On-Farm Composting & Vermicomposting

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What is compost?
Decomposed Organic Matter

Managed in a way that grows beneficial microbes, concentrates nutrients, and builds humus.

Humus = Final Product, resistant to decay
Compost Happens in Nature

- Original Source of Soil Fertility
- Nature’s Recycling Program
- Vital Component of a Functioning Ecosystem
The Microbes Do the Work

1 tsp. of healthy compost contains:

- 1 billion bacteria
- 400-900 ft. of fungal hyphae
- 10,000-50,000 protozoa
- 30-300 nematodes
THE COMPOST FOOD WEB

Energy flows in the direction of the arrows.

ground beetles 8–20 mm
springtails 0.5–3 mm
centipedes 30 mm
pseudoscorpions 1–2 mm
feather-winged beetles 1–2 mm
mold mites
bacterial mites 1 mm
fungi 1

roundworms (nematodes) 1 mm
protozoa 0.01–0.5 mm
rotifers 0.1–0.5 mm
flies 1–2 mm
roundworms (nematodes) 1 mm
earthworms 50–150 mm
land snails & slugs 2–25 mm
beetle mites 1 mm
millipedes 20–80 mm
white worms/potworms 10–25 mm

actinomycetes
compost pile
compost pile

1* = first-level consumers
2* = second-level consumers
3* = third-level consumers
Interested in Soil Microbes?

Why compost?
Reasons to Compost

- Build soil fertility by recycling farm waste

Benefits of compost as soil amendment:

1. Builds soil structure
2. Increase water holding capacity of soil
3. Improved aeration of soil
4. Nutrients when your crops need them
5. Initial fertilizer value of about 1-1-1
6. Plant growth stimulant
7. Beneficial microbes that promote plant growth and suppress pathogens
Compost Uses

1. Incorporate into Soil before Planting
   - at 5 - 20 tons/acre

2. Apply as Mulch or Top-dress

3. Brew Compost Tea or Extract
   - Promotes nutrient cycling, plant growth, and suppresses pathogens
   - Foliar spray or soil drench

4. Make Your Own Potting Mix
   - Promotes seedling germination, growth
   - Reduces need for fertilization
Compost Tea

• Compost “brewed” in aerated water, 24-36 hrs
• Nutrients added to feed, grow microbes
  – molasses, fish hydrolysate, kelp, humic acid
• Immediately sprayed on soil, plant leaves

10 gal commercial brewer

5 gal homemade brewer
How to make compost
Compost Requirements

1. Correct Ratio of Materials
   - “Brown” material, high in C
   - “Green” material, high in N
   - C:N Ratio, 25:1 to 35:1

2. Adequate Moisture
   - Feels like a damp sponge
   - 50-60% moisture

3. Adequate Aeration
   - Turn pile to incorporate oxygen
Compost Requirements

4. Small Particle Size
   - Use wood chipper or mower

5. Temperature
   - Biological activity causes temp to rise
   - Mesophilic Stage: 50 - 113°F
   - Thermophilic Stage: 113 - 158°F
   - High temp kills weed seeds and pathogens
   - Avoid temp over 150°F to conserve N and preserve beneficial microbes
Building the Compost Pile

- Roughage – 3 in
- Brown Material – 1 to 2 in
- Green Material – 1 to 2 in
- Soil/Clay – 0.5 in
  
  (Manure – 0.5 in)

(Rock dust and trace minerals)

(Repeat)

45% Green Material
45% Brown Material
10% Soil/Clay

Rock dust to add trace minerals and nutrients
as much as 25% manure
When is the Compost Finished?

Process takes 3 - 12 months
Maturation Stage: under 113°F
More resistant material broken down by fungi and arthropods over longer period of time
Test Maturity of Compost
Solvita Compost Maturity Test Kit or Seedling Test
Compost Structures
Free-Standing Windrow

- At least 3 x 3 ft. at base and 3 ft. tall
- Easy to access with equipment
- Good structure for large piles
Enclosed Bins

• Made from wood, cinderblock, used pallets, hardware cloth
• For small piles or backyard composting
• Must ensure means for aeration
Enclosed Bins

used shipping pallets

$\frac{1}{2}$ in. mesh hardware cloth
Compost feedstock
Common Compost Feedstock

Farm Materials
- Hay, 15-32 C:N
- Straw, 100-150 C:N
- Wood chips, 200-1000 C:N
- Cover crops, 9-30 C:N
- Manure, 10-50 C:N
- Vegetable Waste, 11-13 C:N

Municipal Waste
- Bagged leaves, 40-80 C:N
- Newspaper, 400-800 C:N
- Coffee Grounds, 20 C:N
- Food Waste, 11-50 C:N
Organic regulation
Requirements for Organic Growers:

1. Records: feedstock, temperatures, management
2. Management of manure compost:
   3. Initial C:N of 25:1 - 40:1
   4. Reach temperatures of 131 - 170°F
      a. 3 days in static aerated pile
      b. 15 days for windrow, turned 5 times
3. Or treated as raw manure
4. 90-day interval if no contact with harvested crop
5. 120-day interval if contact with harvested crop
6. Does not apply to plant-based compost
Vermicomposting

Processing organic matter with worms to produce worm castings
Benefits of Worm Castings

- Concentrated plant-available nutrients
  - higher analysis than compost, 2-2-1
- Beneficial microbes
- Plant growth hormones
- Increased germination rate
- Disease suppression
Vermicompost Uses

1. **Incorporate into Soil before Planting**
   - cost prohibitive for large acreage

2. **Apply as Top-dress Fertilizer**
   - spread $\frac{1}{4} - \frac{1}{2}$ inch thick

3. **Brew Vermicompost Tea or Extract**
   - Can mix with compost in tea
   - Most economical way to apply vermicompost

4. **Make Your Own Potting Mix**
   - Better germination rates than thermo compost
   - Use 5-10% in potting mix
Composting with Worms

Red Wigglers (*Eisenia fetida*)

- Can consume $\frac{1}{2}$-1x body wt. in food a day
- Will double population in 60-90 days
- Grind food with gizzard and use bacteria to process food in intestine
The Worm Bin

- Bin constructed from various materials
  - Wood, plastic, cinder blocks, straw bales
- Bedding material
  - peat moss
  - compost
  - aged manure
  - newspaper
  - cardboard
Maintaining the Worm Bin

- Bury food in bedding or add in layers
  - avoid meat, fat, bones, dairy, citrus
- Keep bedding moist, 70% moisture
- Ideal temp 60 - 75 F
- Cover bin to keep dark
Collecting Worm Castings

1. Light Method
2. Screening Method
3. Feeding Method
4. Death Method

Place worms in new bin

Screen castings to remove debris
Long-term Benefit of Compost & Vermicompost
Why It Pays to Compost

1. Long-term soil fertility
   - Plant nutrients in organic, slow-release forms

2. Introduction of beneficial microbes
   - Biological cycling of nutrients (soil food web)
   - Plant-growth promoting substances
   - Suppression of plant pathogens

3. Lower fertilizer costs

4. Water conservation

5. Improved soil tilth
Recommended Resources

Rodale Institute

The Rodale Book of COMPOSTING
EASY METHODS FOR EVERY GARDENER

Natural Resource, Agriculture, and Engineering Service (NRAES)

On-Farm Composting Handbook

Northeast Organic Farming Association (NOFA)

Compost, Vermicompost, and Compost Tea
Feeding the Soil on the Organic Farm
ANY QUESTIONS?

Thank you for your time.

Feel free to see me afterwards for more information.