


WASHINGTON STATE UNIVERSITY

Use of Vermifiltration as a Tool for Manure Management

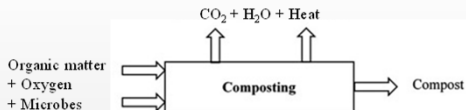


Joe Harrison, Pius Ndegwa, Gilbert Miito, and Patrick Beckett,

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Overview: composting, vermicomposting, & vermiltration

- Composting:** this is an aerobic process of decomposing organic solid wastes into a humus-like material known as compost which is not only a good fertilizer for plants but also a valuable soil conditioner.





- Vermicomposting:** similar to composting but with the incorporation of earthworms in the process to work in concert with micro-organisms.
 - Earthworms consumes and breakdown organic matter providing more surface area for microbes to thrive better.
- Vermifiltration:** Similar to vermicomposting but the substrate is liquid rather than solid.

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Overview: composting, vermicomposting, & vermiltration



- Earthworms dislike heat so vermicomposting is done in small layers or heaps that do not allow heat build-up.
- The products of vermicomposting are:
 - Earthworms, and
 - Vermicompost (castings {poop!} + undigested substrate).

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Overview: Vermicomposting

- Earthworms utilization:
 - Fishing/fish baits.
 - Earthworm meal is a **potential** protein supplement for livestock animals & poultry feeds.
- **And: potential additional income streams.**
- Vermicompost utilization - similar to compost.
- Has additional hormone-like compounds, which accelerate plant growth (shorter production cycle) making it superior to conventional compost.

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Overview: Vermicomposting Systems

- Small worms bins (treating kitchen or household waste).

The structures are shallow to ensure no heat build-up.

May also have a castings collector at the bottom.

May also have a receiver for the leachate (commonly known as vermi-tea).







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Overview: Vermicomposting systems

- Medium worm beds (indoor or outdoors).

The structures are shallow to ensure no heat build-up.

May also have castings and leachate collectors at the bottom.






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Overview: Vermicomposting systems

- Large worm beds (may be enclosed and sheltered from weather elements)
 - Note the long shallow windrows to ensure no heat build-up.

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Overview: Vermifiltration systems

- Fairly new technology - mostly developed during the last two decades.
- It is technically a trickling filter but with addition of earthworms to it.
- The base media is usually a combination of sand, fine gravel, medium and coarse gravel.
- Vermifilter systems are aerobic. Worms movements & burrowing enhance aerobic conditions.
- Considered low-cost: no moving parts, just plumbing work and a few pumps to move the liquid.

Note: Besides vermicompost and earthworms, vermifilters also produce cleaner treated water suitable for recycle to clean manure or to irrigate crop land in larger amounts since it has less nutrients loads.

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Overview: Vermifiltration systems configurations

The important design aspect is to hold the water long enough for it to be acted on by microorganisms.

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Overview: Vermifiltration systems

Wastewater sprinkled

A
B
C
D
E

Typical vermifilter:
 (A) earthworm & vermicompost, (B) sand,
 (C) fine or medium gravel,
 (D) coarse gravel or cobble stone, (E) treated water.

- Systems have mostly been used for treating municipal, domestic and industrial wastewaters.
- Much less information of how they treat livestock wastewater.
- **This system is mostly applicable in livestock operations using water to collect manure.**
- Recently, WSU evaluated a pilot-scale vermifilter (manufactured by BioFiltro), for treatment of dairy wastewater.
- Gilbert, who was mainly involved in this evaluation will NEXT present the performance of this system at treating dairy wastewater.

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