Home & Community Food Scrap Composting Success

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www.nerc.org

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or•gan•ics

waste Rescue

Reduction

food Composting

scraps

Food Waste

- 30-40% of food is wasted each year
- Equals about $1,600 each year per family
- ~13% of carbon pollution emissions are related to the growing, manufacturing, transporting, & disposal of food

Food Waste in Maryland

- Food waste & yard trimmings (organics) make up ~1/3 waste
- Only ~9.6% of food waste was composted in Maryland in 2014
- 9.4% of Cecil County residents are food insecure

Science of Composting

What is Compost?

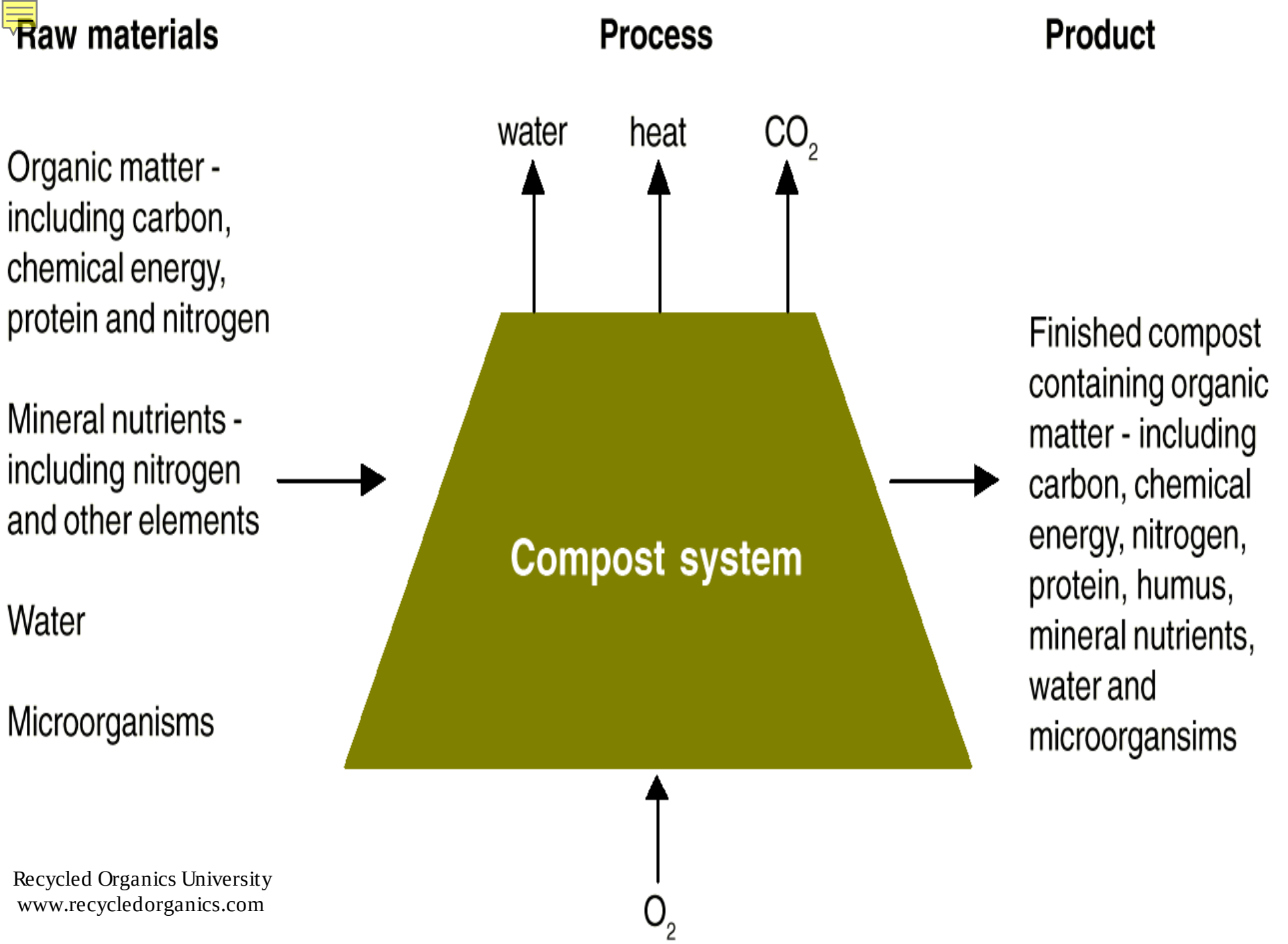
Compost is a value-added product

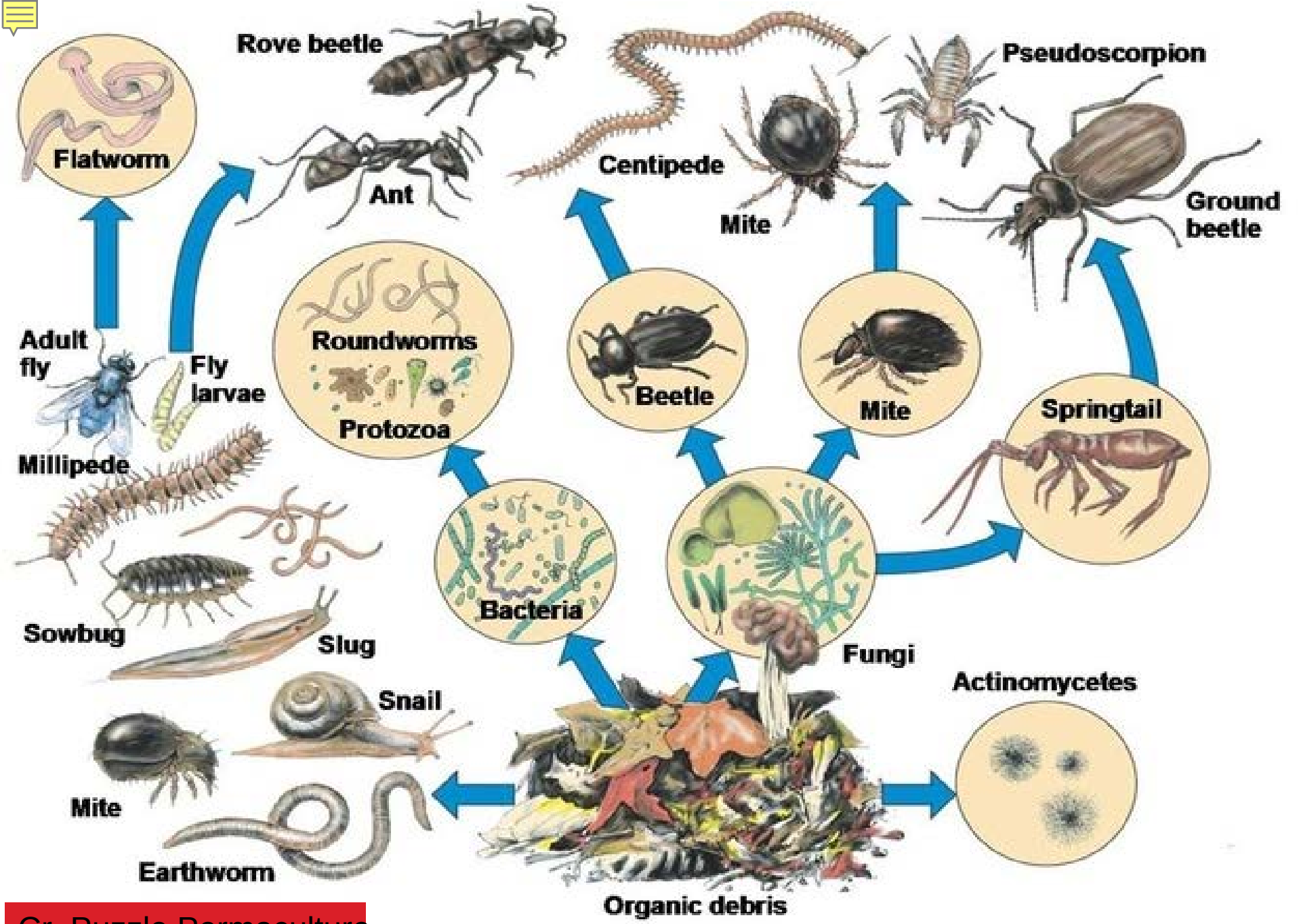
Converts residue material into -

- ✓ Easy-to-handle
- ✓ Humus-like product
- ✓ Rich in organic matter & organisms

Composting

- Controlled, aerobic biological process
  - ✓ Results in the decomposition of organics
- Decomposers: Micro & Macroorganisms
  - ✓ Digest organic residues for food & energy
  - ✓ Speed up the process by creating heat

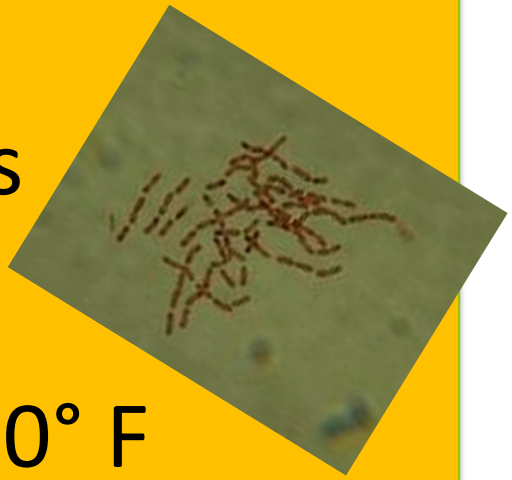

Raw materials
Process
Product
water
heat
CO_2
Organic matter - including carbon, chemical energy, protein and nitrogen
Mineral nutrients - including nitrogen and other elements
Water
Microorganisms
Compost system
Finished compost containing organic matter - including carbon, chemical energy, nitrogen, protein, humus, mineral nutrients, water and microorgansims
O_2



Cr. Puzzle Permaculture

Compost Bacteria

- Mesophilic
  - ✓ Active at lower temperatures
- Thermophilic
  - ✓ They're hot! Active above 120° F
  - ✓ Necessary for more rapid composting



Goal: Keeping the Decomposers Happy!

Healthy biological activity is essential to successful composting—setting up the right environment and conditions is fundamental to the process

Composting Science Basics

- **Aeration**
  - ✓ Oxygen concentrations: 10-14+%.
- **Carbon to Nitrogen (C:N) Ratio**
  - ✓ 20:1 – 60:1
  - ✓ Preferred 30:1-50:1
- **Moisture**: 40 to 65 percent
  - ✓ Like a damp sponge

Science, cont.

- **Optimum pH range**
  - ✓ 5.5 to 8
- **Temperature** – 90°-150°F (32°-66°C)
  - ✓ *Process to Further Reduce Pathogens*
  - ✓ **131°F for 3-15 days (*f* of system)**

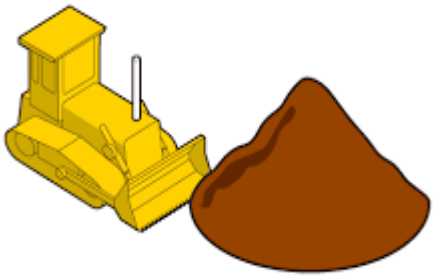
Basic Recipe

- **2-3 Parts Carbon - "Brown" materials**
  - ✓ Woody, dry materials: wood shavings, leaves, soiled/shredded paper, straw, animal bedding
- **1 Part Nitrogen - "Green" materials**
  - ✓ Fresh, "wet" materials: food scraps, grass clippings, garden trimmings (no weeds), manures
- **Keep it small!**
  - ✓ Mowing, grinding, chipping, or shredding

???
Does your site have enough of the right mix?

High Carbon 2-3 volumes

High Nitrogen 1 volume



Recipe, Cont.

- **A little soil, finished compost, or horse manure**
- **Moisture**
  - ✓ Just a little, like a damp sponge
  - ✓ Leave lid or cover off during rain
  - ✓ Required to keep microorganisms alive & active

C:N Ratios of Various Organics

Carbon Sources	Carbon:Nitrogen Ratio
Yard wastes	50 - 90:1
Straw/hay	50 - 80:1
Wood chips/sawdust	250 - 500:1
Nitrogen Sources	**Carbon:Nitrogen Ratio**
Vegetable scraps	10 – 30:1
Fruit scraps	10 – 30:1
Grass & garden gleanings	10 – 20:1
Chicken manure	10 – 25:1
Cow manure	20 – 30:1
Horse manure	25 – 30:1

Adapted from Robert Rynk, "*On-Farm Composting Handbook*," Natural Resource, Agriculture, and Engineering Service, 1992.

Recipe, cont.

Minimum of 3 x 3 x 3

- Containers or piles
- Cover

Recipe Tips for Tumblers

- Start with equal parts C to N or 2 parts C to 1 part N
- Adjust to speed decomposition
  - ✓ Temperature
  - ✓ Moisture level
  - ✓ Active decomposition

Recipe Tips for Bins/Piles

- Carbon – keep with the 30^{+}:1 C:N
- Bulking agents – wood shavings, chips
  - ✓ Odor control – shavings
  - ✓ Chips/twigs on bottom
    - ➢ Provide porosity
    - ➢ Pile stabilization
    - ➢ Aid air flow

General TIPS

- Mix ingredients together to create a better balance— homogeneous mix
- Adding food scraps
  - ✓ No more than 20%, more okay in tumblers/Jora
  - ✓ Balance C:N ratio, moisture, bulk density
- Observation, temperature, look & feel of compost, trial & error

Aeration Techniques

- Tumblers: Close lid & rotate
- Piles, bins: Lift materials with pitch fork
  - ✓ Move materials from outside to inside
  - ✓ Or, place materials on perforated pipes or pipe through middle

Acceptable Materials

- Vegetable food scraps, peels
- Fruit food scraps, peels
- Nuts & nut shells
- Dairy, cheese, eggs/egg shells
- Coffee grounds/filters & tea bags
- Leaves, garden trimmings
- Napkins, paper towels
- Sawdust
- Livestock bedding/manure
- Straw

DO NOT COMPOST

- Meat/Bones/Grease
- Weeds
  - ✓ Tomatoes & squash may sprout “volunteers”
- Cat litter or dog manure

*** Small amounts of meat & grease, e.g., in soups, casseroles, sauces should be fine.*

COMPOST SYSTEMS & OPERATIONS

Tumblers

Compost Bins

Aerobin & Jora

3-BIN SYSTEM

Image Cr.: George McDonald, Maine DEP

Four Bin System

Image Cr.: Cornel Waste Management Institute

Windrows

Images Cr.: David Hurd, GrowNYC

In-Vessel

The Dirt Factory community composting facility in University City
Image Cr.: PlanPhily

Aerated Static Piles

Images Cr.: David Hurd, GrowNYC

Black Dirt Farm

Devine Gardens

Vermicomposting

Image Cr.: Black Dirt Farm

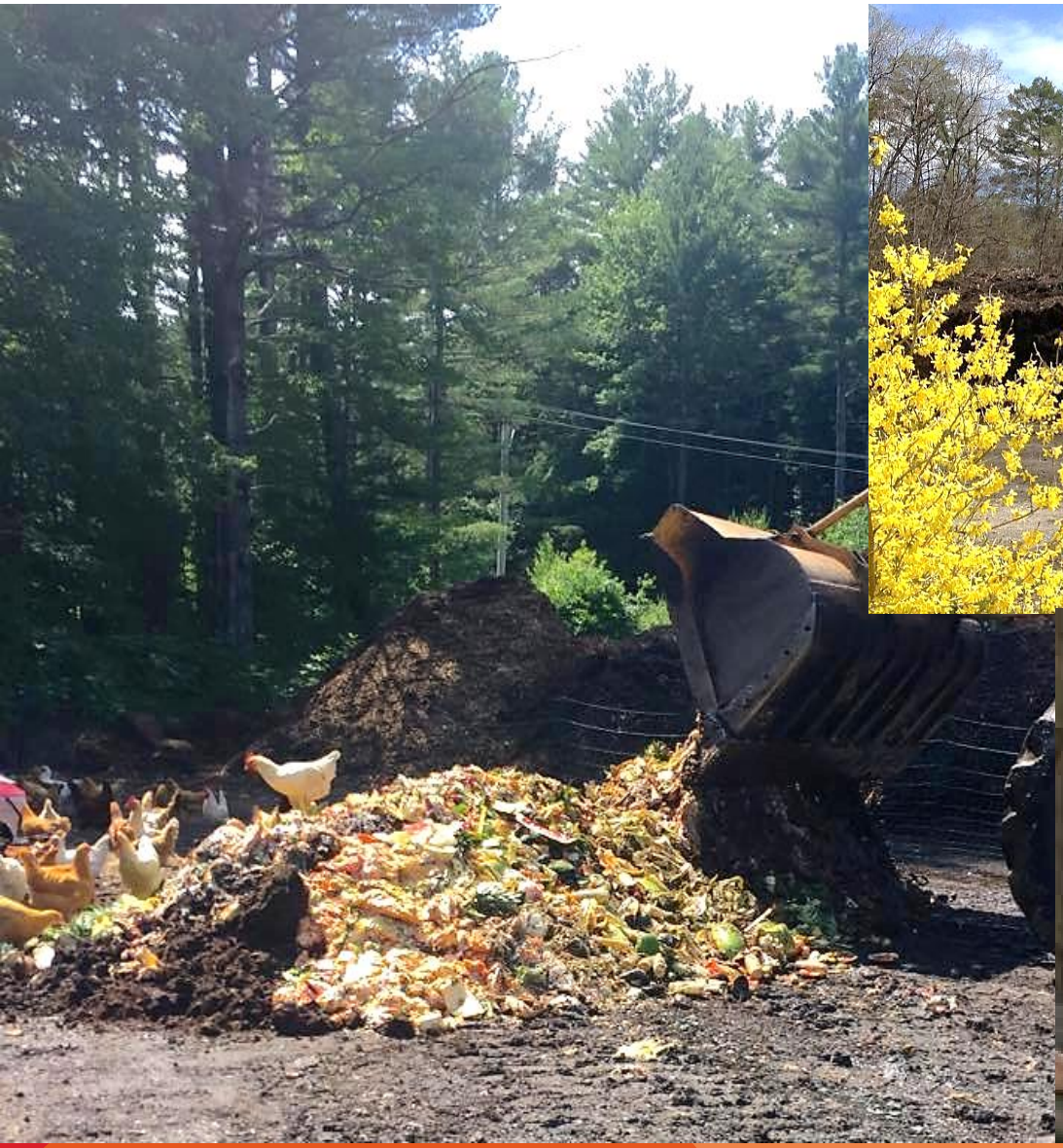
Image Cr.: Devine Gardens

Brattle grow Compost

Windham Solid Waste Management District's
All Purpose Compost

Call to order 802-257-0272

Grow Compost Vermont



Green Mountain Compost

Onondaga County Resource Recovery Agency

Tipping fee: $34/ton vs. $84/ton MSW

Community Composting

- Often volunteer run; some operated by nonprofit organizations or farms
- Produces compost for local use
- Promotes community connections
- Provides an essential role in the evolution of food scrap diversion
- Range of sizes - 10 sq. ft. – 20,000 sq. ft.

Maryland Regulations

- Exempt
  - ✓ Any feedstocks
  - ✓ No more than 5,000 sq. ft. “in support of composting”
  - ✓ Maximum pile height restrictions
    - Feedstocks no higher than 9 ft.
    - All other piles no higher than 12 ft.
  - ✓ Operated so as to not be a nuisance

Costs & Inputs to Build System

Materials, Equipment, Supplies, Tools

Bins, Screener

- ✓ Purchased Bins, Tumblers
- ✓ Tools to assemble or build
- ✓ Wood
- ✓ Screws, bolts, nails, etc.
- ✓ Hardware cloth
- ✓ Screening material

Supplies

- Gloves
  - ✓ Rubber for handling food scraps
  - ✓ Gardening for turning
- Tarps
- Signage &fliers
- Scissors (cut bags)
- Water-proof box for logs

Equipment/Tools

- Chopping & Shredding
  - ✓ Trowels for tumblers
  - ✓ Hatchet
  - ✓ Garden edger or spade shovel
  - ✓ Pruners
  - ✓ Mulch mower




Equipment/Tools

- Turning & Material Moving Tools
  - ✓ Pitch fork
  - ✓ Shovel
  - ✓ Bobcat/tractor
- Thermometer
  - ✓ For hot composting

PROCESS MANAGEMENT & MONITORING

Site

- Year-round accessibility
- Access to a water source is necessary
- Shrubbery, fencing, or cover to block wind
- Shady/partial sun is best
- Sit bins/piles on ground, grass or vegetated area
  - Tumblers can be mounted

Ludlow Community Compost Site

Jora/Tumbler

3-Bin System

Signage

Food scrap collection bins & carbon storage

Elm St. Community Compost Site

Receiving/Mixing

- Feedstock Preparation
  - ✓ Size reduction: chop, shred
  - ✓ Mix: homogenous blend
- Blend proper C:N ratios
- Add moisture, if needed

Image Cr.: Dreamkeeper Garden

Mixing in the Tumblers

Mixing Food Scraps in Bins

Food Land Opportunity - Chicago

Nola Greens – New Orleans

Simple & "Slow" Method

- Follow the basic recipe
- Turn occasionally
- Compost ready in 12-18 months

Hot Compost

- Temperature should rise to at least 90-120° F
  - ✓ 130°F for PFRP
  - ✓ Turn/rotate materials to achieve heat
    - ➢ 1-2 times per week, as needed

"Hot" or Active Composting

- Enclosed containers
  - ✓ Insulate in winter
  - ✓ Larger containers or tumblers
  - ✓ Cover piles – tarp or chips
- Proper C:N "mix" of feedstocks
- Add water, as necessary

Hot Compost, cont.

- Fill one tumbler or bin completely prior to moving to next
- More frequent turning of materials
  - ✓ 1-2 times per week
- Temperature should rise to 120° F
- Finished compost in 4-8 months

Turning Active Compost

Hands in Heart Community Garden

Ready for Curing

- Ingredients are digested & bacterial activity declines
- Compost pile heats up very little
  - ✓ Even after turning or aerating the pile
- Compost has a uniform, crumbly appearance, earthy smell

Curing

- Store in bin or pile
- Turn occasionally
- Keep moist

Image Cr.: Rodale

Chapel Hill Community Compost

Image Cr.: Chapel Hill Spring Garden Tour

Harvesting & Screening

- Remove finished compost from curing area
- Screen/sift
- Send sample for testing
- Cover until ready for use
  - ✓ Signage – “finished compost”

Finished Compost - Screening

Image Cr.: University of Florida/IFAS Extension Sarasota County

Image Cr.: EcoCity Farms

TROUBLESHOOTING

Monitoring the Process

- *Observation*
  - ✓ Are the bins or piles steaming?
  - ✓ Are materials looking different?
    - ✓ Is decomposition occurring?
    - ✓ Materials looking like soil?
    - ✓ Is the pile uniformly composting?

Monitoring the Process, cont.

- *Compost feel*
  - ✓ Does the squeeze test indicate that there is moisture in the material
  - ✓ Does it feels like a damp sponge & stick together?
  - ✓ Is the material too wet/slimy?

Monitoring the Process, cont.

- *Oxygen*—Smell is the best measure of properly aerated composting
- Unpleasant odor – indicative of anaerobic conditions
  - ✓ Pile needs to be turned

Monitoring the Process, cont.

- *Temperature monitoring*
  - ✓ Is the temperature rising appropriately for rapid compost?
  - ✓ Does the temperature rise to 90°F
  - ✓ Maintain for PFRP (131°F…ideal)

Tips

- Adequate amount of carbon
- **Always** cover food scraps with carbon & soil
  - Sawdust is best
- Cover with lime if fruit flies & vermin (rodents, bears) an issue

Tips

- Line bottoms of bins with wire mesh
  - ✓ To detour vermin
- Use vinegar to wash collection containers

If Critters Become An Issue

- Use Jora, Tumblers for full decomposition
- Eliminate any meat, sauces, cheese
- Discontinue adding food scraps, especially in early spring
- Build an enclosure around the compost area

Bins within Fencing

Compost Testing

- Maturity
- At a minimum—analyze the basic nutrient content—nitrogen, phosphorous, & potassium (N:P:K:)
- Bioassay testing

BE ONE WITH YOUR COMPOST

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