Compost Basics

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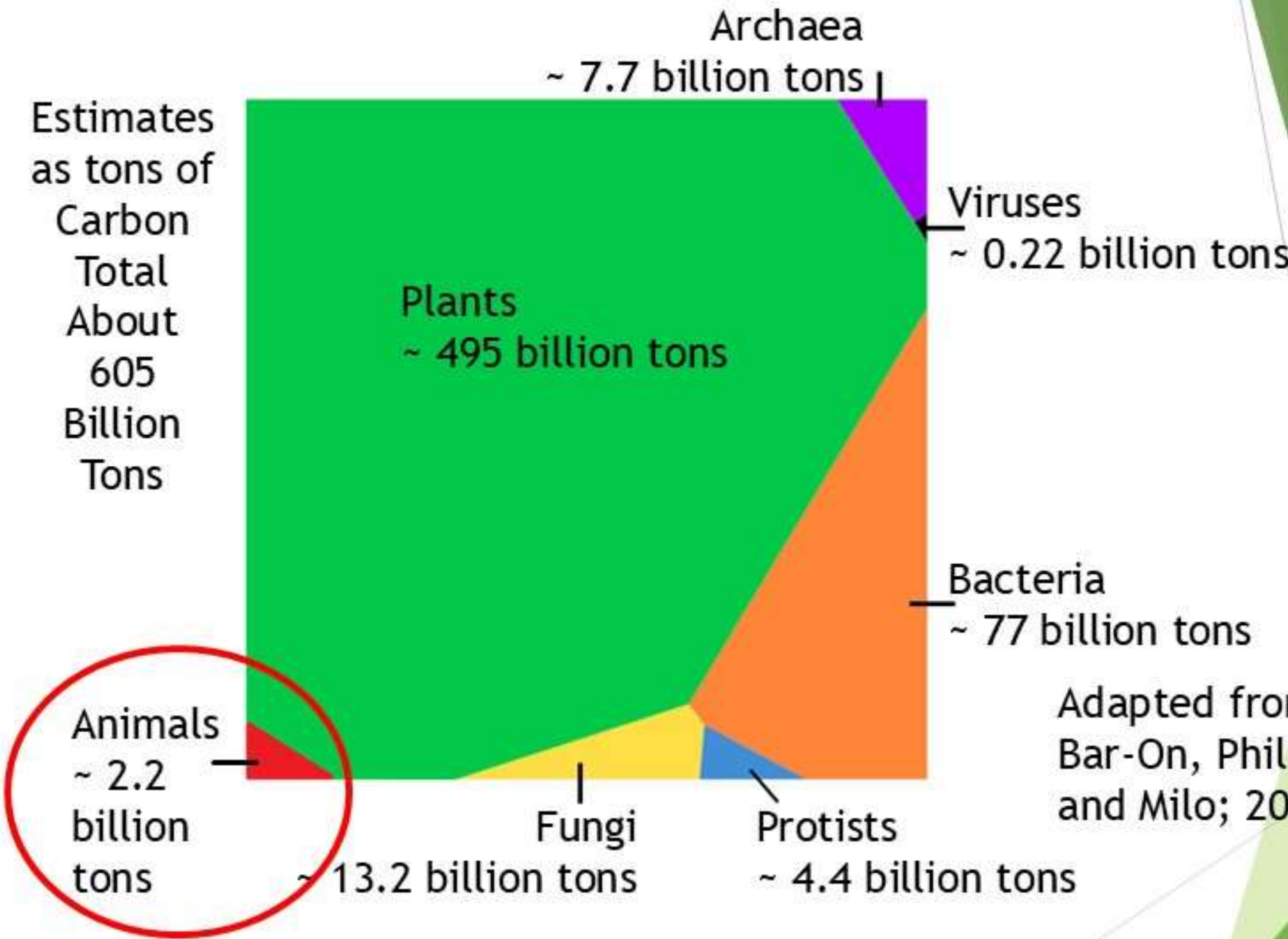
History of Composting
Basics of Composting
Feedstock Characteristics
Recipe Development
Process Variables

What are we Composting?

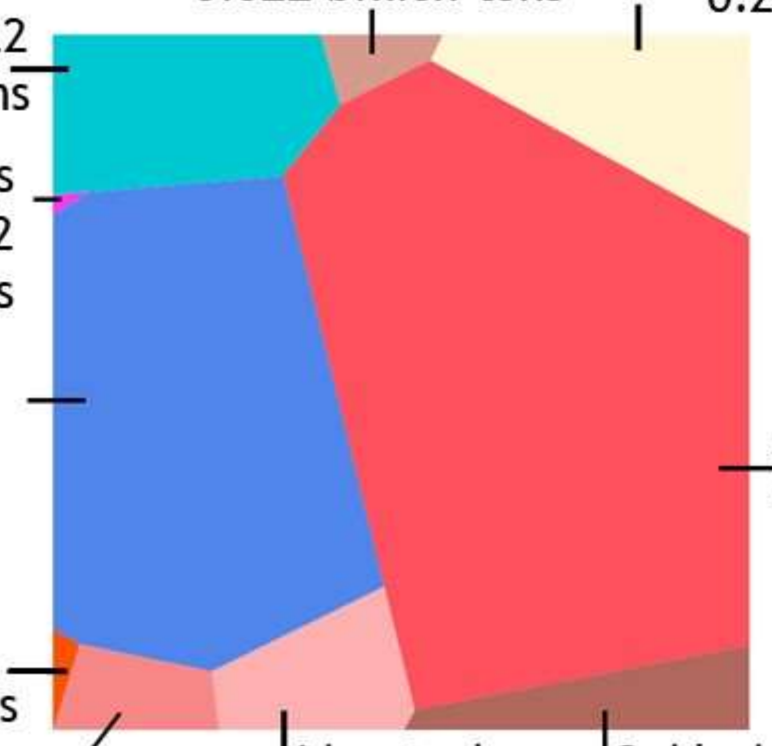
Earth's Biomass Distribution

Estimates as tons of Carbon Total About 605 Billion Tons



Adapted from Bar-On, Phillips, and Milo; 2018

Earth’s Biomass Distribution



Estimates as tons of Carbon

Adapted from Bar-On, Phillips, and Milo; 2018

Earth's Ecology

- ***Ecology is based on the restorative decomposition by microbes and molds, acting on plants and animals after they have died to return their chemical nutrients to the total living system of life on Earth.***

Adapted from Stephen Gould, 1996

Composting Basics

- Microorganisms do most of the "work" if given the right environmental conditions

- Keep microbes happy with good, workable recipes

- <u>**Keep contaminants out!**</u>

What is Composting?

- ***Composting is the controlled and optimized decomposition by microorganisms***
- ***Bio-degradable or organic materials***
- ***Aerobic composting is exothermic i.e.; heat is produced in the process.***

Why Compost?

- To make $$$$??

- Reduce pathogens
- Reduce volume
- Reduce odors
- Easier handling and transport

When does Composting not work?

- Inorganic materials i.e., rocks, soil, sand, etc.
- Plastics, glass, metals
- **Lack of**
  - **Knowledge**
  - **Resources**
  - **Time**

History of Composting

How old is old?

Is composting an old method?

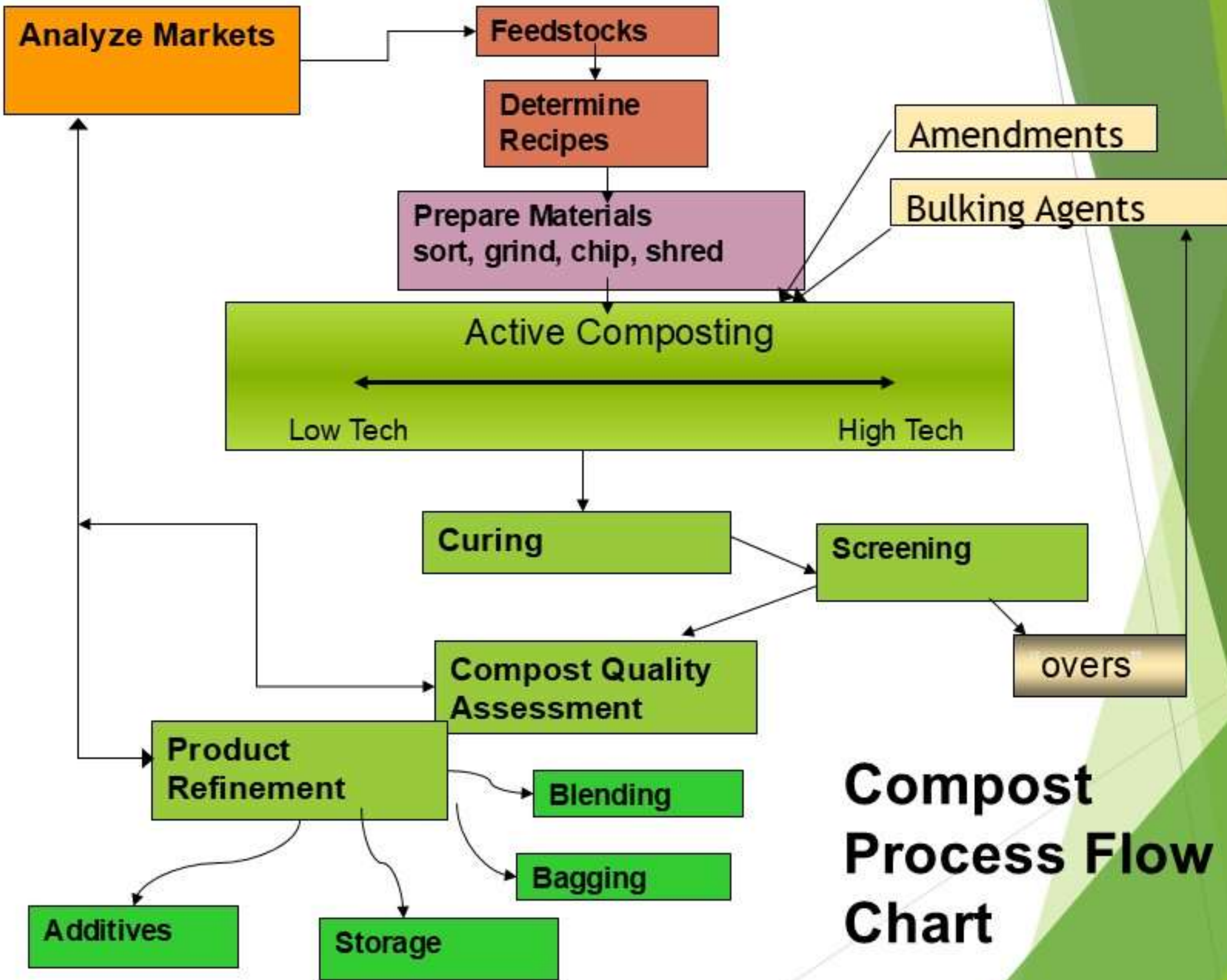
Yes, an old method
China ~ 7,000 years
Europe ~ 5,000 years
South Asia ~ 5,000 years
South America ~ 5,000 years
Africa ~3,000 years

History of Composting

How old is old?

Is composting an old method?

Yes, an old method
Compost Schools since 1995



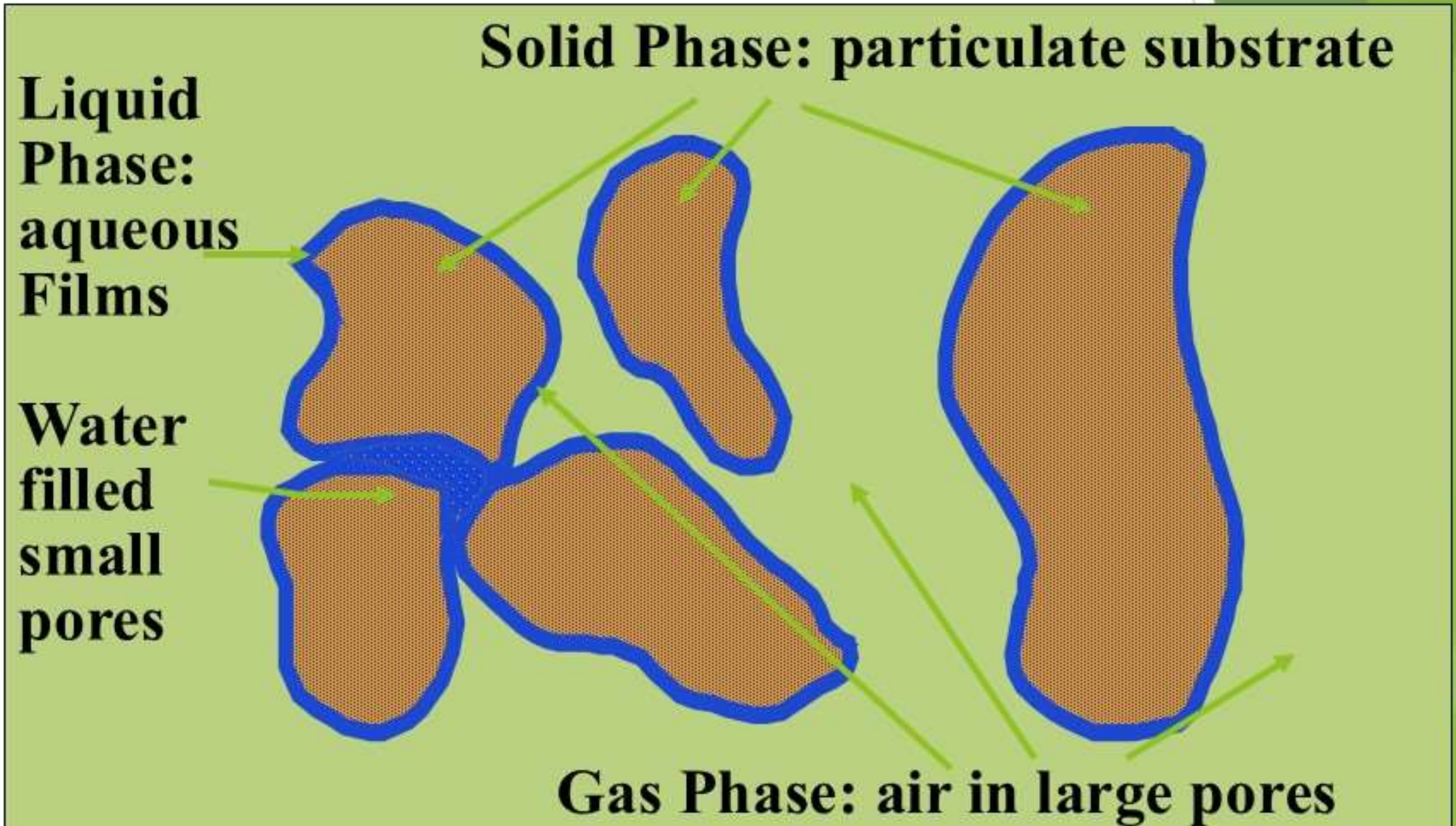
Compost Process Flow Chart

The Basic Process

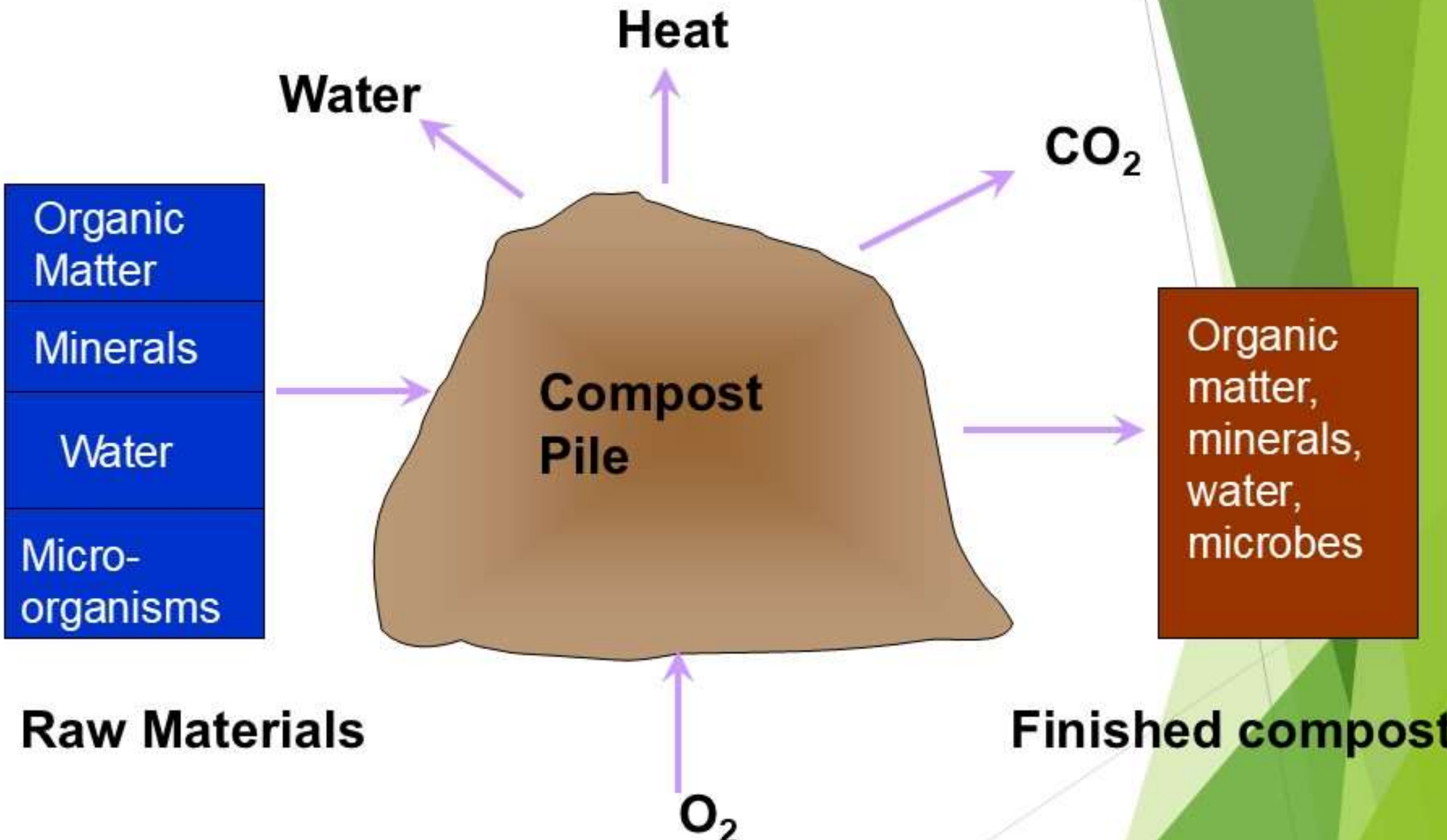
- Microbes, to do the work efficiently, need:
- Air
- Water
- Food
- In proper proportions irrespective of the method of composting, style or technology used, or facility size !!

Biotechnology: Solid-State Fermentation

Adapted from Tom Richard



The Composting Process



Compost Basics: *Initial* Conditions and Feedstock Characteristics

1) Free Air Space
2) Desired range?
3) What are your feedstocks telling you?

Compost Basics: *Initial* Conditions and Feedstock Characteristics

1) Oxygen in the pile
2) Range
3) Sensors

Compost Basics: *Initial* Conditions and Feedstock Characteristics

1) Moisture in the mix
2) Range
3) Free water

Compost Basics: *Initial* Conditions and Feedstock Characteristics

1) Carbon to Nitrogen Ratio
2) Range
3) High or low C:N Ratio

Compost Basics: *Initial* Conditions and Feedstock Characteristics

1) Bulk density of the mix
2) Range
3) Why?

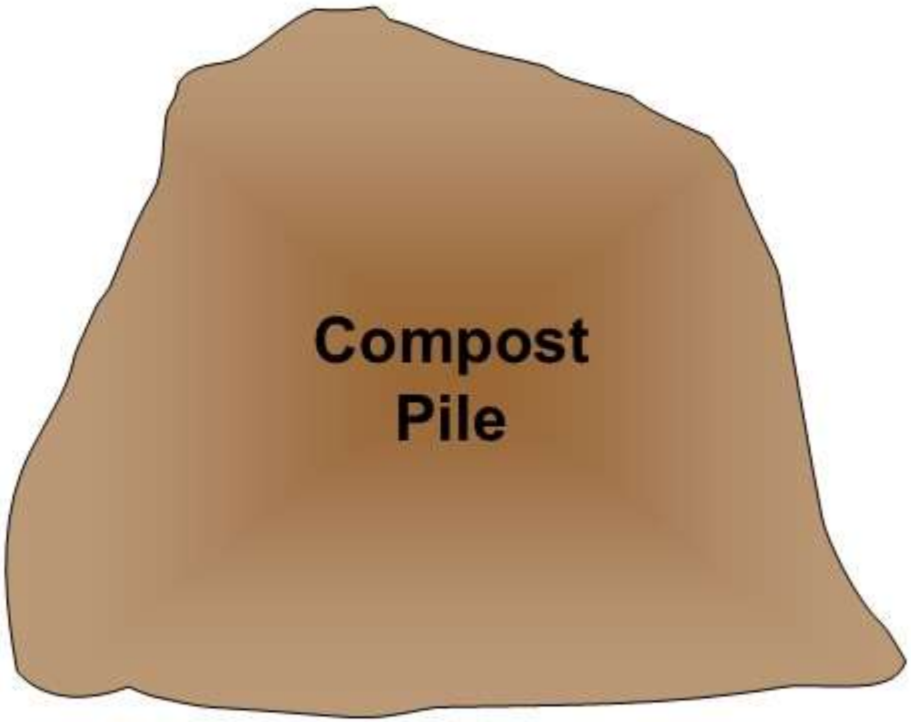
Compost Basics: *Initial* Conditions and Feedstock Characteristics

1) Particle size distribution
2) Range
3) Large particles
4) Fine particles

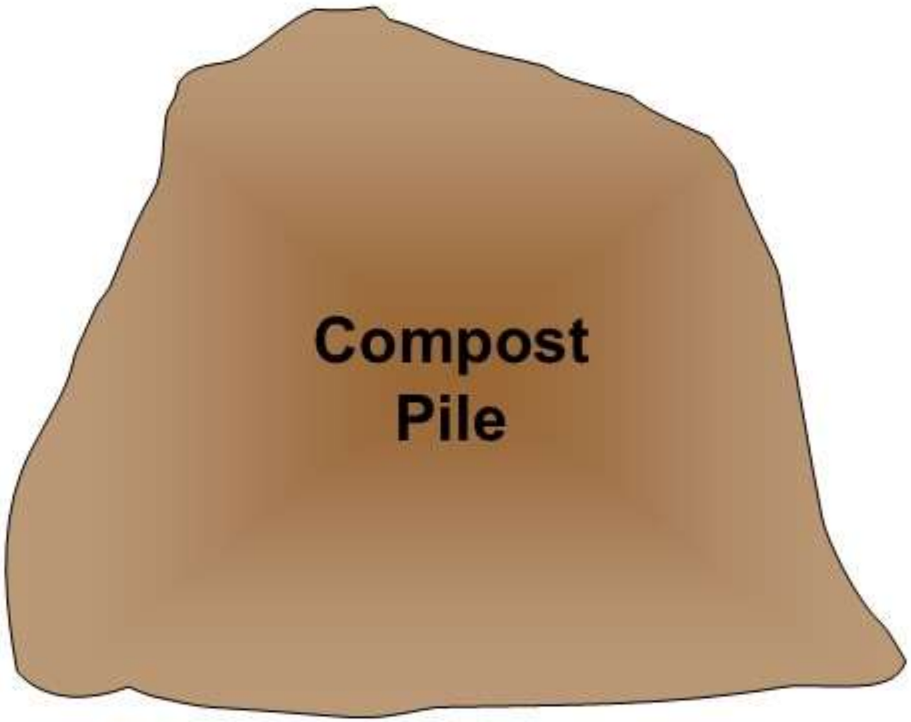
Compost Basics: *Initial* Conditions and Feedstock Characteristics

1) Temperature
2) Mesophilic range
3) Thermophilic range
4) Too hot?
5) Cold turkey?

The Temperature Profile



Pile Turning



Compost Basics: *Initial* Conditions and Feedstock Characteristics

1) Pathogen Reduction
2) PFRP
3) Outside static piles
4) In-vessel systems
5) Turned windrows

Compost Basics: *Initial* Conditions and Feedstock Characteristics

1) Pathogen Reduction
2) PFRP
3) Time to achieve PFRP?

Getting Started

- Start with the “End” in mind
- Increase your understanding
- Use the knowledge to improve your composting operation
- Plan, monitor, measure, and adjust to improve product quality

Why make a Recipe?

- To make a good cake that I can sell?
- Balance
  - Moisture
  - Air Space
  - Bulk Density
  - Pile Structure
  - C:N Ratio

What Changes?

- Process is microbial
- Changes
  - Moisture
  - Air Space
  - Bulk Density
  - Pile Structure
  - C:N Ratio

What Changes?

- Process is microbial
- Changes
  - Moisture – Add water
  - Air Space – Turn
  - Pile Structure - Turn
  - Bulk Density – Bulking agent
  - C:N Ratio – Add N if high

Questions?