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

Average monthly temperature (°C) at Coachella Valley

- **High temperatures**
  - High activity of soil microorganisms
  - Increased rate of organic matter decomposition
  - Low levels of organic matter in desert soils
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
Soil NO$_3$ Content

Soil nitrate content was similar at planting and at harvest.
Lettuce yield was lower in the organic system in 1999.
Yields were similar in all systems in 2000.
Soil Organic Matter:

- **↑ ↑** Water retention
- **↓** Bulk density = less compaction
- **↑** Melon yield
- No effect on lettuce yield
Aggregate area (um)

lettuce (t/ha)
↑ Soil Aggregate Size:

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

<table>
<thead>
<tr>
<th>Cover crop</th>
<th>Management</th>
<th>Mg C per g Soil</th>
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<tbody>
<tr>
<td>None</td>
<td>Conventional</td>
<td>0.50</td>
</tr>
<tr>
<td>None</td>
<td>Organic</td>
<td>0.61</td>
</tr>
<tr>
<td>Cowpea</td>
<td>Conventional</td>
<td>0.58</td>
</tr>
<tr>
<td>Cowpea</td>
<td>Organic</td>
<td>0.60</td>
</tr>
<tr>
<td>Sudangrass</td>
<td>Conventional</td>
<td>0.62</td>
</tr>
<tr>
<td>Sudangrass</td>
<td>Organic</td>
<td>0.67</td>
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### “The Great Plate Count Anomaly”

<table>
<thead>
<tr>
<th>Habitat</th>
<th>Culturability (%)</th>
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<tbody>
<tr>
<td>Seawater</td>
<td>0.001-0.1</td>
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<tr>
<td>Freshwater</td>
<td>0.25</td>
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<tr>
<td>Mesotrophic lake</td>
<td>0.1-1</td>
</tr>
<tr>
<td>Estuarine waters</td>
<td>0.1-3</td>
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<tr>
<td>Activated sludge</td>
<td>1-15</td>
</tr>
<tr>
<td>Sediments</td>
<td>0.25</td>
</tr>
<tr>
<td>Soil</td>
<td>0.3</td>
</tr>
</tbody>
</table>

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