



A Monthly e Magazine
ISSN:2583-2212

Popular Article

April, 2026 Vol.6(4), 1168-1170

From Waste to Wealth: Vermicompost

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doi.org/10.5281/ScienceWorld.20075379

Introduction

Earthworms have inhabited the planet for millions of years and play a vital role in maintaining ecological balance. Their primary function is to recycle organic matter by converting dead plant and animal residues into nutrients that can be reused by living organisms. This natural process sustains soil fertility and supports the cycle of life. The importance of earthworms has been recognized since ancient times. Civilisations such as those of Greece and Egypt valued their contribution to agriculture. Cleopatra, the ruler of ancient Egypt, famously regarded earthworms as sacred due to their role in enriching the fertile lands of the Nile Valley after annual floods. Similarly, the renowned naturalist Charles Darwin devoted nearly four decades to studying earthworms and highlighted their immense contribution to soil formation and ecosystem functioning.

Vermicomposting is a biological process in which earthworms convert organic waste into nutrient-rich compost known as vermicast. This compost is highly beneficial for soil health as it contains essential nutrients such as nitrogen, phosphorus, potassium, calcium, and magnesium. Compared to ordinary topsoil, vermicompost is significantly richer in plant-available nutrients and enhances soil properties like aeration, structure, water retention, and drainage. Additionally, worm activity improves soil permeability and promotes better root growth.

Vermicomposting and Its Utilisation: Vermicompost is essentially the excreta of earthworms, rich in humus and plant nutrients. Earthworms can be reared artificially in



controlled environments such as brick tanks, pits, or near the base of trees, particularly in horticultural systems. By feeding them organic biomass under suitable conditions, high-quality compost can be produced efficiently.

One of the most commonly used species for vermicomposting is *Eisenia fetida*, known for its high reproductive rate and efficiency in decomposing organic matter. Under optimal conditions, the composting process is usually completed within 40–45 days.

Construction of Vermicomposting Shed

A proper shed is essential to protect earthworms from direct sunlight, heavy rainfall, and extreme temperatures. The shed should be designed with adequate ventilation and a sloping roof to allow water drainage.

A shed accommodating two composting piles should be approximately 4.25 meters long, while one for four piles should be around 7.5 meters long.

The height of side pillars should range between 1.25 to 1.5 meters, and the central height should be about 2.25 to 2.5 meters.

Roofing materials may include grass, coconut husks, sorghum stalks, plastic sheets, or metal sheets, depending on availability and cost.

Methods of Vermicomposting

1. Pile Method

In this method, compost is prepared above ground in the form of heaps.

Prepare piles of about 2.5–3 meters in length and 0.9 meters in width.

Moisten the ground and place a base layer (3–5 cm thick) of non-decomposable materials such as coconut husk or paddy straw.

Add a layer of partially decomposed dung or soil, followed by the introduction of earthworms. Subsequent layers consist of chopped organic materials like crop residues, animal dung, green leaves, and poultry waste.

Maintain moisture at around 40–50% by regular sprinkling of water and cover the pile with sackcloth. Ensure the temperature remains between 25°C and 30°C for optimal worm activity.

The total height of the pile should not exceed 60 cm.

2. Pit Method

This method involves composting in constructed pits.

Pits are generally 3 meters long, 2 meters wide, and 0.6 meters deep.

A base layer of organic materials such as straw or husk is added, followed by partially decomposed manure or soil.

Around 7,000 earthworms are introduced for every 100 kg of organic material.



Maintain adequate moisture and cover with sackcloth to create a suitable environment. Aeration is crucial; compact layers should be gently loosened without harming the worms. Once composting is complete, watering is stopped, allowing worms to migrate downward. The upper compost layer is then collected, dried in shade, and sieved. The worms can be reused for further composting cycles.

Benefits of Proper Livestock Waste Management

Environmental Benefits

- Reduces pollution of air, water, and soil
- Protects biodiversity and ecosystems
- Minimises greenhouse gas emissions
- Controls odour and prevents waste accumulation
- Reduces risks of flooding and contamination

Economic Benefits

- Creates new business and income opportunities
- Reduces costs through recycling and resource efficiency
- Improves productivity by enhancing environmental quality and health

Social Benefits

- Generates employment across various skill levels
- Supports formalisation of informal waste sectors
- Enhances living conditions and community hygiene
- Promotes responsible environmental behaviour

Conclusion

The future of livestock production must focus on sustainable and integrated waste management systems. Better integration of livestock farming with crop production can improve resource efficiency and reduce waste. Innovative waste management approaches, such as separating liquid and solid waste at an early stage, can significantly reduce emissions and improve processing efficiency. Recycling nutrients, particularly phosphorus, and promoting technologies like biogas production will further enhance sustainability.

Additionally, emerging environmental concerns such as antibiotic residues, endocrine disruptors, and resistant pathogens must be addressed through stricter regulations and advanced treatment methods. The adoption of comprehensive evaluation tools like life cycle assessment will help ensure the long-term viability of livestock production systems while balancing environmental, economic, and social considerations.

