Composting
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Do You Currently Compost?
1. Never
2. Sometimes/usually
3. Always

Think About This.....
How can I change from “waste-ful” to being “waste-free”?

Vermicomposting
Vermicompost
Promote Global Worming
Composting with worms
Produces nutrient-rich organic fertilizer (humus).
How much moisture does humus hold?

1. 10-20% of its weight
2. 30-50% of its weight
3. 50-70% of its weight
4. 80-90% of its weight

5 Great Reasons To Compost with Worms

1. Reduce your garbage
2. It’s easy
3. Helps the environment: Less waste means less trucks on the road and recycling nutrients back into the earth
4. Improve your garden: Your compost will help your garden soil retain moisture after rain or watering.
5. Reduce use of chemical fertilizers: Keep local waterways clean by avoiding chemical fertilizers. Composting returns nutrients to the garden.

How many pounds of kitchen waste does the average family produce annually?

1. 50 pounds
2. 100 pounds
3. 200 pounds
4. 400 pounds
5. 500 pounds

Americans throw away what percentage of the food they prepare?

1. 5%
2. 10%
3. 25%
4. 50%

How many pounds of food waste do Americans produce each year?

1. 96 tons
2. 96 million pounds
3. 96 billion pounds
4. 96 trillion pounds

How much money does the U.S. spend a year to dispose of food waste?

1. 1 million
2. 10 million
3. 100 million
4. 1 billion
Cleopatra realized the value of worms and declared them sacred in 50 BC. A man named Marcus Cato, who was a Roman Statesman, recorded the first use of vermicomposting more than 2,000 years ago. More than one hundred years ago, Charles Darwin found that worms can compost their own weight in organic matter in one day.

Which worm is used in vermicomposting?

1. Nightcrawler
2. Earthworm
3. Computer worm
4. Red worm

In this phylum there are about 1,800 species of earthworms grouped into five families and distributed all over the world.

- **Nightcrawlers**: This earthworm is common to the northern states. Although very popular with fishermen, they are not commonly used because they reproduce slowly.
- **Field worms** (also known as garden worms): These make excellent fish bait. They are not prolific breeders, so are not recommended.
- **Manure worms** (also known as bandlings, red wigglers, or angleworms because of their squirming reactions when handled): These are particularly adaptable to vermicomposting.
- **Red worms**: These are basically another type of manure worm, differing mainly in size and color from their larger and darker cousins. They are also very adaptable.

By far, the most common variety of composting worm is *Eisenia fetida* (eye-SEN-ee-uh FE-ti-duh) — also known as the red worm.

Red worms stay at home, under normal conditions. They will not crawl away if adequate food, aeration and moisture are provided for them. Mature red worms living under favorable conditions can produce 4 to 10 egg capsules every seven days.

Newly hatched red worms will reach breeding age in 60 to 90 days. They develop a muscular band called a clitellum around their body near the head signifying it is mature enough to breed.

Red worms continue to grow until they are approximately 6 months old. The normal length of a healthy red worm is about 3 – 3 ½ inches.

Red worms feed from beneath after they become familiar with their new environment.
Red Worms 101

- Red worms eat the bacteria that breaks the organic material down. They do not actually eat "food". When you see them feeding on the top layer, be sure to give them more food to process.
- Remember, the finer the food is when it goes into the bin, the quicker it will be processed and the finer your final vermicompost will be when they are finished.
- Primitive physiology is unchanged
- Body composition
  - 70-95% water
  - Balance=protein, fat, minerals
- Five "hearts"
- Cold-blooded

How long do redworms live?

1. 1-2 months
2. 1 year
3. 2-3 years
4. 4-6 years

Movement

- Red worms have a segmented, cylindrical body.
- Uniquely suited to its life, the slender red worm moves by alternately elongating and shortening its segmented body, helped along by stiff hairs known as setae and lubricating mucous, leaving behind channels that let essential air and moisture into the zone where plant roots live.
- Setae, the tiny bristles poking out from each segment of the worm, dig into the surrounding matter to keep the worm from slipping, a good tool when it doesn't want to be pulled out by a bird!
- Red worms have no bones and can bend their bodies in any direction, wriggle and even curl up into a ball.
- They excrete a mucus which helps them slide along.

Breathing, Smelling and Hearing

- Red worms have no eyes, ears or lungs.
- They breathe through their skin.
- The air which is present between soil and food particles is diffused through their moist skin into a complex network of blood vessels.
- The mucus they excrete helps keep their skin moist.
- They have a complex nervous system, which enables them to sense light, food, acid conditions, vibrations and heat.
What's needed to vermicompost?

1. Worms, food and eggs
2. Education, equipment and environment
3. Worms, bedding and food
4. Newspaper and worms

Education

- Publications
  - [http://www.bae.ncsu.edu/topic/vermicomposting/vermiculture/](http://www.bae.ncsu.edu/topic/vermicomposting/vermiculture/)
- Websites
- Books
  - Worms Eat My Garbage: How to Set Up and Maintain a Worm Composting System by Mary Appelhof

Reproduction

- Red worms are hermaphrodites, which means they are both male and female, but it still takes two worms to reproduce. They cannot self-fertilize.
- In the act of mating, the worms lie next to each other nose to tail (it almost looks like they are tied in a knot) and exchange sperm.
- The worms then part and each worm secretes a thick mucus ring around its clitellum. This ring contains the worm's female eggs and exchanged male sperm.
- As the mucus ring is passed over the worm's upper body and head it hardens and forms a cocoon.
- The cocoon changes in color from yellow to dark brown.
- The egg capsules incubate in 14 to 21 days. Each egg capsule produces from 2 to 20 worms with an estimated average of 4.
- The worms when first hatched are very pale in color, and about the thickness of a strand of cotton, but soon start eating and change to a reddish-brown color.

Eating

- A red worm has no teeth so it cannot chew. Instead, it uses a small pad of flesh that sticks out above its mouth to break down the food.
- Muscles then pass the “food” down through its消化 tract where tiny, hard pieces of food are ground up and mixed into smaller particles.
- The “food” becomes food and passes into the worm's digestive tract.
- The remaining particles are passed out of the worm: this is called wormcast.
- Worms eat their weight in soil and organic matter daily.

What’s needed to vermicompost?

- Three E’s
  - Education
  - Equipment
  - Environment

The worms when first hatched are very pale in color, and about the thickness of a strand of cotton, but soon start eating and change to a reddish-brown color.
Equipment: Worm Bin

Size is Important
- Track food waste for a week
- Allow 1 square foot of surface per pound of waste
- Example: 5 pounds of food waste per week will require 5sqft of surface. Bin should measure 1’ x 2’ x 3’ (6sqft)

Equipment: Bin Comparison

**Wooden Bin**
- Organic
- Breathes
- Heavy
- Deteriorates faster
- Can be built
- No treated lumber or fragrant woods (i.e. cedar)

**Plastic Bin**
- Lightweight
- Holds moisture
- Will not rot
- Requires more holes for aeration
- Inexpensive
- Many bins available

Environment

A worm bin must be:
- Convenient
- Easily accessible
- In a well-ventilated location
- Covered and protected from wind, sun and animals.

Bedding

**Various materials**
- Shredded newspaper
- Sphagnum peat
- Manure
- Leaf litter
- Coir
- Wood chips

**Possible Additions**
- Calcium carbonate to control pH (Do NOT use hydrated lime)
- Rock dust for grit
- Zeolite for grit. Also balances pH, controls odors, absorbs ammonia

Bin Temperature 59-77°F

**A cooler bin...**
- Stay moist
- Worms appear more active
- Bedding is thicker
- May have more mites
- Easier to maintain consistent conditions

**A warmer bin...**
- Dries out quickly
- Worms appear more lethargic
- Bedding appears to be settled
- Harder to maintain non-ambient temperature
- Additional moisture may be required

Food

- Variety
- Bury foodstock under bedding
- Don’t overload the system
- Maintain aerobic conditions
Food

**Do's**
- Fruit & vegetable scraps
- Banana peels
- Grains
- Tea bags & leaves
- Coffee grounds & filters
- Leaves
- Plant cuttings
- Egg shells

**Don'ts**
- Non-biodegradables
- Plastic, glass, rubber
- Pet feces
- Toxic materials
- Orange peels
- Plant cuttings treated with herbicides or insecticides

Worm castings vs. vermicompost

- **Worm castings** are deposits that have moved through the worm's digestive system
- **Vermicompost** is a combination of
  - Worm castings
  - OM and bedding at various stages of decomposition
  - Organisms such as worms and cocoons
  - Microorganism

Harvest Methods

- Dump and hand sort
- Lateral method
- Vertical method

How to Use Your Compost

- Soil amendment
- Mulch
- Potting mix
- Compost tea: Dilute (one part liquid with 10 parts water) as a plant fertilizer. You can call this worm tea.

Questions?

Promote Global Worming