

Farmers and home gardeners in the Philippines and other Asian countries pay renewed attention to fertilizing with compost. A growing concern for the environment and escalating production costs make organic fertilizers more attractive to growers and government alike. Composting as a method of producing organic fertilizer has limited popularity with farmers for two reasons. It requires extra labour and the compost normally takes 3-4 months to mature. The IBS (named after the Institute of Biological Sciences) method of rapid composting addresses these two drawbacks. In this article the author discusses the advantages and constraints of rapid composting.



Photo: Wim Hierata

Rapid Composting fits rice farmers

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In the 1960s, the low cost of inorganic fertilizers discouraged the use of compost among lowland rice farmers. Besides being inexpensive, chemical fertilizers were easier to use. In addition, their ability to boost plant growth and grain yields was easily seen and could, at times, be dramatic. In irrigated areas, rice farmers can get two to three crops a year using the high-yielding, earlier maturing rice varieties. The interval between croppings can be as short as 15 days in places planted to three rice crops a year or 45 days in two-crop areas. With this busy schedule, rice farmers abandoned composting almost completely. Rice straw that had accumulated in the field after each harvest was simply burnt, especially during the dry season, so as not to hamper land preparation for the next planting season.

Revived interest in composting

Greater use of inorganic fertilizers in the Philippines means increased imports. More than 80% of the country's total supply of inorganic fertilizers is imported. In 1990, the Philippines imported 580,299 metric tons of urea alone, at a value of about US\$ 149,000,000 in foreign exchange. As the oil price began to rise in 1973, the cost of oil-based fertilizers rose tremendously. Today, the average Filipino farmer, particularly in the more isolated areas where transport of goods can be a problem, can no longer afford to use inorganic fertilizers and he is confronted with the hard fact of low rice yields. This agri-

cultural crisis has renewed interest in compost as an alternative fertilizer for crops.

Rapid IBS method

Ordinary composting is too slow for farmers who plant two or three crops a year. The IBS rapid composting method, introduced in 1986, speeds up the process with a compost fungus activator, *Trichoderma harzianum*, and a set of procedures that provide favourable conditions for the quick decay of agricultural wastes. Like the normal method, it uses rice straw, animal manure, and water (Table 1). Unlike the normal method, it uses no ash or lime because only minimal organic acids are produced during decomposition. The compost fungus activator replaces soil as a source of waste cellulose decomposers, thereby increasing the number of decomposers.

Rapid composting requires two kinds of substrates: those rich in carbon and those rich in nitrogen. Rice straw is abundant on the farm. It is rich in carbon but not in nitrogen. To speed up decomposition and get good quality compost, a farmer will also need fresh or dry animal manure such as guano, poultry dung, or hog, cow, carabao, or horse manure. A good substrate combination is three parts carbon to one part nitrogen substrate. If animal manure is difficult to obtain, you may partly replace it with plants such as *Mikamia cordata* (bagging ilog), *Chromolaena odorata* (hagonoy), azolla, *Leucaena leucocephala* (ipil-ipil), *Gliricidia sepium* (madre de cacao or kakawati), *Sesbania*, and other leguminous plants. They can be combined with animal manure at a 3 to 1 ratio (75% manure and 25% leguminous plants,

according to weight). *Trichoderma harzianum* is now produced by the Dept. of Science and Technology, the Dept. of Agriculture, by state colleges and universities, and by non-government organizations and farmers' cooperatives in the Philippines. The ideal compost heap cover is white transparent plastic. Good substitutes are open plastic bags sewn together, banana leaves, or coconut fronds.

Procedures

How to do rapid composting on irrigated lowland rice fields?

- 1 At harvest time, heap up the rice straw from each paddy on one side of that paddy. It saves labour later when you have one compost pile for each paddy instead of one big pile for all fields.
- 2 Soak the rice straw overnight in irrigation water or in the rain during the rainy season. You may also water them with sprinklers before they are piled, until saturated.
- 3 Make a simple platform in the middle of the paddy. The size will depend on the amount of rice straw.
- 4 Loosely pile up the water-saturated rice straw in layers on the platform. Each layer may be 10-15 cm thick.
- 5 On top of each straw layer, broadcast one or two handfuls of the activator. Use 25 kg of activator for each hectare of riceland.
- 6 Repeat steps 3 to 5 until all the straw is used up.
- 7 Put manure and nitrogenous plants on top of the straw layers. The nitrogen substrate should be 15-25% of the total weight of all the substrates.

- 8 Cover the compost pile. It will heat up in 24-28 hours.
- 9 Moisten the pile often. Water evaporates fast and since the compost pile is in an open field, it must be moistened regularly.
- 10 Leave the compost unturned. It will mature within one month. It is ready for use when
 - The temperature in all layers of the pile has gone down. You can tell this by feeling the straws.
 - The volume of the pile is only 30% of what it was before.
 - The substrates are brown to black and no longer recognizable as such. They have become soily in appearance.
 - The odour is not foul.
- 11 Before the last harrowing, scatter the compost on the field. Harrowing will mix it with the topsoil.

Benefits

About 2.5 to 8 tons of compost are needed to meet the 90 kg N/ha requirements of rice crop. In the national programme, we recommend the use of compost as basal fertilizer and supplementation of inorganic fertilizers at half the recommended rate applied 30-45 days after rice transplants. In this fertilization scheme still about 2-3 tons/ha compost are needed. To raise the required amount we recommend that all rice straws produced after threshing must be converted to compost. Our field data show that if this is done, an average of 3.4 tons/ha can be generated. If use of compost and inorganic fertilizers is combined, rice yields increase 10-15% as compared to using 100% inorganic fertilizers (see Table). I attribute the increase in yield to the availability to the crops of other required nutrients from compost.

Besides the immediate income gains, the soil benefits from the continued use of compost in the long term. It results in improved texture and tilth of the soil, better aeration and water-holding capacity, increased fertility and less acidity. Because rice straw is converted into compost rather than burnt, less carbon dioxide is released into the atmosphere. Less inorganic fertilizers are washed out into surrounding waters, which means fewer algal blooms that will compete with fish for oxygen. In addition, farmers gain self-reliance as they become less dependent on outside farm inputs.

Possible drawbacks

Rapid composting, like composting in general means more work for the farmer. Labour inputs can be cut down by composting in the farmer's field and in small heaps that are easily transportable. Locating the compost pile near water also helps. Rapid composting hinges on the action of the activator. A dependable supply of *Trichoderma harzianum* is critical.

Provinces	No of Demo/ Area (ha)	Demo plot Ave. Yield/ ha (kg)	Farmers practice Ave. Yield/ ha (kg)	Yield Difference (kg)	% Yield Increase w/RCT	% Increase in Income
Nueva Vizcaya	14	4259.79	3770.14	487.65	12.98	22.52
Isabela	62	5122.48	4624.53	497.95	10.76	18.68
Cagayan	132	4671.98	4319.77	352.21	8.15	10.49
Quirino	50	6289.59	5679.19	610.40	10.74	18.24
Average		5085.96	4598.40	487.55	10.65	17.48

Grain yield of rice on rapid composting technology (RCT) Demo vs. Farmer's Practice in the Four Provinces.

To assure the supply, a national programme was set up on rapid composting and the use of compost as fertilizer. The quality of the activator is a major concern. Contaminants reduce the effectiveness of the activator. They may also cause skin irritations for both farmers and technicians.

Availability of basic materials

When I started my work in composting I never thought that supply of manure would be a limitation to farmers' adoption of the technology. I thought that Filipino farmers raised one or two heads of livestock which could adequately provide manure for composting. It was a great surprise to me to learn that a large number of our farmers at present either use a tractor, rent one or hire farmers with carabaos to do land preparation for them. If there are farmers with carabaos they graze their animals in open lands and regularly transfer them from one place to another. Collecting the manure at different places is tedious and laborious. There are other sources of manure such as poultry houses or piggeries. However, there are areas in the country where these sources of manure are far from the farmers' field. The transport cost increase adds up to the total cost of composting. This problem of inadequate supply of manure results in several drawbacks for field composting:

- the ideal 25-75% animal manure to rice straw ratio is reduced to a 10-90% ratio.
- as a consequence of this change in ratio, the resulting compost usually has very low nitrogen content (only about 1% N).
- composting period is extended from 2.5 to 5 weeks.

The recommendation of utilizing all straw for composting is untenable in regions where rice straw are precious commodities like in Nueva Vizcaya where rice straws are used as mulch for garlic, a high value crop. This recommendation is also inapplicable in areas where rice straw is used as animal feed. In these areas we recommend the use of weeds and agricultural residues as substrates for composting. But using these substitutes increases

labour inputs for composting especially if the sources of substrates are far from the fields where the compost will be applied.

Technology improvement

The adoption of the rapid composting technology by farmers in Guimara was successful because they modified the composting process. They did not use the recommended platform for aeration, instead they provided another method that suited farmers better. There may be other innovations which I may not be aware of. We expect greater farmer adoption with the composting modifications that we will try for the rainy season with our farmer cooperators in Calamba and Majayjay. The modifications include the removal of the platform and piling up. Instead the straw will be immediately scattered on the field after the wet season harvest, when there will be no water limitation. Activator and manure will be broadcasted on top of the wet straws. In two to three weeks time the decayed rice straws can be easily ploughed in. This process, according to the farmers who first tried this method, will reduce labour inputs by around 50%. If this labour reduction is verified, adoption of the on-site composting process will be greatly enhanced.

References

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