100
150
200
250


20
18
16
14
12
10
8
6
4
2
0
lettuce (t/ha)
10000
20000
30000
40000
50000
Aggregate area (um)

↑ Soil Aggregate Size:

- ↑ Lettuce yield
- ↑ EC
- Varieties tolerated higher EC
- Rougher pores, bigger lettuce heads
- Melons generally unaffected

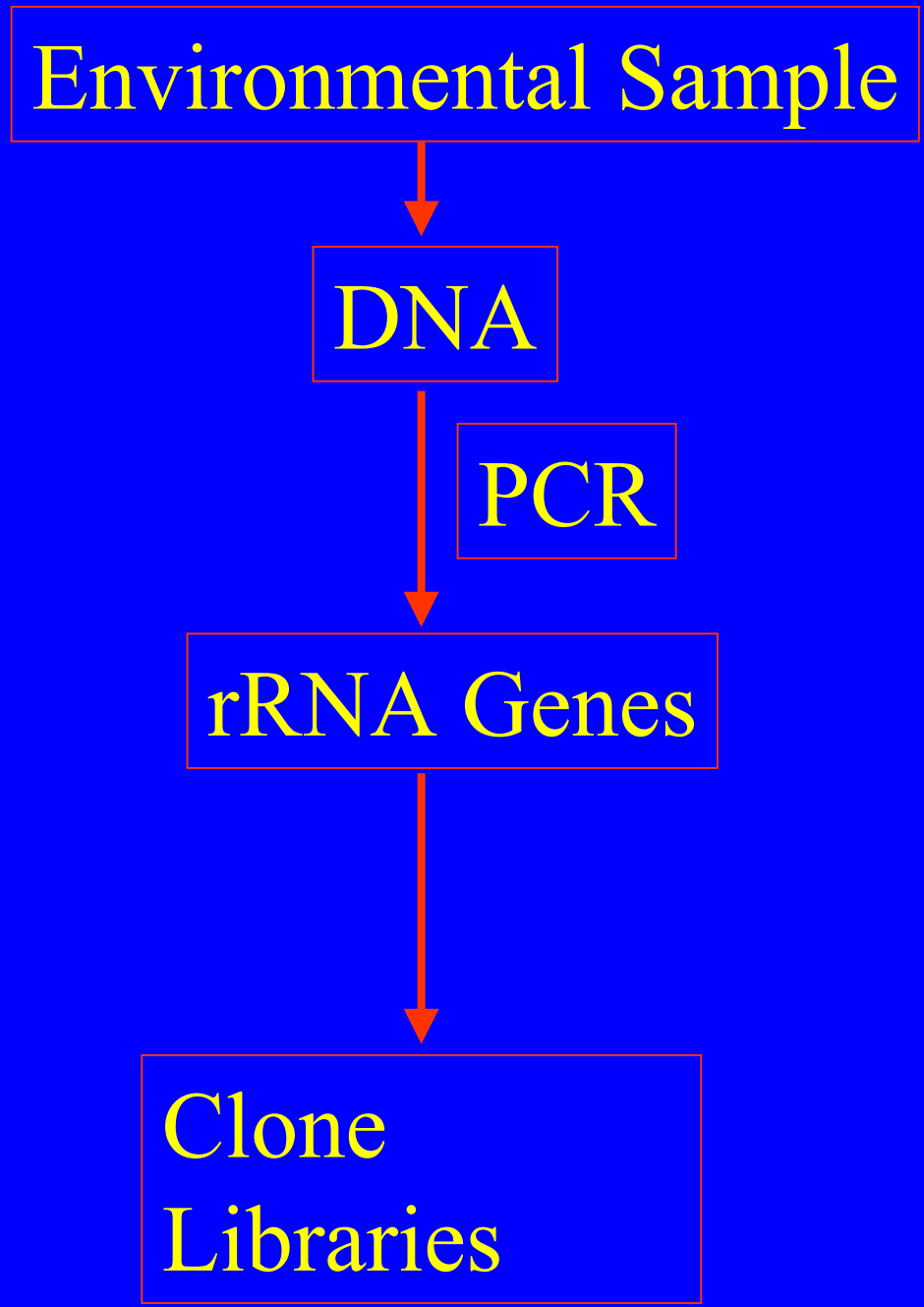
Microbial Respiration

Cover crop	*Management*	*Mg C per g Soil*
None	Conventional	0.50
None	Organic	0.61
Cowpea	Conventional	0.58
Cowpea	Organic	0.60
Sudangrass	Conventional	0.62
Sudangrass	Organic	0.67

"The Great Plate Count Anomaly"

Habitat	Culturability (%)
Seawater	0.001-0.1
Freshwater	0.25
Mesotrophic lake	0.1-1
Estuarine waters	0.1-3
Activated sludge	1-15
Sediments	0.25
Soil	0.3

Amann et al., 1995; Staley and Konopka, 198


Environmental Sample
DNA
PCR
rRNA Genes
Clone
Libraries

The Organic Effect

- Soil organic matter affects physical properties years later.
- Substrate for soil microbes.
- ↑ Yield, ↓ leaching, nematodes, weeds.
- Mixed effect on pathogens and insects.
- Effect due to ↑ soil om, not ↓ pesticides.