

Natural resources management technologies: Natural resources management

❑ **RAPID COMPOSTING METHODS: Use of celluloytic cultures**

Synopsis: The potential of composting to turn on-farm waste materials into a farm resource makes it an attractive proposition. Composting offers several benefits such as enhanced soil fertility and soil health, thereby increased agricultural productivity, improved soil biodiversity, reduced ecological risks and a better environment. While traditional composting procedures take as long as 4-8 months to produce finished compost, rapid composting methods offer possibilities for reducing the processing period up to three weeks.

Detailed description of the technology

Use of Celluloytic Cultures

IBS Rapid Composting Technology

IBS Rapid Composting:

IBS rapid composting technology involves inoculating the plant substrates used for composting with cultures of *Trichoderma harzianum*, a cellulose decomposer fungus. The fungus, grown in a medium of sawdust mixed with the leaves of ipil ipil (*Leucaena leucocephala*), a leguminous tree, is termed as compost fungus activator (CFA). The technology is a development of the windrow type of composting. The composting time, using this procedure, ranges from 21 to 45 days, depending on the plant substrates used. The procedure consists of two parts: the production of the compost fungus activator, and the composting process.

Preparation of substrates:

Substrates such as rice straw, weeds and grasses should be chopped. Chopping helps speed up decomposition by increasing the surface area available for microbial action, and providing better aeration. If large quantities of substrates are to be used (i.e. several tons), a forage cutter/chopper is needed. Chopping can be dispensed with if the compost is not needed in the near future.

Adjustment of moisture content:

Substrates should be moistened with water. Plant substrates can be soaked overnight in a pond, which cuts down on the need for water. If a large volume of substrates are to be composted, a sprinkler is more convenient.

The compost mixture:

Carbonaceous substrates should be mixed with nitrogenous ones at a ratio of 4:1 or less, but never lower than 1:1 (on a dry weight basis). Some possible combinations are:

3 parts rice straw - 1 part ipil-ipil

4 parts rice straw - 1 part chicken manure

4 parts grasses - 1 part legume materials + 1 part manure

4 parts grasses - 1 part *Chromolaena odorata* or *Mikania cordata* + 1 part animal manure

Composting procedure:

The substrates should be piled loosely in a compost pen to provide better aeration

within the heap. The material should not be too compact and no heavy weights should be put on top. Compost heaps should be located in shady areas such as under big trees. The platform should be raised about 30 cm from the ground, to provide adequate aeration at the bottom. Alternatively, aeration can be provided by placing perforated bamboo trunks horizontally and vertically at regular intervals, to carry air through the compost heap.

The compost activator, consisting of a cellulolytic fungus, is broadcast onto the substrates during piling. The amount of activator used is usually 1% of the total weight of the substrates (i.e. about 1 kg compost activator per 100 kg substrate).

Decomposition is faster if the activator is mixed thoroughly with the substrate. A greater amount of activator can be used if faster decomposition is desired.

The heap should be covered over completely. This maintains the heat of decomposition, and minimizes water evaporation and ammonia volatilization. White plastic sheets, or plastic sacks with their seams opened and sewn together, can serve as a cover. The compost heap usually heats up in 24 - 48 hours.

Heat should be maintained at 50°C or higher, and the heap should be turned over every 5-7 days for the first two weeks, and thereafter once every two weeks. After the first week, the volume of the pile should be reduced by one-third. After two weeks, the volume of the pile should be reduced to one half the original.

The mature compost should be removed from the pen, and dried in the sun for two days. It should then be put into sacks and stored in a shaded area. Decomposition will continue until the substrate is finely fragmented, so that the finished product has a powdery texture. Then, once decomposition is complete, the compost should be sundried again until the moisture content is at 10-20%.

If mature compost is needed at once, it should be sun-dried for one day, as soon as its temperature drops to 30°C. Drying removes excess moisture, and makes the compost much easier to handle. Although the compost still retain some fibres, it can be applied immediately as fertilizer.

IBS Rapid Commercial Compost Production

In the large-scale commercial production of compost, the following operations need to be mechanized, other steps remaining the same:

Chopping of substrates.

- Mixing/Turning - when there are several tons of substrate, a pay loader will make mixing of substrates or turning of heaps much easier.
- A hammer mill should be used to break up big lumps of mature compost before drying.
- During rainy months, it is more economical to dry compost mechanically than try to sun dry it.

IBS Rapid Rice Straw Composting

At harvest time, rice straw is heaped on to one side of the paddy field. It saves labour to have one compost pile for each paddy field instead of one central pile. Various steps are as follows:

- Rice straw is soaked overnight in water or in the rain until saturated.
- A simple platform is made in the middle of the field
- A layer of saturated rice straw 10-15 cm thick is loosely piled on the platform.
- On top of the layer, one or two handfuls of the activator is broadcast (25 kg /ha).

- Straw is alternately layered with the activator until all the straw has been used.
- Manure and nitrogenous plants are put on top of the straw layers. The nitrogen substrate is 15-25% of total composition.
- The compost is covered (with plastic, banana leaves, or coconut fronds) and heats up within 25 hours.
- The compost must be moistened frequently to compensate for evaporation.
- The compost is left unturned and matures within one month. It is ready for use when the pile has cooled and is 30% of its original size.

== RAPID COMPOSTING METHODS: Use of effective micro-organism(EM)

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Detailed description of the technology

Use of Effective Micro-organisms (EM)

EM based Quick Compost Production Process

Since 1999 seven small-scale organic fertilizer plants, using the EM based quick production process have been in operation in Myanmar. They are owned and operated by Women's Income Generation Groups (WIGG). A unit plant consists of nine pits of 6 ft (l) x 4 ft (w) x 3 ft (d) , enclosed by low walls and covered with roof.

Raw Materials:

The raw materials for organic fertilizer production are as follows:

- Cow dung 2 portions
- Rice husk 1 portion
- Rice husk/charcoal 1 portion
- Rice bran, milled 1 portion
- Accelerator 33 litres of EM solution or Trichoderma solution per pit.

Preparation of EM solution (accelerator):

Firstly one litre of 'instant solution' is made by mixing 10 ml EM, 40 ml molasses and 950 ml water and leaving it for five to seven days, depending on temperature. Then the solution is added to one litre of molasses and 98 litres of water to obtain 100 litres of ready to-use EM solution. This amount is enough for three pits. The EM solution functioning as accelerator reduces the composting period from three months to one month.

Procedure:

Firstly, mix all the ingredients, except accelerator. Then make 0.5 ft layer of mixture in the pit and sprinkle accelerator over. Repeat the same procedure until the pit is full. Cover with plastic sheet. Two or three weeks later, mix the whole pit to boost aerobic decomposition. The fertilizer is ready to use a couple of weeks later. . A pit turns out 900 kg of final product per batch, which are usually packed in 30 kg plastic bags. Assuming that it takes 30 days on average to produce a batch and only eight pits may be used for technical reasons, the annual potential production capacity works out to 86.4 tons ($0.9 \text{ t} \times 8 \text{ pits} \times 12 \text{ months}$).
