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FOREWORD

Farm and household wastes constitute about 70 percent of the sources of solid waste. To make it worse, generating these wastes is done at a larger scale than utilizing them. If they are re-used, only a small percentage is properly done so. The greater bulk is either merely discarded or burned.

At PhilRice, we are developing a system that targets to manage these farm and household wastes together to produce soil amendments such as organic fertilizer. While at the same time contributing to make better our living conditions by properly managing wastes, we also aim to reduce our farmers’ dependence on external farm inputs such as chemical fertilizers. Through this simple and practical technology, we also aim to lessen farmers’ costs of production and increase the biodiversity of our environment.

By reusing the byproducts of our farming processes and day-to-day living, we return what we take from the soil while we optimize all available sources of nutrients. We are also able to comply with local and international environmental laws such as the Clean Air Act, Clean Water Act, and Solid Waste Management Act. In addition, PhilRice is now also ISO 14001-certified, meaning, it has successfully put into proper use its environmental management system (EMS). EMS calls for the integration of principles of environmental protection into an organization’s products, operations and activities, as well as services.

This technology bulletin aims to introduce farmers and their household to better ways of managing the wastes they generate everyday. The common ways of managing wastes are presented, followed by the practices done at PhilRice. It is hoped that by properly managing wastes, farmers and their household members will help lessen environmental problems, increase their farm yields and have healthier crops.

LEOCADIO O. S. SEBASTIAN
Executive Director
Introduction

Everyday, wastes from farms and households are produced at a large scale. For instance, the total waste generated daily by a person is approximately 0.6 kg, 50% of which is considered biodegradable or what is commonly known as biowaste. Therefore, in a household composed of six, the total monthly biowaste generated would be 54 kg and would reach up to 324 kg in just six months.

Producing these wastes is greater than reusing them; the bigger bulk is either merely discarded or burned. This improper disposal of wastes poses environmental hazards such as:

- water pollution;
- air pollution through the release of harmful chemicals and particles;
- land pollution through the spread of disease-causing organisms; and
- unsanitary environment owing to foul odor of wastes thrown everywhere.

It also affects human health through food contamination, exposure to dirt that causes skin diseases, and emission of fumes that cause respiratory diseases. Improper disposal of wastes also brings about the proliferation of pests, thus, resulting in the breeding of disease-carriers.
Conversely, properly managing wastes lessens the risks of pollution. It brings about economic benefits such as lesser inputs like chemical fertilizers. It also results in end-products such as soil amendments that come in various forms like organic fertilizer.

This process of resource recovery in the agricultural production system converts energy from solid waste in one usable form or another, as can be seen in the following diagram:

Close-loop resource recovery system of managing farm and household wastes.
Examples of household wastes

Biodegradable
1. Food waste
2. Paper and print materials
3. Toiletries (in general)

Nonbiodegradable
1. Plastics and vinyl
2. Aluminum, iron, and other metals
3. Empty bottles
4. Glassware and pottery
5. Broken or old furniture and appliances
6. Old clothes

Examples of farm wastes (biomass)

Farm wastes are wastes generated from planting or harvesting of crops, trimming or pruning of plants, and run-off materials from farms or fields.

1. Rice hull
2. Rice straw
3. Weeds and other grasses
4. Animal manure
5. Corn stalks
6. Corn cobs

Many households still do not segregate their wastes. Used plastics, cans, and bottles are usually mixed with other wastes and just given to garbage collectors who also do not segregate these wastes.
Common waste management practices

1. For farm wastes:
   - Burning rice straw, rice hull, and weeds.
   - Using corn stalks and rice straw as additives in ruminant and poultry feeds; the feed value of rice-mill feeds is higher due to the presence of rice bran and polished feed.
   - Using animal manure as charcoal
   - Using corn cobs as fuel
   - Dumping or leaving wastes anywhere

2. For household wastes:
   - Throwing away without segregating or separating from other materials
   - Disposing of and dumping in some containers
   - Giving left-over food to domesticated or stray animals
   - Recycling or selling paper waste materials
   - Reusing or selling used bottles

PhiLRice waste management practices

1. Farm wastes are managed by:
   - Recycling – making wastes suitable for beneficial use and other purposes; transforming wastes into new products wherein the original materials may be used as raw materials to produce other goods and services

4R-technology implemented at PhiLRice:
- Reduce the amount of waste generated
- Reuse existing materials and commodities
- Recycle to reclaim usable materials
- Rethink to save money and resources
- Reusing – recovering the materials for the same or different purpose without altering the physical and chemical characteristics of the original material
- Composting – the controlled decomposition of organic matter by microorganisms into a humus-like product useful in enriching house plants and garden and farm soils.
- Zero-tillage method – minimizing the frequency of farm operations (i.e. plowing) during land preparation
- Producing carbonized rice hull (CRH) - partially or incompletely burning rice hull (refer to Rice Technology Bulletin # 47) to be used as soil conditioner, substrate for microbial inoculant, feed additive, odor adsorbent, and water filter
- Combining CRH with compost to produce quality organic fertilizer

2. Household wastes are managed by:
- Segregating nonbiodegradable from biodegradable wastes
- Using microbial inoculants to hasten composting of biodegradable wastes and fermenting these for one week
- Recycling or selling nonbiodegradable wastes such as plastics, bottles, and cans
Integrated farm and household waste management

To address the problem of improper farm and household waste management, PhilRice has developed a system that involves the integration of both types of wastes. By managing farm and household wastes together, soil amendments such as organic fertilizer and compost are produced. Farmers and the farming households are also able to manage the wastes they generate while at the same time earning economic benefits.

Framework to generate eco-profitable agricultural products.
10 General Practices for an environment-friendly workplace

1. Segregate wastes
2. Use biodegradable soaps
3. Handle chemicals with care (*read and follow instructions carefully*)
4. Switch off lights and electrical appliances when not in use
5. Save on gas (*Observe speed range: 80-100 kph*)
6. Save water (*Report/repair leaks*)
7. Safety first (*Wear appropriate protective gadgets at work*)
8. Respect NO SMOKING areas
9. Know your colors*: GYR
10. Learn it. Do it!

*COLORS THAT MATTER*

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SEGREGATE YOUR WASTE!

To facilitate and efficiently conduct the collection of segregated waste in your respective areas, please follow this simple guide schedule:

- Food waste
- Paper and prints
- Wood and other biomass
- Glassware and pottery
- Toiletries
- Empty bottles
- Aluminum, iron, and other metals
- Broken/Old Furniture and Appliances
- Recyclable clothes

Let’s Work Together to Keep PhilRice Clean, Green, and Waste-Free
AT THE SOURCE (farm or household):

1. Segregating farm waste and household food waste. At the farm, separate organic materials such as rice straw, rice hull, dried leaves, and wilted flowers. At the household, use only materials suitable for turning into compost such as fruit and vegetable peelings, and leftover meat, fish, and other foods. Exclude paper products, although these are also organic materials.

2. Chopping and shredding. For the farm waste, shred large pieces into smaller ones and set aside. For the segregated household food waste, break large chunks of food into smaller fragments to ensure an effective fermentation process. Drain excess liquid before placing in bucket. Use a chopping or shredding machine when necessary.
3. **Fermenting.** Add a microbial inoculant to the food waste in the bucket to hasten the composting process. A well-fermented waste has a sweet and sour smell similar to pickles. A strong, rancid, or rotten smell indicates improper fermentation.

**AT THE WASTE MANAGEMENT CENTER:**

4. **Collecting.** After one week of fermenting the food waste, collect these composting materials and gather them including the shredded farm waste.

5. **Mixing.** Mix the fermented food waste with the shredded farm waste. Add chicken manure if available. Add microbial inoculant to hasten decomposition.
6. **Decomposing.** Ferment the mixed farm and household waste materials for further decomposition. Cover the compost.

7. **Bagging and storing.** After 5-7 days, put decomposed materials in sacks or bags, ready for use.

8. **Delivering and applying.** Apply compost as organic fertilizer.
Final product: SOIL AMENDMENT OR SOIL CONDITIONER

- improves the soil’s physical condition to make crops grow better and healthier, resulting in increase in yield
- makes nutrients available for the crop as it grows

Soil amendment may come in the form of:

1. organic fertilizer
   - replenishes the soil’s nutrient and micronutrient content
   - helps retain moisture and slows down the growth of weeds
   - improves soil structure to give way for more water and air retention
2. compost
3. compost tea
   - used to water gardens and orchids
4. indigenous microbial inoculant
5. natural pesticide

Benefits of integrating farm and household wastes

Farmer benefits

1. Reduced cost of production in terms of fertilizer
2. Reduced health risks
3. Increase in income owing to healthy crops

Farm benefits

1. Less soil acidity resulting in good-quality soil
2. Maintenance of nutrients as these are returned to the soil
Environmental benefits

1. Environmental protection - reduced global warming incidence owing to reduced acid rain occurrence brought about by burning

2. Increase in biodiversity

Health benefits

1. Health protection - reduced risks of food contamination and respiratory diseases brought about by water, land, and air pollution.

2. Eco-profitable products or safer food are produced because of the use of organic fertilizer, natural pesticides, and other organic farm inputs.

TECHNOLOGY TO WATCH

Through a project funded by the New Energy and Industrial Technology Development Organization (NEDO) of Japan, PhilRice is testing and evaluating a new 24-hour continuous gasification, carbonization, and combined heat and power generation system. CRH and liquid materials produced during the operation will be used for various agroindustrial applications. End-products of the system include soil conditioners, organic fertilizer, and natural pesticide, among others.
References:


Philippine Rural Reconstruction Movement (PRRM). Rice Hull Biomass. Towards agricultural productivity and rural development, a project primer. Quezon City, Philippines.


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PhilRice

PhilRice is a government-owned and -controlled corporation attached to the Department of Agriculture. It was created through Executive Order 1061 dated 5 November 1985 (as amended) to help develop high-yielding and cost-reducing technologies so farmers can produce enough rice for all Filipinos.

It accomplishes this mission through research, development and extension (RD&E) through its central and branch stations coordinating with a network that includes 57 agencies and 95 seed centers strategically located nationwide.

PhilRice is an ISO14001-certified agency.

Its interdisciplinary programs are the following: (1) direct-seeded and (2) transplanted irrigated lowland rice; (3) hybrid rice; (4) rice and rice-based products; (5) rice-based farming systems; (6) policy research and advocacy; and (7) technology promotion. With these programs, PhilRice develops and promotes technologies that are ecosystem-based, location- and problem-specific, and profitable to the Filipino farmers.