



# Module 11: Vermicomposting

LSU AgCenter Home Composting Certificate Course

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# What is Vermicomposting

Utilizing earth worms and microorganisms in a managed system to convert organic waste into a nutrient-rich humus like material known as vermicompost (worm castings).





# Earthworm Fun Facts

- There are more than 9,000 species of earthworms worldwide.
- Each worm has five pairs of hearts and a simple brain.
- An earthworm can grow a new tail if some of its segments are nipped off behind the clitellum.
- Worms breathe through their skin.

# Earthworm Fun Facts

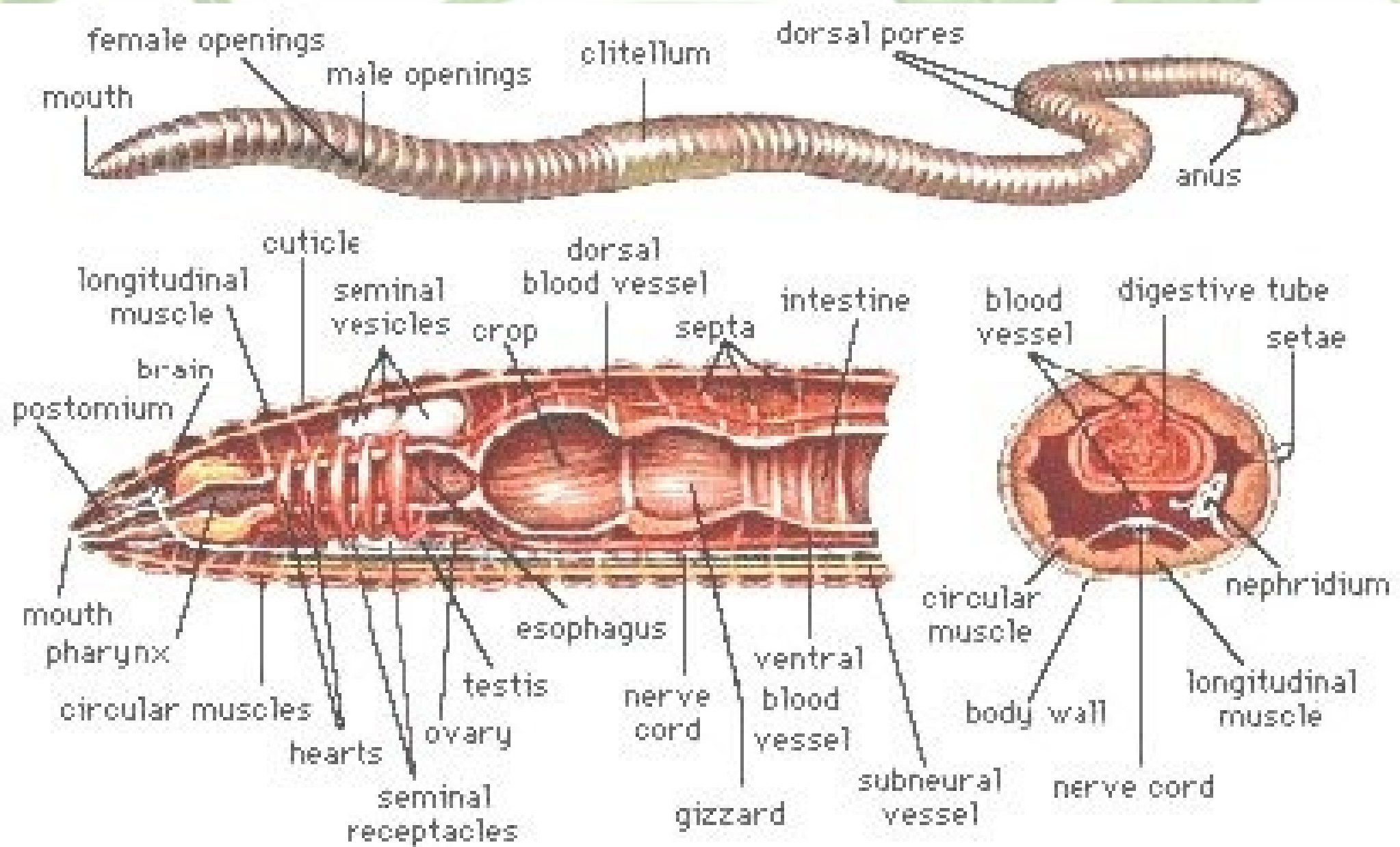
- A worm can eat about half its own weight in food scraps every day.
- An enlarged cummerbund-like band (clitellum) near the worm's head holds the reproductive organs.
- Each worm is both male and female (hermaphroditic) but not self-fertile.
- Worms exchange sperm to reproduce and each produces an egg (cocoon) from which 2 to 4 baby worms emerge.



# Earthworm Fun Facts

- Eight breeding worms can become 1,500 worms in 6 months.
- Each healthy worm may produce an egg capsule every 7 to 10 days. These capsules incubate for 14 to 21 days.
- The baby worms will mature to breeding age in 2 to 3 months.
- A healthy red worm can live from 7 to 10 years and grows to about 3 inches.

# Earthworm Anatomy





# 3 Main Types of Earthworms

## 1. Epigeic



- 'Epigeic' from Greek for 'on the earth'
- Do not build burrows; instead reside amongst decaying organic matter on the soil surface
- Feed on decaying plant matter, leaf litter, and dung.
- Weak burrowers; prefer to live amongst loose organic materials and topsoil.
- Dark coloring for camouflaging themselves in piles of leaves or topsoil and for UV protection.
- They have strong muscles, which enables them to move faster than other types of worms
- These worms are important in composting and are known to rapidly consume and excrete organic matter.
- They reproduce very quickly.
- They are small in size, usually ranging from between less than an inch up to seven inches in length.



# 3 Main Types of Earthworms

## 2. Endogeic



- 'Endogeic' from Greek for 'within the earth'
- These worms burrow within the top layers of soil and rarely come up to the surface, preferring instead to literally live within the earth.
- They are commonly found in the uppermost layers of soil where they create semi-permanent, horizontal burrows or under rocks and logs.
- They typically only make an appearance on the ground surface in instances of heavy rain, as the extra moisture prevents them from drying out.
- These worms are small and generally measure between one and twelve inches.
- They tend to be very pale or translucent and colorless.
- They have weaker muscles than epigeic worms, which and move more slowly.
- They help to mix minerals and air within the soil and help with aeration because they eat the soil itself.



# 3 Main Types of Earthworms

## 3. Anecic



- 'Anecic' from Greek for 'out of the earth'
- Although these worms live below ground, they come to the soil surface for food.
- These worms burrow vertically in the mineral layers of soil, creating permanent burrows as deep as six feet below surface level.
- These worms collect food from above ground in the form of organic matter such as fallen leaves and drag them back underground to their burrows. They are also known to eat soil.
- These worms encompass some of the most common types of earthworms, worms used for fishing bait, and nightcrawlers.
- They have very weak muscles and are the slowest moving of all types of worms.
- They have some pigmentation but are often a milky color.
- They can range in size from one inch to sixty inches in length.



# Best Vermicomposting Worm

## Characteristics of the Red Wiggler (*Eisenia fetida*)

- Upper soil, non-burrowing feeder
- Can consume half it's weight of food per day
- Requires 70% moisture – to breath
- Temperature – 60-85 Degree F
- pH 6-8
- Aeration – Good ventilation and drainage
- Bedding and Food
- Lots of Surface area
- Darkness required



# To Begin Vermicomposting

Five Basic Things Are Needed:

1. Container
2. Bedding
3. Water
4. Worms
5. Food (non-fatty kitchen scraps)





# Important Container Qualities

- One ft<sup>2</sup> surface area/pound of food/week
- Depth 8"-12" (depending on how you harvest), *E.f.* are surface feeders
- Dark or easily darkened
- Durable – plastic (many years) or wood (2-3 years)
- ¼ to ½ inch holes in bottom (6" apart) for drainage and aeration
- ¼ to ½ inch holes in sides ABOVE the highest surface level for aeration
- Solid loose-fitting lid/cover to help regulate moisture, maintain darkness and keep out predators
- \*Solid tray underneath to catch leachate (good compost tea)





# Important Bedding Qualities

- Retain moisture
- Provide aeration
- Non-toxic
- High C:N ratio
- Neutral pH
- Needs Replenishing



Egg Cartons



Commercial Bedding



Chopped Straw



Wood Wool



Aged Manures



Shredded Leaves



Coconut Coir



Cardboard



Wood Shavings



Newspaper or Office Paper



# Importance of Moisture Management

- Earthworms breathe through their skin
- Moisture is essential for gas exchange
- 65-70% is ideal
- Too moist, worms will be sluggish, breeding rates decrease
- Too dry, worms have difficulty breathing
- Moisture meter or Squeeze Test (if you can get just a few drops of water between your fingers, the moisture is OK)



The right amount of moisture also enables worms to travel through composting material with ease, encourages worms to reproduce, and helps to maintain their overall health





# It's All About the Worms

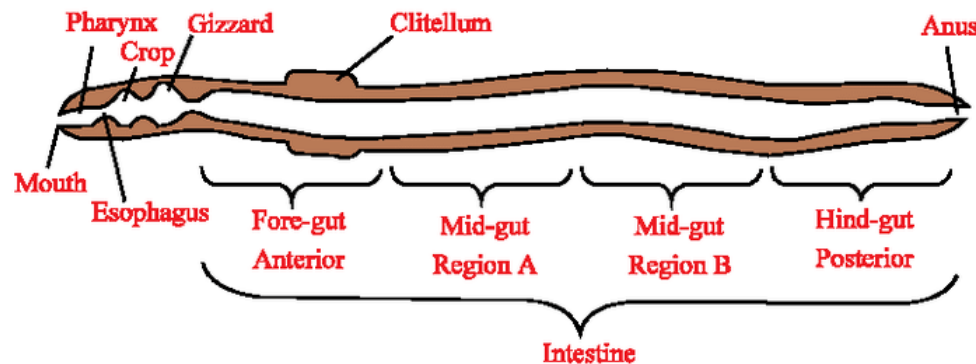
- Vermicomposting is a form of WORM FARMING
- Provide everything the worms need and you will be successful
- Epigeic earthworms are best
- Eat 90% organic matter and 10% soil
- *Eisenia fetida* can eat half their wt. in food per day – calculate how much waste you produce, you need 2X that wt. in worms
- Shallow box with lots of surface area
- Temperature between 60 and 85°F
- pH 6-8
- Darkness
- Available commercially or from a friend





# What's For Dinner?

- Composting earthworms feed on decaying plant matter and manure that is near the start of the decomposition process (not fresh).
- With new bins, start slowly
- Organic matter that is breaking down
- Gritty material (fine sand, crushed eggshells, cornmeal) for their gizzard
- Bedding material
- Size is important – the smaller the particle the better.
- Worm food is actually the decaying organic matter and the associated organisms





## What Can Red Wigglers Eat?

Just like humans, red wiggler worms prefer and thrive on a nutritionally balanced diet. We have created this infographic to help you figure out the types of foods that your worm colony will love!

### Perfect Worm Food



### Feed In Moderation

#### Starchy Foods

Starchy foods take longer for the worms to break down, and can also attract gnats. Be sure not to overfeed.



### Do Not Feed



#### Citrus Fruits

The high acid content of citrus fruits can prove harmful to your worm colony. The peels of citrus fruits also contain D'limonene, a chemical that is sometimes used for insect control. Worms are not fond of this stuff.



#### Meats & Bones

The protein in these products tends to create strong odors when breaking down. This will attract all sorts of undesirable creatures to your worm bin.



#### Dairy Products

Decomposing dairy products will create the same harsh odors as meat products or eggs, and attract creatures that you do not want around.



#### Spicy, Salty, Greasy, or Fatty Foods

Composting worms have trouble digesting these foods, and tend to avoid their locations in the worm bin.



### Additional Worm Feeding Tips



#### Add Grit

Worms digest their food with the help of tiny bits of matter that they take in from the world around them. Add some sort of grit to your worm bin to help your worms process your waste into worm castings.

Examples: fine soil, crushed egg shells, and rock dust.



#### Give It A Rinse

Be sure to wash all fruits and vegetables to eliminate any traces of pesticides and herbicides.



#### Blend It

If you want to speed things up, consider throwing your worms' occasional feast into a blender before feeding. This allows your worms to process the food more quickly, and create more worm casting in less time.

Downloadable  
Infographic:  
[TheSquirmFirm.com](http://TheSquirmFirm.com)



# Locating Your Worm Bin

Things to consider:

1. Temperature – ideal is 60-85°F. Bright sunny locations can cook your worms. Unprotected outdoors can freeze your worms.
2. Remember, you have drainage holes
3. Preferably elevated, avoid locations with standing water
4. Aeration – good air movement
5. Conveniently accessible





# A Word About Temperature

- Use a thermal probe much like the ones discussed earlier
- Measure the temperature **INSIDE** the worm bin
- Temperatures **below 50°F** will slow down worm activity.
- Temperatures **below 40°F** will kill your worms over an extended period.
- Temperatures **above 80°F** will slow down worm activity.
- Temperatures **above 95°F** will kill your worms quickly.
- Shading and ventilation lowers temperature
- Insulating wrap will help prevent cold temperatures
- Heat lamps or othering heating source warms the worm bin





# Worm Castings

More pleasing name for “worm poop”

Contains:

- Partially composted organic matter
- Humus
- Beneficial Microorganisms (bacteria, fungi, nematodes, actinomycetes)
- Available plant nutrients





# Harvesting Worm Castings

- Migration Method (worms move to new food)
- Photosensitivity Method
- Screening
- Bottom opening bin





# Troubleshooting

Fruit flies, flies or other insects – too much food, too much kitchen wastes, bury the food

Odors – poor aeration (anaerobic decay), foods with innate odors (manures), bad food (meats, fats, etc.)

Worm death – moisture problem, temperature problem, pH problem, food problem







Please post all your questions and results to the message board .

