What is Compost?

Composting Biology and Core Principals

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Compost: definition

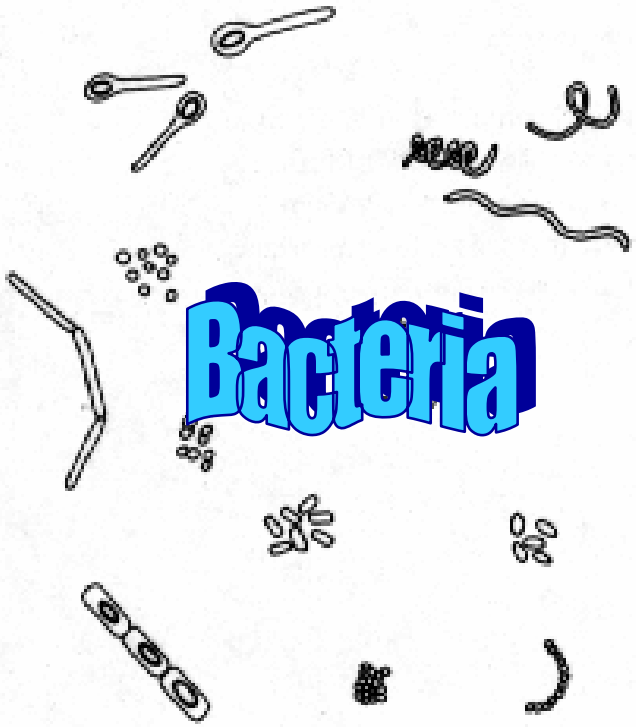
- "An accumulation of decaying or decayed organic matter, as from leaves and manure, used to improve soil structure and to provide nutrients."
  - Decay is a biological process (not a chemical process)
  - Properties determine what is a compost (not the production method)

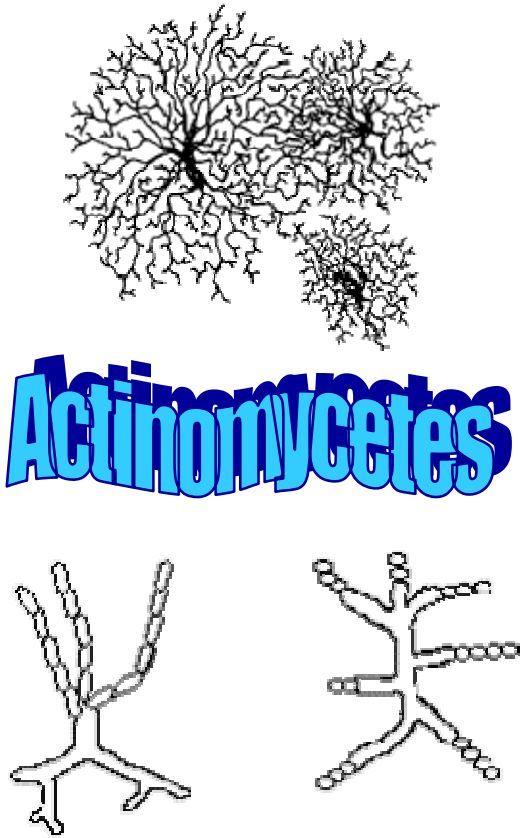
- Backyard Composting
- Vermicomposting
- Lasagna Composting
- Thermophilic Composting

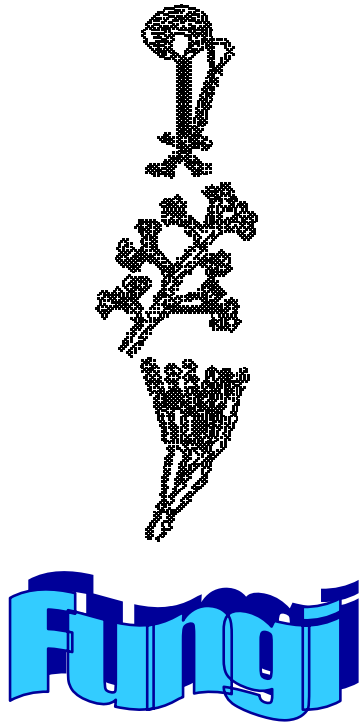
Not all composts are created equal.

Thermophilic composting

Compost microorganisms

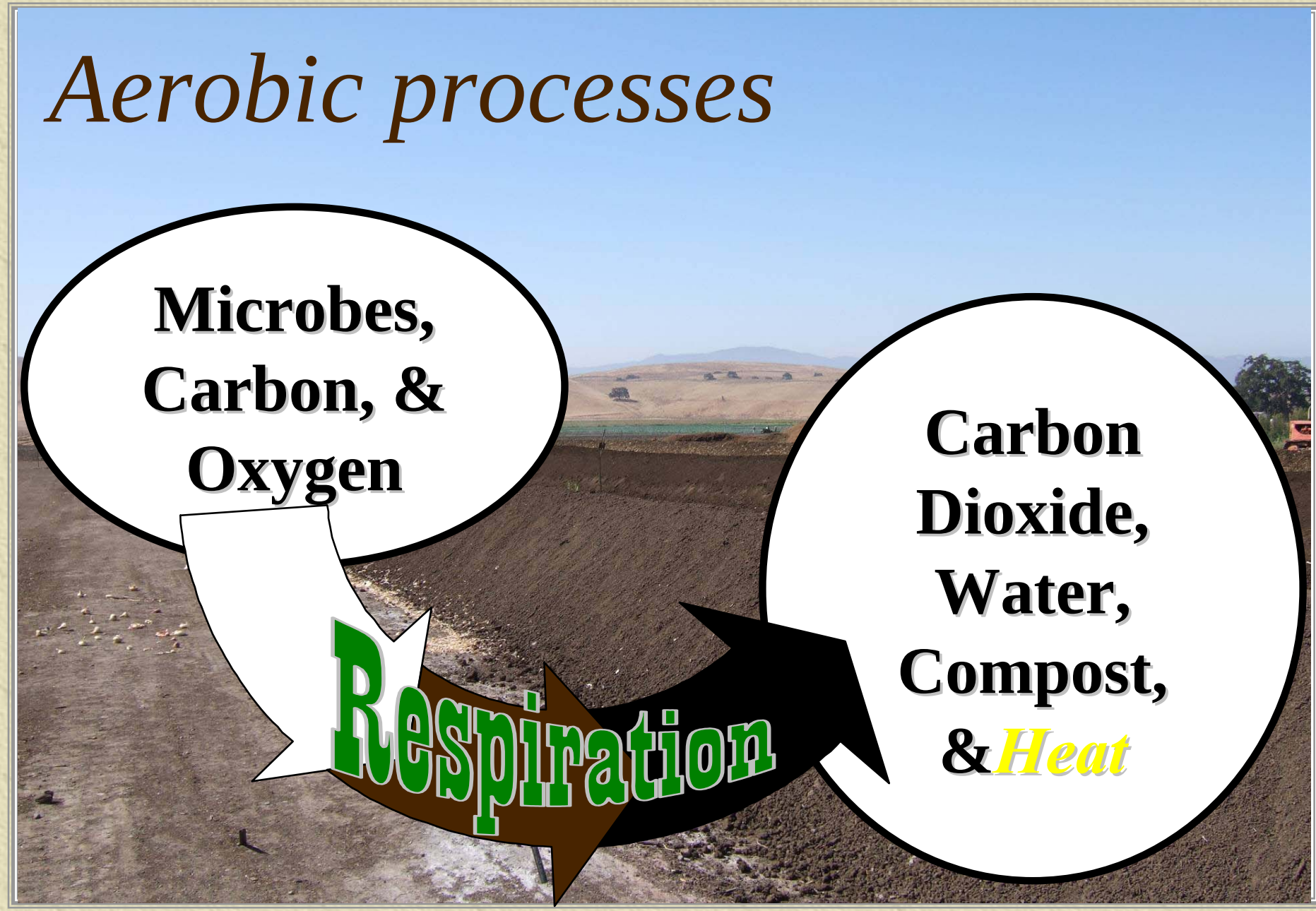






Illustrations: www.Digitalseed.com

Aerobic processes



Thermophilic composting

- Microbes tend to specialize in the temperatures they prefer.
- In California soils and in our bodies mesophiles are most abundant. Pathogens are mesophiles.
- Between 110°F and 155°F, thermophiles dominate.
- Above about 160°F dieoff begins.
- Reliable pathogen kill occurs above 131°F.
- Heat greatly accelerates microbial efficiency.

Thermophilic composting

Why compost?

Active Composting

- **To eliminate disease organisms**
  - ***Animal • Plant • Human***
- **To produce a stable and safe soil amendment**
  - ***Nutrients • Odors • Phytotoxins***

Carbon

- **Source of energy for microbes**
- **Not all forms are equally available**
  - **lignin (less available)**
  - **cellulose**
  - **fats, waxes, proteins**
  - **sugars (more available)**

C

C

Nitrogen

- **Vital nutrient for microbes**
- **Needed for protein synthesis**
- **Excess may volatilize as ammonia (NH_3)**
- **Other nitrogenous compounds can be odiferous**
- **Also important for plants**
- **C:N ratio**
  - **initially about 35:1**
  - **about 10:1 to 20:1 in cured product**

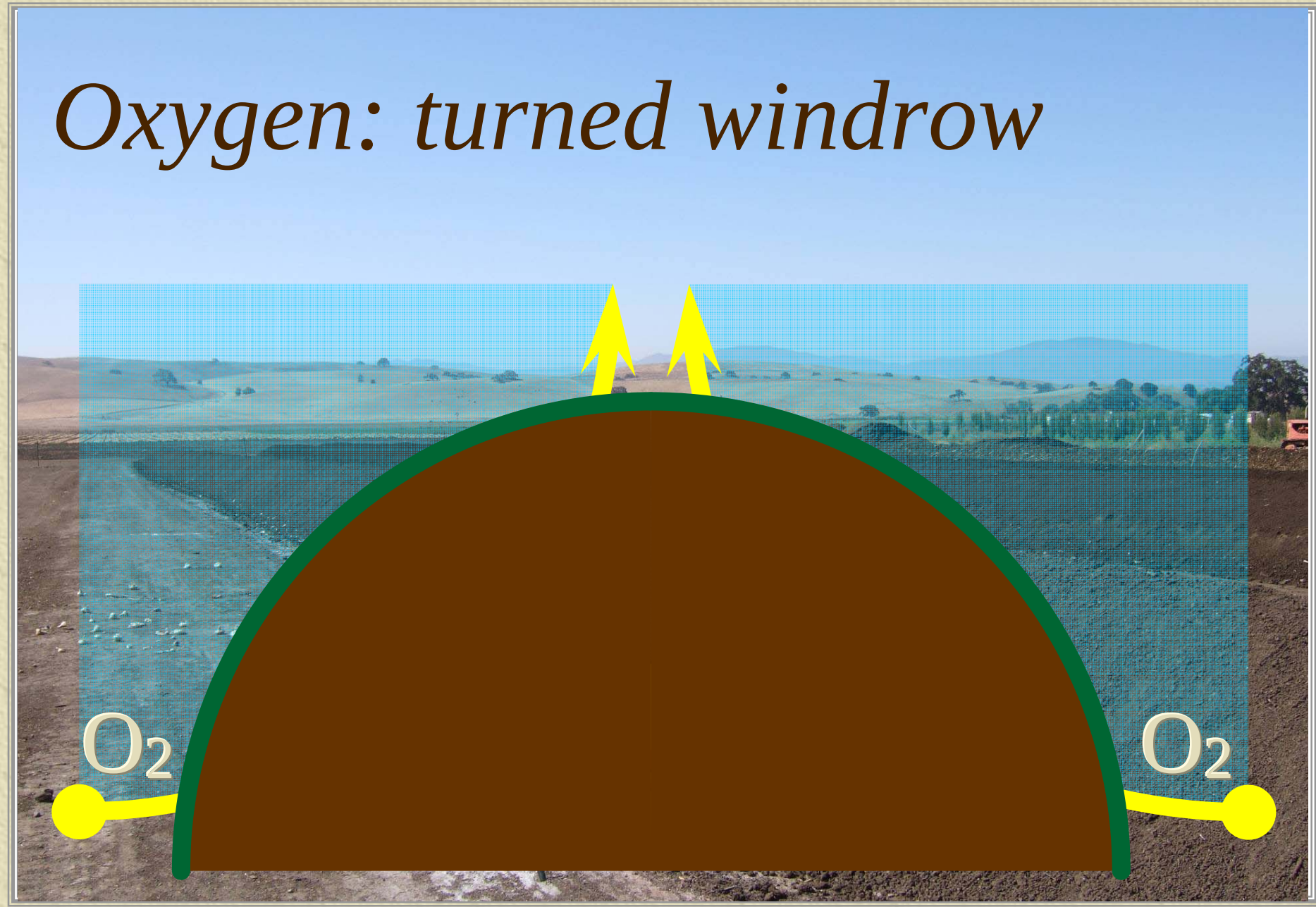
N

N

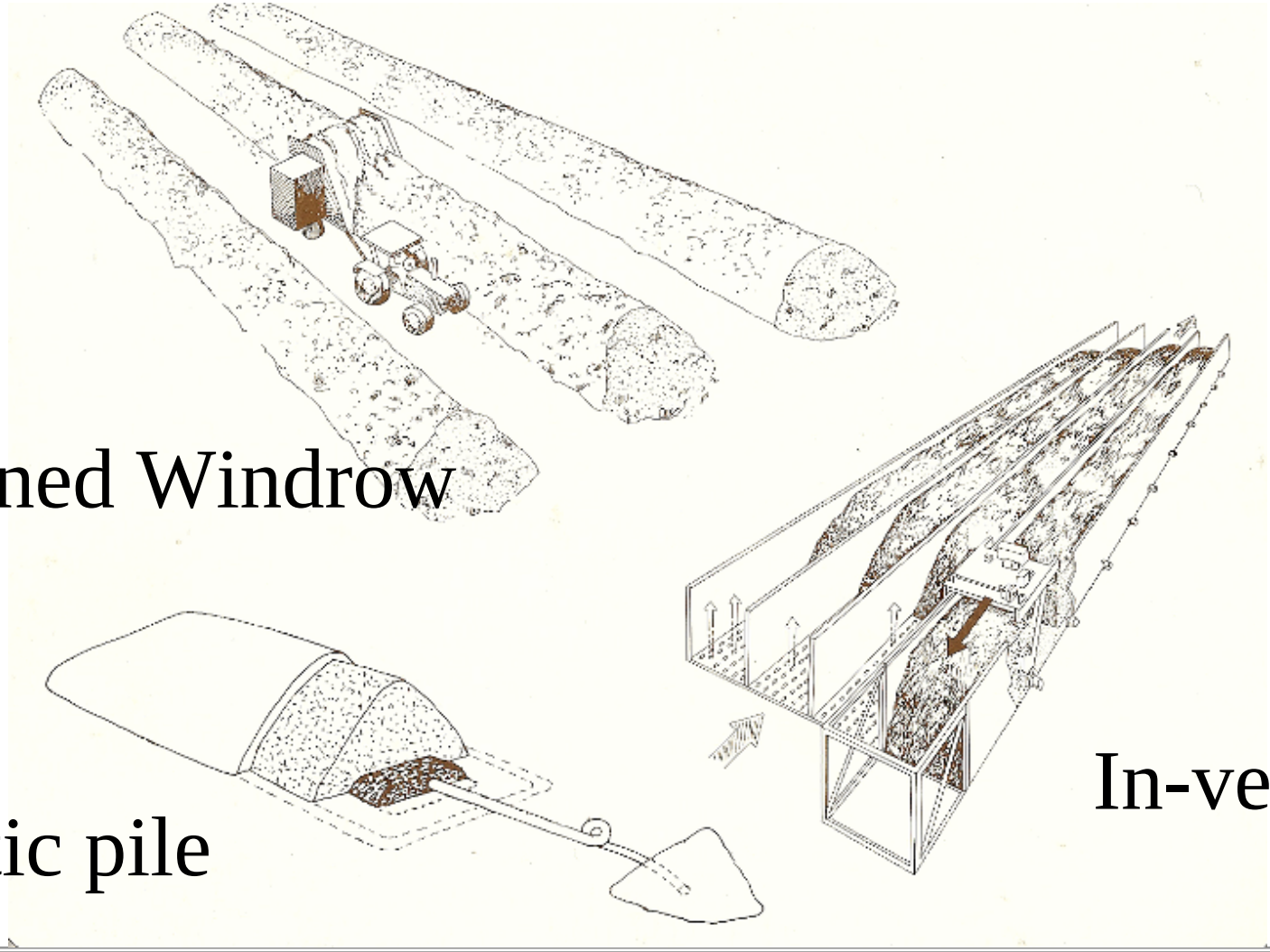
Oxygen

- **Acts as an electron acceptor**
- **Permits efficient liberation of *energy* from carbon**
- **Energy is used by microbes to grow and reproduce**

Oxygen: turned windrow



Composting alternatives



Turned Windrow

Static pile

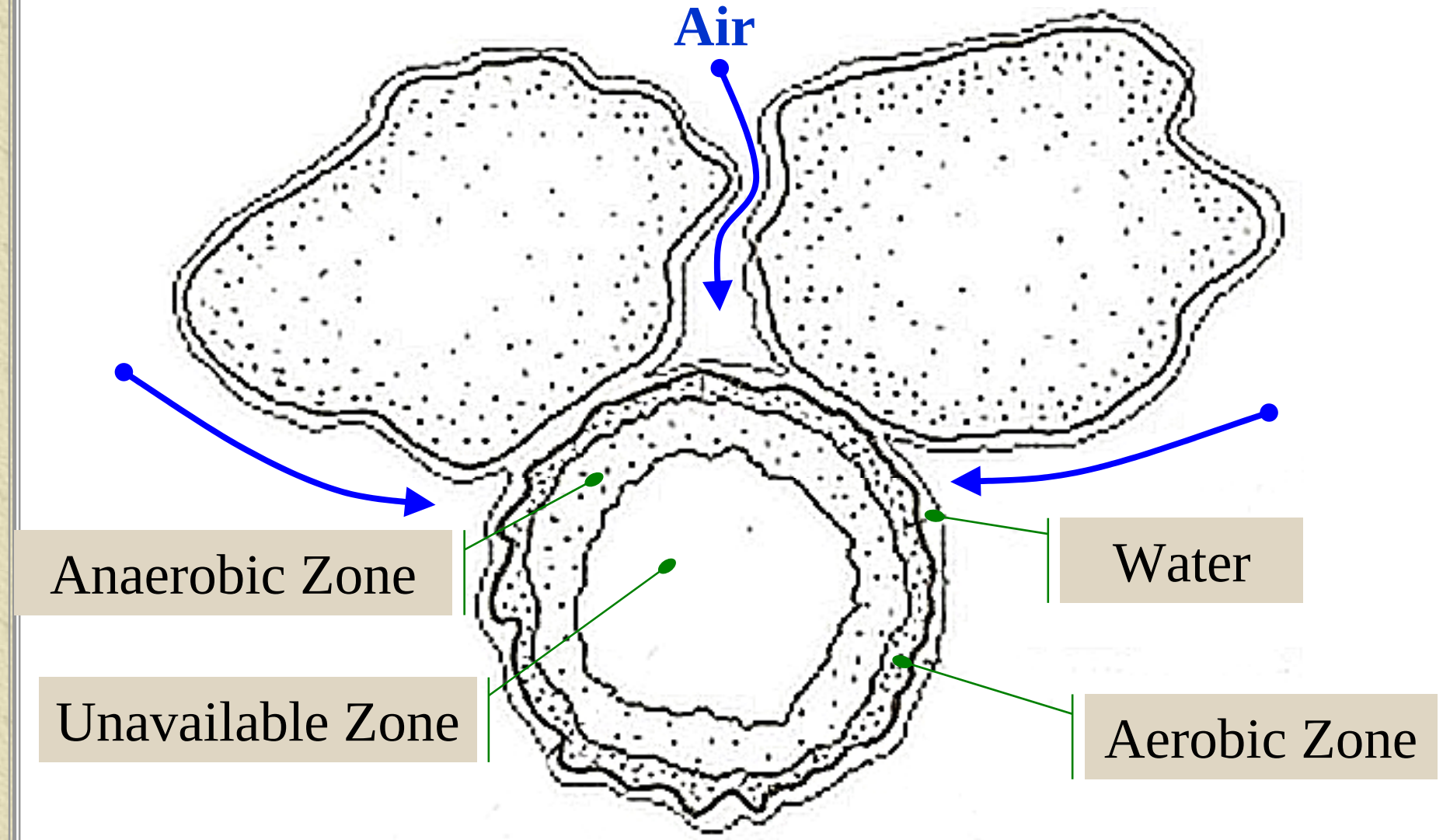
In-vessel

Illustration: Rynk et al. 1992

Water

- **Clings to compost particles**
- **The bath within which microbes grow**
- **Too much fills pores**
- **Oxygen moves slowly into water**

Compost particle environment



Management parameters

- **Particle Size**
- **Porosity**
- **C:N ratio**
- **H_2O**
- **O_2**

Conclusions

- The composter's success in managing the process will determine
  - Product quality
  - Product consistency
- Consistent quality increases demand for composts
- Increased demand increases product value

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Questions?

Compost types and uses

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Mulches: cover the soil

- Higher C:N ratios
- Larger particles sizes
- Low trash levels
- Maturity less important

Soil amendments: modify soil properties

- Changes take time
- Soil properties are changes by
  - Compost particles
  - Formation of soil aggregates
- Salinity more likely to be a concern
- Maturity may be more important

Organic fertilizers: slow release

- Compost nutrient content is usually not available immediately
- Important in long-term nutrient budgeting
- Low C:N ratios are better fertilizers

Conclusions

- Mulches, soil amendments and organic fertilizers are uses, not products.
- Composts may serve any of these.
- Different composts have different properties, and will therefore be more suitable for some uses than for others.