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# FACULTY OF AGRICULTURAL SCIENCES AND ALLIED INDUSTRIES

# Lecture 2: Properties and methods of preparation of farmyard manure and compost

**A. Bulky organic manures**

**Definition:** Bulky organic manures are those materials of plant and /or animal origin, which when added to the soil have tendency to decrease bulk density and to increase soil volume ,thus providing better physical conditions for plant growth especially in coarse textured soils and also provide essential nutrients in smaller quantities than the chemical fertilizers .

## Characteristics of bulky organic manures:

1. Organic manures are poorer in concentration of plant nutrients compared to chemical fertilizers.

2. These materials possess wider C:N ratio and C:S ratios and so supply energy needed for microorganisms

3. The mineral nutrients that are available in the organic materials become available to plants after mineralization.

4. Judicious combination of organic and inorganic manures is quite essential to maintain fertility status. Examples : 1.FYM, 2.Composts, 3.Green manures, 4.Pouderette, 5.Biogas slurry, 6.Sewage or sludge, 7.Molasses and 8.Vermicompost

**1. FARM YARD MANURE (FYM/ Cattle manure)**

**Definition:** The physical composition of cattle manure is called Farm Yard Manure, which consists of dung and urine of cattle and the litter, a bedding material like hay, straw used for cattle. Cattle manure is slow acting, bulky organic and however is a low analysis fertilizer, obtained from dung and urine of farm animals mixed with litter and other miscellaneous farm wastes.

**Constituents of FYM:**

**Dung:** The dung is solid excreta voided by farm animals, which represents the undigested and non-digestible portion of the animal feed. Besides, it is also admixed with digestive juices, tissues of alimentary canal, microbial cells etc., The percentage of moisture varies from 70-80 per cent.

**Urine :** The liquid excreta of farm animals, which is composed essentially of the by products of nitrogen metabolism of farm animals .It also consists of 90 per cent water with small

amounts of urea, hippuric acid, sulphates of sodium and potassium and also chlorides and phosphates of Ca, Mg ,K and Na etc.,

**Litter:** Litter is a variable mixture consisting of straw , leaves , stems used as bedding material for cattle during their rest and eventually absorbs the urine and adds carbonaceous matter in the manure to facilitate decomposition .

## Methods to prepare FYM:

**A. Pit method ( Below ground level) :**

In this method, the manure is stored in a pit with non –absorbent bottom and sides.
The pit is provided with a bund at the rim of the pit to prevent the surface run-off of waters during rainy season .The dimensions of the pit can be variable depending on the quantity of dung ,urine and litter produced on the farm per day .The losses also occur in this method due to exposure to sun and rain ,but it is relatively a better method than the heap method.

**B. Heap method (Above the ground level) :**

This is the most common method adopted in Indian villages. Manure is heaped on the ground preferably under the shade of a tree. Ideal procedure is to dump the dung first and to cover it with litter soaked urine .This is further covered with a layer of litter /ash / earth to prevent the loss of moisture and to avoid direct exposure to sun .It is also desirable to put up a small bund around the base of the heap to protect against surface run-off washing out the manurial ingredients .It is beneficial to cover the exposed portion of the heap with Palmyra leaves or any other available material.

The maximum losses of nutrients occur in this method of storage, resulting in poor quality manure. Direct exposure to the vagaries of climate such as sunshine and rainfall causes looseness and dryness of manure, which hasten the losses of nutrients and rapid oxidation of organic matter.

**C. Covered pit method:**

Of all the methods described, it is the best method .In this method, the bottom and sides of the pit are made non-absorbent by granite stone lining. The pit is also provided with a bund of 1½ feet height to prevent surface fl ow of water (Rain water) and a suitable cover by way of roofing with locally available materials like Palmyra or phoenix leaves etc., organic matter and 8nutrient losses can be effectively controlled in this method of storage in order to obtain better quality manure [FYM: 0.68 % N- 0.5%P – 1 % K].

## 2. Properties and methods of preparation of compost

**Compost:** The word compost is derived from the Latin word “COMPONERE” to mean put together. Compost is a product of decomposition of plant and animal wastes with various

additives. The compost had the largest variation of all organic material ranging from neglected garbage dumps to carefully composted and treated substances with high fertility.

**Composition of compost (Rough)**

| S.No. | Constituent | Percentage |
|---|---|---|
| 1 | Dry matter | 30-50 |
| 2 | Organic matter | 10-15 |
| 3 | N | 0.3 |
| 4 | P | 0.1 |
| 5 | K | 0.3 |

**Methods of composting**

The various systems of composting are:

**1. ADCO process:**

Agricultural Development Company was initiated, [A private concern operating at Harpenden, England] developed by **Hutchinson, H.B and Richards , E.H.** during 1914-1918, at Rothamsted Experimental Station , England .

Materials needed:

*Basic raw material*: Straw and other wastes -
*Starters*: Ammonium sulphate/Ammonium phosphate /Super phosphate/Muriate of potash, Ground limestone/ urea

Procedure:

The basic raw material straw is spread in layers and sprinkled over with a solution of ammonium sulphate. Then powdered lime stone is applied as broadcast. Then another straw layer is put on. The piling of the layer is continued till a decent heap of convenient height is built up. After about 3 months of fermentation the resulting material is similar to FYM and hence called "synthetic FYM"
The ADCO process was patented and concentrated starters were put in the market with the trade names of ADCO accelerator and ADCO complete manure with full direction for their use.

**2. Activated compost process:**

This method was developed by **Fowler and Ridge in 1922** at Indian Institute of Science, Bangalore

Materials needed:

Basic raw materials ( Straw and farm wastes )

Starters : a) C ow dung b) Urine c) Night soil d) Sewage and sludge

Procedure:

In this process the basic raw material for composting straw and other farm wastes is treated w ith mixture of cattle dung and urine as decoction . So that every portion of mass com es in contact with the inoculants (dung + urine ) and fermentation takes place evenly . On piling up in a heap of 3 feet or 4 feet height and turning over form time to time, keeping moist with dung and urine decoction,very high temperatures attained. When the temperatures begin to drop at the end of one week. The volume of the material gets red uced . further quantity of the basic material is added onto the heap. About 25 % of the new materials should be added a t one time and thoroughly mixed with starters (dung +urine decoction) at intervals as before. If properly carried out, the
compost will be read y in 5-6 weeks .Night soil and se wage and sludge are also used as starters in this method.

**3. Indore process:**

This process is developed in India by **Howard and Ward** at the Indian Institute of plant Industry, Indore.

Materials needed: a) Straw or organic farm wastes as basic raw materials b) Cattle dung as starter (urine, earth and wood ashes)

Procedure :

A compost pit of dimensions of 30 x 14 x 3 feet with sloping sides (narrow at bottom and at wide surface) is prepared and the raw material is spread in layers of 3" thickness. A mixture of urine, earth, and wood ashes is sprinkled and this is followed by 2" layer of dung. The pit is filled up this way until the material occupies a height of 3 feet above the ground level . As air can conveniently penetrate only to a depth of 1.5 to 2.0 feet extra aeration has to be provided, which is done by means of artificial vents (holes) of 4" diameter pipe for every 4 feet length of the pit. The pit is watered twice a day i.e., morning and evening with rose can. The material is turning over 3 times, i.e.,
First – at the end of the first fort night
Second – at the end of the second fort night
Third – when the material is two months old in the process of composting.
Compost is ready by 3-4 months .One cattle pair produced 50-60 cartloads per year.

4. **Bangalore process** [Aerobic and anaerobic process] :
This process of composting was developed by **Dr. C.N. Acharya** in the year 1949.

1. Basic raw material used : Any organic material
2. Starters or inoculants [Undecomposed] : FYM or mixture of dung and urine or litter
3. Additives :Bone meal or oil ca kes , wood ash

Procedure [Pit size: 20 x 4 x 3 feet]:

The basic raw material is spread in a pit of 20 x 4 x 3 feet dimensions to a depth of 6 " layer, moistened with 20-30 gallons of water if the material is dry .Over this FYM or preferably a mixture of dung, urine and litter (un-de composed) from the cattle shed is placed as a layer of 2" thickness. It is again covered on the top with a layer of earth to a thickness of 6 " .It is beneficial to mix the earth with bone meal or oilcakes, wood ash etc., to improve manurial value of the compost .The piling of layers is continued till the heap raises above the ground level to a height of 2 feet , .Then the heap is kept open for one week to facilitate aerobic decomposition . Later the heap is plastered with a layer of moist clay for anaerobic fermentation t o occur .Fissures , or cleavages (cracks ) that occur in the clay layer , have to be sea led off periodically .The compost will be ready in 4-5 months period starting from the day of preparation .This process is called as aerobic and anaerobic decomposition of compost . In this process the basic raw material is not so well decomposed as in the other methods .But organic matter and N contents are well conserved .The number of turnings are reduced .The out turn of the compost is relatively greater and cheapest process .

5. **The Coimbatore process**: The basic raw materials:

1. Raw organic matter

2. Starters : Powdered bone meal and cattle dung and water emulsion prepared by mixing

Dung in water @ 5-10 kg dung in 5 to 10 liters water.

Procedure [Pit: 12 x 6 x 3 feet]:

The basic raw material loosely spread [Pit: 12 x 6 x 3 feet] to a depth of 9" and water is sprinkled till the entire material is moist. The n about one kg of powdered bone meal is broadcasted uniformly above the layer and above this an emulsion of 5-10 kg of fresh cattle dung in 5-10 liters of water is applied .Repeat this process until a heap 2 feet above ground level is formed .Then the entire exposed surface area of heap is plastered with mud to facilitate semi-aerobic fermentation which would takes place for above 4-6 weeks depending upon the nature of the raw material .After 4-6 weeks ,the mud plaster is removed

to permit aerobic fermentation . If the heap has sunk unevenly which is a sign of defective fermentation, the material is heaped again after forking and moistened .The decomposition is complete in 3-4 months and is fit for application to the field.