JUST AGRICULTURE
multidisciplinary e-Newsletter

# Organic Waste Recycling – Sources and Approaches

**P. Nivethadevi**
Assistant professor in Agronomy, Department of crop management Vanavarayar Institute of Agriculture, Manakkadavu, Pollachi – 642 103

**ARTICLE ID: 46**

## Introduction

Organic waste is a substance that can be broken down and comes from either plants or animals. Organic waste recycling is the bioconversion of various organic wastes to utilize the embedded nutrients for providing enriched organic manure for better soil health and crop growth. The 5 R'S in waste recycling were: Refuse, Reduce, Reuse, Repurpose and Recycle. waste recycling not only improve the yield and quality of the produce but also conserve energy, minimize pollution, save money, and increase the fertilizer use efficiency, which will help to revitalize and restore the soil fertility and also revive the microbial activity for sustainability.

## Types and sources of organic wastes available for recycling

| Group | Types and sources of wastes |
|---|---|
| Plant wastes | Crop residues |
| | Kitchen wastes |
| | Green market wastes (Fruits and vegetable market waste) |
| | Coconut-arecanut/perennials(By Products waste) |
| | Forest biomass and its by products |
| | Road side vegetation (weeds and Invasive Biomass) |
| | Aquatic plant biomass |
| Animal wastes | Animal dung and urine (Faeces and urine of domestic animals and dairies) |
| | Poultry excreta (poultry droppings) |
| | Fish meal and fish wastes (from fresh water fish and fish industries) |
| | City garbage and municipal solid wastes |
| | Biogas slurry from biogas plant |
| | Sewage and sludge from industrial and municipal waste |

JUST AGRICULTURE
multidisciplinary e-Newsletter

| | |
|---|---|
| Other wastes | spent and distillery wastes from sugar industries |
| | Spent and effluent of Paper mill industrial wastes |
| | Fly ash from thermal power plants |

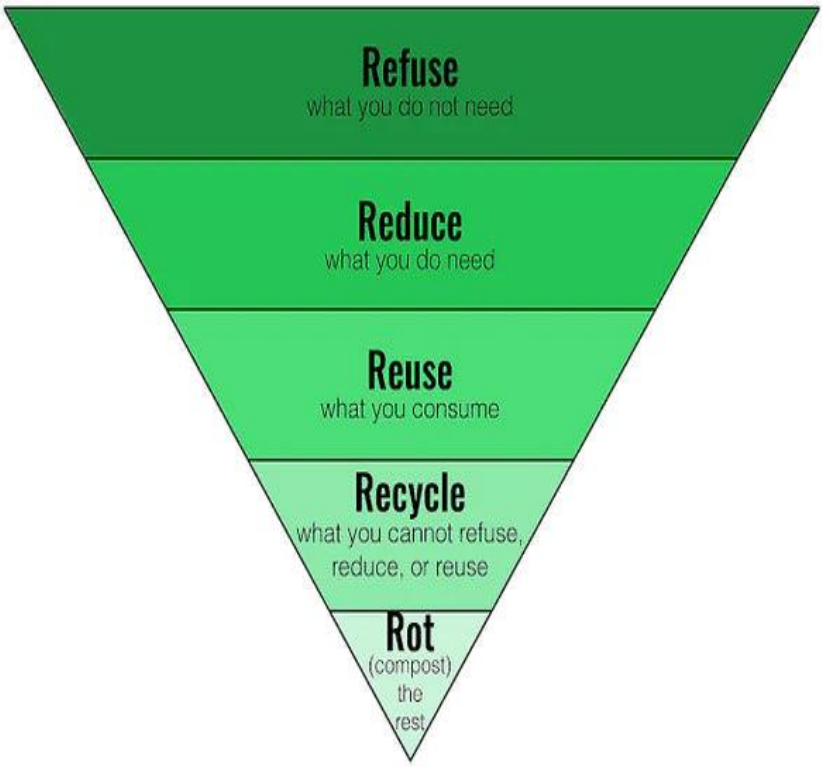


**Fig 1. 5 R's of Waste recycling – A path to sustainability**

**Methods of recycling of organic wastes:**

- In-situ recycling – Recycling of organic wastes within the field.
  a) Raising of green manure crop b) Mulching of organic residues
- Ex-situ recycling - Recycling of organic wastes outside the field.
  a) Composting b) Vermicomposting

**Ex-situ recycling**

**Compost**

A mass of rotten organic matter made from waste is called compost. It can be prepared from various kinds of waste materials such as cereal straws, crop stubbles, cotton stalks etc. which are rich in cellulose and other decomposable carbohydrates and have wider C: N ratio of 40:1 or more and it is necessary to compost or partially decompose to reduce the C:N ratio to 10:1 or 12:1 to check immobilization of soil and added nitrogen.

JUST AGRICULTURE
multidisciplinary e-Newsletter

**Composting**

Composting is the natural process of decomposition of organic residues by microorganisms such as bacteria, actinomycetes and fungi under controlled conditions. Composting can be done in both aerobic and anarerobic condition.

**Types of compost**

- Farm compost
- Night soil/town compost
- Sewage and sludge
- Phosphocompost/ N-Enriched phosphocompost
- Vermicompost

**Farm compost**

The compost made from farm waste like sugarcane trash, paddy straw, weeds and other plants and other waste and its Average nutrient content was 0.5% N, 0.15% $P_2O_5$, and 0.5% $K_2O$

**Town compost**

The compost made from town refuses like night soils, street sweepings and dustbin refuse. Night soil is human excreta, both solid and liquid and richer than FYM and compost. Its Average nutrient content is 5.5% N, 4.0% $P_2O_5$ and 2.0% $K_2O$.

**Sewage and sludge**

- **Sewage:** Used water and waste materials generated by people and factories are collected through sewers or other pipes. The vegetable growers on the outskirts of large cities can use the sewage that has been chemically cleaned and treated as manure.
- **Sludge:** It is the accumulating thick, soft mud, solid material, or other substance at the base of the sewage storage tank. The processed industrial or human waste is referred to as industrial or chemical sludge and is applied to farmland as fertilizer or manure.

**Phosphocompost/N- Enriched Phosphocompost**

Biosolids made in farms, cities, or agro-industries typically have low nutrient contents, especially of P, making them unprofitable. Therefore the nutrient value of farm compost can be increased by using (PSB), namely *Aspergillus awamori, Pseudomonas straita* and *Bacillus megaterium*, or rock phosphate or super phosphate to increase the manurial value.

**Preparation of phosphocompost**

JUST AGRICULTURE
multidisciplinary e-Newsletter

About 1500 kg of organic vegetable wastes or straw, 200 kg of dry cow dung, and 250 kg of rock phosphate (18% P2O5) are used to produce 1 tonne. Make the base of the heap (3 m long, 3 m wide, and 15 cm thick) out of hard, woody materials like sticks, etc. Over this base, spread slurry made from combined cow dung and rock phosphate over the crop residues. Place a bio-solids layer (30 cm ± 10 cm). Every 15 days, mix the materials and add water to maintain a moisture level of 60 to 70%. Within 90 to 100 days, the compost will be ready. Comparing the average nutrient content to normal compost or FYM, it is 2.0 - 8.0% P and 12-14% N.

**N-Enriched phosphocompost**

The composting mixture is supplemented with N as urea at the rate of 0.5-1% (w/w), rock phosphate and pyrite at the rate of 12.5% and 10%, respectively. An N- Enriched phosphocompost contains 1.4-1.6 % N.

**Vermicompost**

Vermicompost is the product of the composting process using various species of worms, usually red wrigglers, white worms, and other earth worms.

**Vermicast:**

It is the end product of the breakdown of organic matter by earthworms and also called (worm castings, worm humus, worm manure, or worm faeces).

**Vermicomposting**

During this bio-oxidative process, detritivore earthworms actively interact with bacteria and other fauna in the decomposer community, hastening the stabilisation of organic matter and significantly changing its physical and biochemical properties. The Nutrient content of vermicompost is 9.5-17.98% of Organic carbon; 2-3% of N; 1% of P and 1.5% K.

**Other species:**

- *Eisenia hortensis* (European night crawlers)
- *Lumbricus terrestris* (Canadian night crawlers)
- *Lumbricus rubellus* (Red earthworm or Dilong)

**Fig. 2. Earthworm species used for vermicomposting**

JUST AGRICULTURE
multidisciplinary e-Newsletter

***Eisenia andrei* (top left), *Eisenia fetida* (top right), *Eudrilus eugeniae* (bottom left) and *Perionyx excavatus* (bottom right).**

**P- Enriched vermicompost**:

Rock phosphate (30-32% $P_2O5$) is used at the rate of 2.5% $P_2O5$ of waste material. The nutrient content of $P_2O_5$ in P-Enriched vermicompost is 4.0%.

**Benefits of recycling of organic wastes in nutrient management:**

- Utilization of embedded nutrients of organic wastes
- Conservation of energy and reduce environment pollution.
- Complementary source of plant nutrients
- Reduction of import cost of fertilizers
- Maximization of fertilizer use efficiency
- Ecological balancing of soil and sustained agricultural growth.

**Conclusion**

The end products of recycling organic waste are extremely helpful to agriculture. So we will try to reuse recyclable materials as long as we produce them, Organic waste recycling adds N to soil and also improves in soil fertility and sustainability and they will never completely vanish from the planet.