

Reduction of Waste Generation by 20% in Surabaya, Indonesia

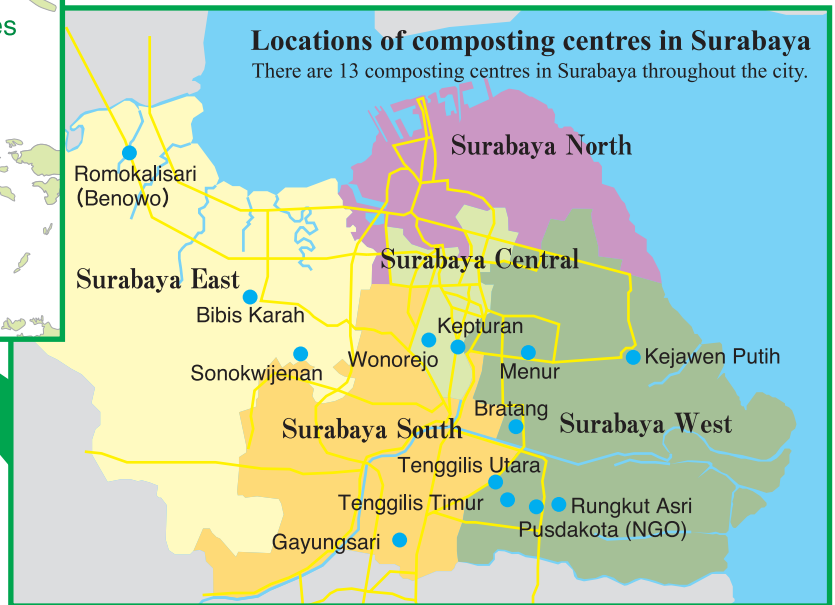
Surabaya City, Indonesia, has achieved more than a 20% reduction in waste generation over four years by actively promoting composting of organic waste. The average daily amount of waste disposed at the final disposal site, which was more than 1,500 tonnes before 2005, decreased to 1,300 tonnes in 2007 and 1,150 tonnes in 2008. Let us look how it was achieved.



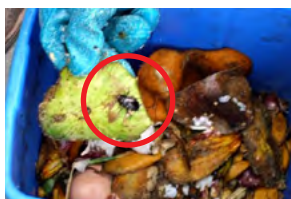
- Legend:
- Cities to which composting practices have spread as a result of activities by local NGOs
 - Cities to which composting practices have spread as a result of activities by Kitakyushu City and IGES
 - Both cases



Surabaya is the second largest city in Indonesia with a population of three million. The composting practices that were introduced in Surabaya have expanded to more than 40 cities in and outside of the country through the activities of local NGOs, Kitakyushu City and IGES.



Social and Environmental Impacts (Co-benefits) Caused by the Promotion of Composting Practices



A cockroach infested in raw garbage.



Kitchen waste hung on a wall until a collection day.



Hygienic composting of kitchen waste at each household.

Composting the kitchen waste hygienically at each household.



A street before implementation of the project.



Streets lined with trees and plants as a result of using compost.

Streets became green using compost.

Income generation from the sale of compost, as well as plants and vegetables grown using compost. Job creation at composting centres.



Employment at composting centres.



Growing and selling herbs and plants using compost.



Growing and selling vegetables using compost.



Purchasing compost produced at households.

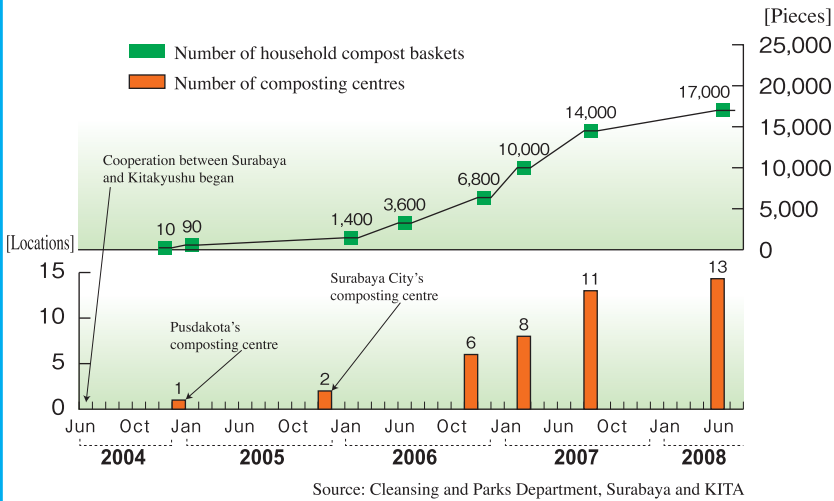


Selling compost products.

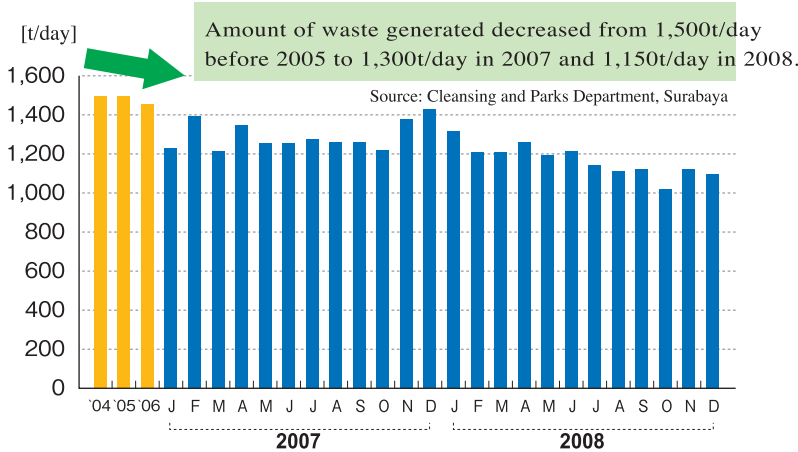
What did Surabaya City do?

Free distribution of household compost baskets and operation of composting centres

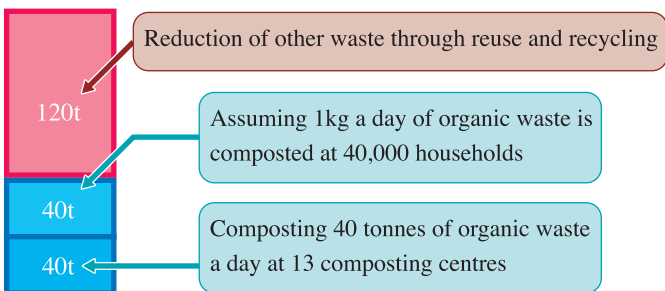
Numbers of household compost baskets and composting centres in use in Surabaya



Average daily amount of waste at Benowo Final Disposal Site in Surabaya, 2004-2008



Breakdown of the reduction of 200 tonnes of waste a day...



Surabaya City has distributed 16,000 household compost baskets for free over four years. The number of baskets in use in the city is more than 17,000, including those purchased by individuals.

Currently, there are 13 composting centres in Surabaya. The first was established in December 2004 as a model composting centre at Puskadkota, a local NGO, with technical assistance from Kitakyushu City. Surabaya City has applied the same composting methods at existing composting centres and built new ones.



- ▲ A composting centre in Surabaya
- ◀ Household compost baskets

As a result, Surabaya has achieved more than a 20% reduction in waste generation!

Out of the 200 tonnes of waste reduced each day (from 1,500 tonnes in 2005 to 1,300 tonnes in 2007), the maximum share from composting is only 80 tonnes. This can be broken down into 40 tonnes at 13 composting centres and another 40 tonnes at households, assuming 40,000 households compost one kilogram a day. The remaining 120 tonnes are the result of reducing the amount of other types of waste such as plastics, paper, bottles and tins through recycling and reusing.

Therefore, the promotion of composting not only reduces organic waste, but also larger amounts of other types of waste, by automatically encouraging waste separation at source.



Status in 2001
Waste lined streets



Current scenery in Surabaya
Green parks and roadside trees are well-maintained using compost (photo courtesy of Surabaya City)

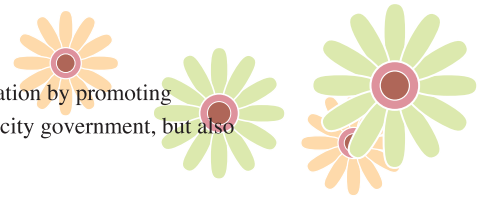


Surabaya City has turned to a clean and green city by promoting composting and waste reduction at various levels.

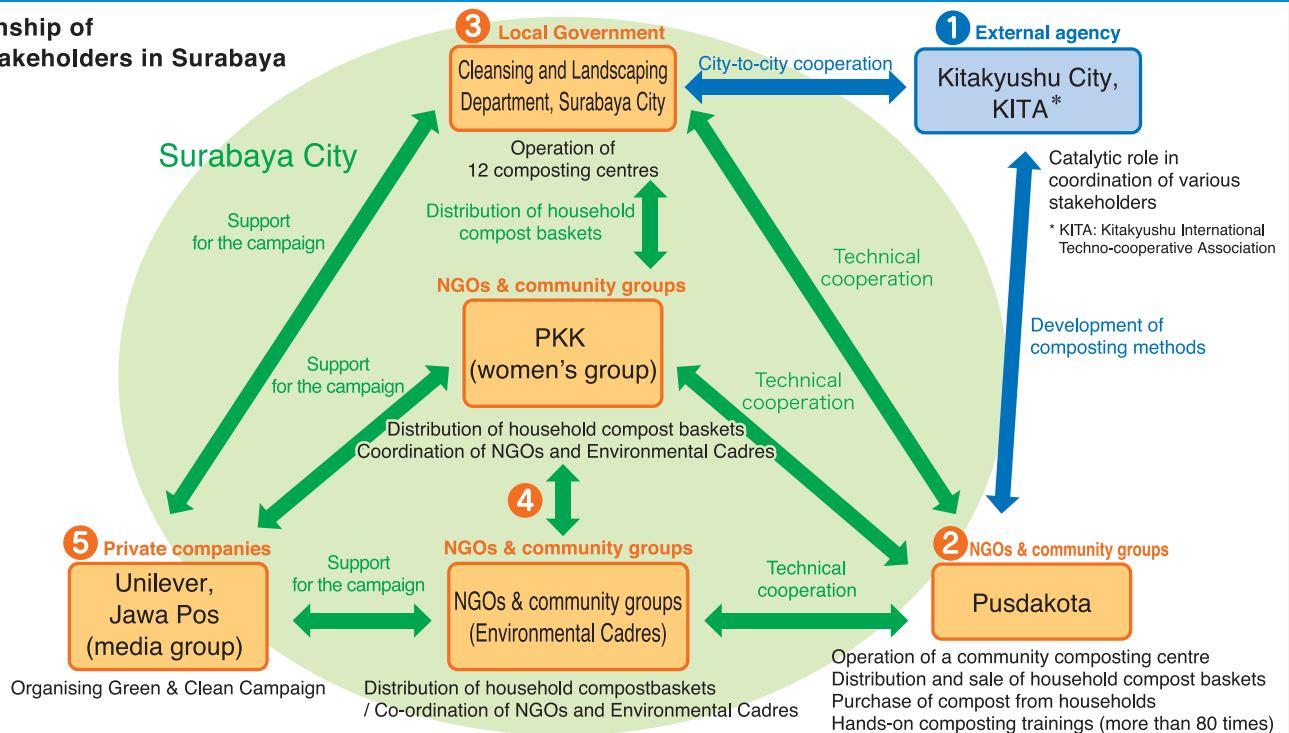


Activities of Main Stakeholders in Surabaya, Indonesia

Surabaya City, Indonesia, has achieved more than a 10% reduction in waste generation by promoting composting practices. This was achieved not only through the efforts made by the city government, but also with the involvement and synergetic effects of various stakeholders.



Relationship of main stakeholders in Surabaya



- 1 First, Kitakyushu City (KITA) and Pusdakota, a local NGO, developed composting methods suited to the environment.
- 2 Pusdakota started operations of a composting centre adopting the new method and distributed household compost baskets to community residents.
- 3 Surabaya City replicated the waste management model developed by Pusdakota by starting the operation of 12 composting centres and distributing 16,000 household compost baskets.

- 4 Environmental Cadres (or leaders) organised by PKK, a women's group, NGOs and community groups carried out the actual distribution of the household compost baskets, explained how to use them, promoted waste segregation at source and monitored performance.
- 5 Surabaya City, Unilever and Jawa Pos, a media group, organised a Green & Clean Campaign to promote waste reduction in communities.

1. Activities of Kitakyushu City (KITA)



Development of a composting method suited to the climate in Surabaya



Development of a household compost basket

Kitakyushu City developed a series of hygienic and efficient composting methods with Pusdakota which were suited to the climate in Surabaya and are applicable at each household, as well as for organic waste from markets and yards.

2. Activities of Pusdakota (NGO)



Composting of organic waste collected from communities



Segregated collection of waste

Pusdakota produces compost from organic waste collected from around 1,000 households in the community by the adoption of the new method developed by Kitakyushu City. Pusdakota produces and sells household compost baskets and also purchases compost products from residents. Pusdakota also promotes the composting method by organising hands-on trainings.

3. Activities of the Cleansing and Landscaping Department, Surabaya City



Bratang Composting Centre processes six tonnes of organic waste a day, and employs nine staff (The person at the right is Ms. Tri Rismaharini, the former Director of the Cleansing and Landscaping Department, who played a leading role in promoting composting practices in Surabaya city.)



Sonokwijenan Composting Centre processes six tonnes of organic waste a day, and employs six staff.

The Cleansing and Landscaping Department processes about 40 tonnes of organic waste a day from vegetable markets and pruned twigs and weeds from parks and streets. The produced compost is fully utilised at city parks and green areas. During Ms. Rismaharini's tenure, the area of green parks increased by three hectares. The production of compost is not yet sufficient to maintain all the city's parks, as the soil in Surabaya is generally sandy and not rich. Surabaya City has saved the purchasing costs for fertilisers by replacing them with compost.

4. Activities of PKK (women's group), NGOs and Environmental Cadres



PKK staff explains to residents how to use household compost baskets (photo courtesy of PKK Surabaya)



PKK staff instructs waste segregation.



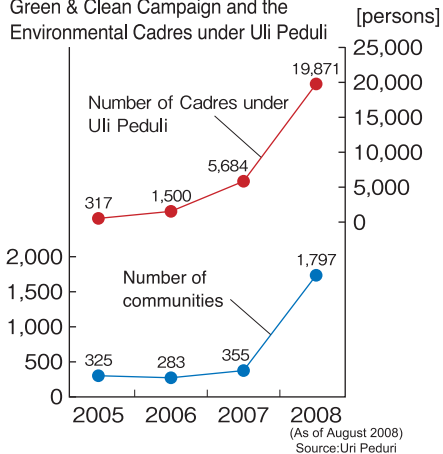
An environmental education event. The man in the centre is the Hon. Mayor of Surabaya City.

PKK mainly consists of wives of city officers; the wife of the Hon. Mayor is the director. PKK Surabaya is actively promoting vocational trainings, maternity health and environmental education for women's empowerment and better household environment. In association with those activities, it promotes composting of kitchen waste at each household.

PKK Surabaya, together with other NGOs and community groups, organises a network of community environmental leaders called Cadres and encourages them to distribute household compost baskets, which are provided free by the city, and monitors the performance of each community. There are about 280,000 Environmental Cadres throughout the city, which is the reason why more than 17,000 compost baskets are actually being used.

5. Green & Clean Campaign

Number of communities that participated in the Green & Clean Campaign and the Environmental Cadres under Uli Peduli



- Number of Environmental Cadres in Surabaya: **28,000**
- 20% of the 8,800 communities in Surabaya participated in the Campaign



At the Awarding Ceremony of Green & Clean Campaign (photo courtesy of Uli Peduli)

The Green & Clean Campaign successfully motivated many communities to clean up their environment and reduce waste at source by practicing waste segregation and composting. When the campaign started in 2005, the number of participating communities was limited to only certain areas of the city. However, as award-winning communities began to appear frequently in newspapers and on TV programmes, people started to acknowledge the benefits of the activity and the number of participating communities increased. In 2008, almost 20% of communities in the city participated in the campaign and the number of Environmental Cadres under Uli Peduli, an NGO fully funded by Unilever and the main campaign organiser, increased to almost 20,000 covering the entire city. Today, the award ceremony, which is held on the independence day of the city, is a major event. The campaign is a product of collaboration between the private sector, local government and NGOs as it is managed by Uli Peduli, reported by Jawa Pos, and financially supported by the city. Winners are selected by a consensus of all three.

What is an Organic Waste Composting Project?

In developing countries, organic waste accounts for more than a half of total household waste. The percentage even reaches 80-90% in some cities. On top of that, most of the waste from fruit and vegetable markets is organic. The organic waste composts project aims for effective use of such untapped resources through composting. In addition to compost production, the project brings various benefits such as reduction in waste generation by facilitating segregation of other dry waste and improvement in sanitary condition in households and communities.

Advantages of the Composting Project



Waste will decrease!

- Reduction in household organic waste
- Improvement in household sanitary condition
- Promotion of waste segregation



Communities will become beautiful!

- Greener streets with the use of compost
- Cleaner streets as a result of improved waste segregation
- Gaining income by selling compost or plants grown with compost



Soil will be rejuvenated!

- Boosting the growth of agricultural crops and plants
- Softening the soil by adding microorganisms



Why is the compost method called "Takakura Method"?

The method was named after a composting expert, Mr. Takakura, who contributed in developing the method in Surabaya, Indonesia. It is widely called "Takakura Method" in Indonesia.



What is Takakura Composting Method?

Features of Takakura Method

▶ **Fast!!**

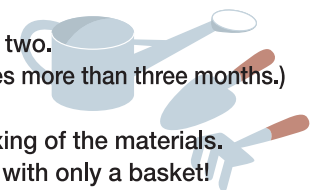
Completes in a week or two. (Usually composting takes more than three months.)

▶ **Easy!!**

Requirement is only mixing of the materials. Household composting with only a basket!

▶ **Cheap!!**

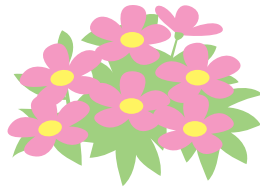
Required mechanical input is only a shredder! It requires only locally-available materials.



In Takakura Composting Method, organic matter is composted by means of cultivation of microorganisms, which suit the soil and are commonly available in the natural environment, and of elimination of unwanted microorganisms. Above all, fermentative microorganisms play a central role in composting. Since fermentative microorganisms which perfectly suit composting inhabit our immediate surroundings, anyone can easily make effective compost by finding and culturing them. The effective use of fermentative microorganisms enables the production of a large amount of compost in a small space and in a short period of time. Moreover, the method is safe and economical as it requires readily available materials only.

Fermentative microorganism

Organic waste easily putrefies unless it is treated properly. One way to prevent that is applying a large quantity of fermentative microorganisms and lead to a desired fermentation process. When the amount of fermentative microorganisms is larger than those putrefying, a transition to a good fermentation stage takes place. In contrast, organic matter putrefies and emits a foul odour when the amount of fermentative microorganisms is smaller than those putrefying. In other words, both sets of microorganisms fight for their own survival by competing with each other. In order to give advantage to fermentative both sets of microorganisms in this struggle for survival, plenty of them need to be prepared and applied from the initial stage of composting. No special fermentative microorganisms are required for composting except the ones that exist in our daily life, which are called Native Microorganisms (NM).



How to Obtain Fermentative Microorganisms

Good-quality fermentative microorganisms exist in the following substances (or places) and collection of them from various sources enhances the effectiveness.

1 Fermented foods

Yogurt, fermented soybeans, unrefined soy sauce, local wine, mushrooms, yeast cells, etc.

2 Leaf mold

The leaf mould collected in the wild is more effective than the commercially-available one. Also, leaf mould which is crumbling in contact with soil brings better results.

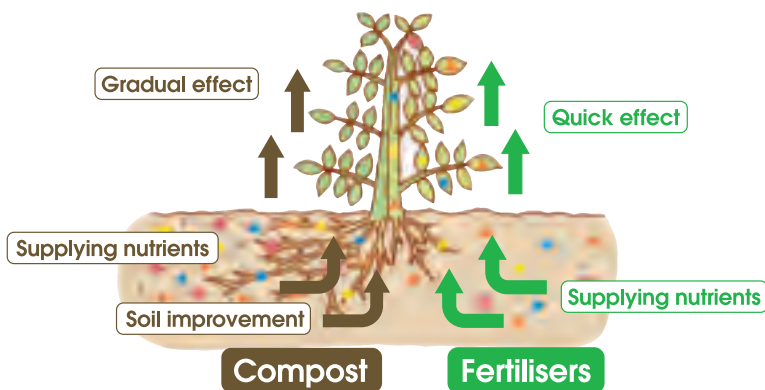
3 Fields for organic farming

Be sure to obtain owners' consent before taking any soil from them.

4 Other natural materials

Rice bran, rice husks, straw, grass, rotten trees, etc.

Difference between Compost and Fertilisers



Crops require both compost and fertilisers. While fertilisers supply necessary nutrients for crops to grow quickly, compost gradually releases nutrients as it improves the soil environment. In other words, using compost every year improves the soil condition and thereby enhances its long-term nutrient supplying capacity.

Locations for organic waste composting

Organic waste composting can be practiced at each household and at a composting centre.

Individual households

Organic waste is composted at individual households, or waste generation sources. In this approach, organic waste is composted in a sanitary manner with little or no emergence of insect pests and foul odour as it is treated before putrefying. Also, all that is required is a small space and a little care. When 500 grams of organic waste is treated every day using a 60-litre composting container, it takes three to six months to be full.



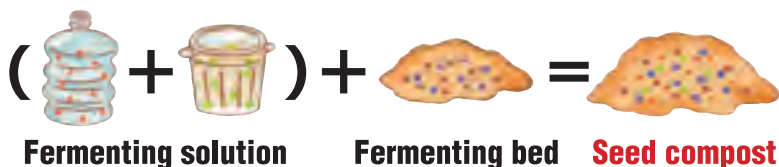
Composting centres

Organic waste generated by households, fruit and vegetable markets, business establishments and others is collected and treated intensively at composting centres. There are mainly two methods for this approach: mechanised large-scale composting centres and manually-operated small-and medium-scale composting centres which also function as local waste disposal facilities. This booklet explains how to make compost at a small-and medium-scale composting centre in a week or two.



How to make seed compost

Seed compost for organic waste composting can be made using common ingredients which contain a large amount of fermentative microorganisms. Fermentating solutions are mixed with rice bran and rice husks to allow microorganisms to grow.

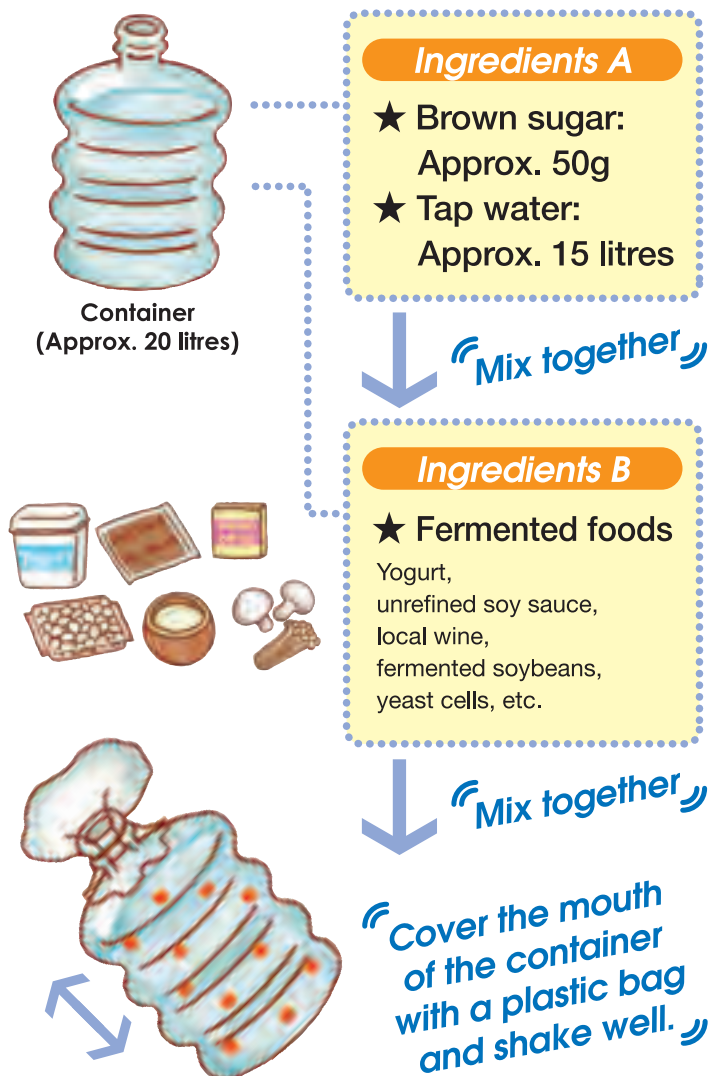


1 Making a fermenting solution

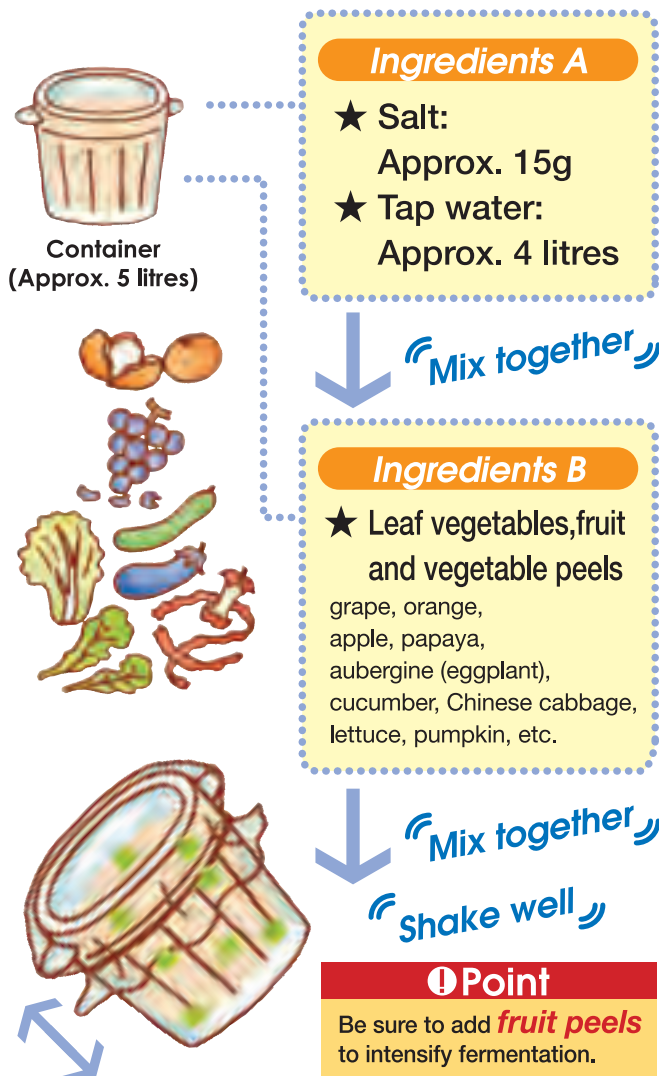
Different types of fermentative microorganisms can be collected by making both of the following solutions, which brings about better fermentation.



Fermented foods + Sugared water



Fruits and vegetables + Salted water



How to make fermenting solutions

- Put [Ingredients A] in the container and mix together.
- Add [Ingredients B] to ① and mix well.
- Cover the mouth of the containers with plastic bags/sheets to protect against insects.
- Leave the solutions for 3 to 5 days, for the fermentative microorganism to grow.

Point!

- ※The plastic bag/sheet used for sealing may swell out due to the generation of carbon dioxide gas, but it is not a sign of failure.
- ※The mixture has a sweet and sour smell/taste as well as the odor of alcohol when the process goes successfully. In contrast, the mixture smells strange and rotten when it fails. In that case, retry the procedure and use an increased amount of salt if it is made with salted water.

2 Mixing a fermenting solution with a fermenting bed



Make a fermenting bed

★ Rice husks
Approx. 1m³

★ Rice bran
Approx. 1m³

Straws may be added

Rice bran: Rice husks = 1:1



Mix well

Leaf mould
↓
Put leaf mould
in water
↓
Loosen it well

Seed compost for 40 to 50 households can be prepared using these ingredients.

Mix the fermenting solution with the fermenting bed

★ Fermenting solution



Mix well

Point

Adjust moisture level to 40-60% by adding the fermenting solution and water. (If the moisture content is right, the mixture becomes a lump without oozing of water when squeezed lightly with a hand.)

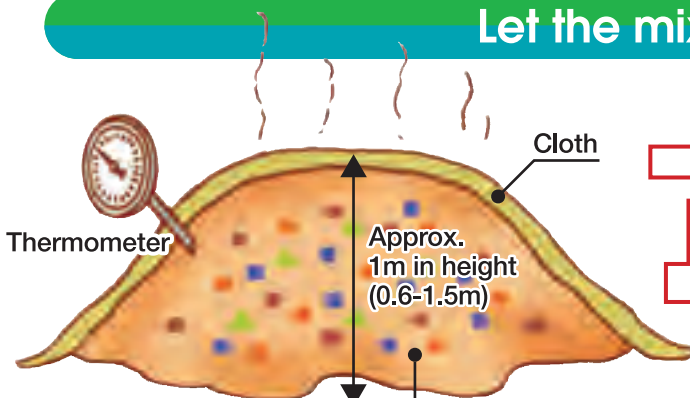


Example of failure
(Too much moisture)

Example of failure
(Too little moisture)

Example
of success

Let the mixture ferment



Thermometer

Cloth

Approx.
1m in height
(0.6-1.5m)

Maintain the inside
temperature at 60-80°C

※ If it is too hot to put your hand in, this means it is over 80°C and is too hot. (If the temperature exceeds 80°C, spread the pile to release heat.)

Pile up the mixture in a trapezoidal shape, and cover the entire pile with a piece of breathable cloth. (Be careful not to allow harmful insects to enter.)

When the entire surface becomes covered with white mould, it indicates the completion of fermentation. The fermentation will be finished in about 3 days. Then, let it dry afterward.

(The finished seed compost can be stored after it gets thoroughly dried out.)



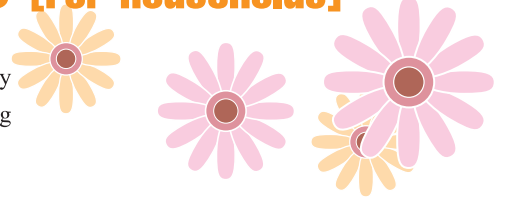
Completion of seed compost

The basic material for composting organic waste is now ready for use.



How to compost organic waste [For households]

A procedure for composting organic waste at source in individual households is described here. By following this procedure, organic waste can be composted in a sanitary manner without generating offensive odours and harmful insects as it is treated before rotting.

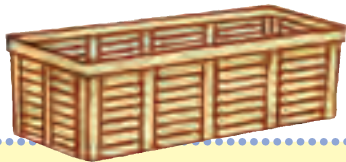


1 Making a compost container

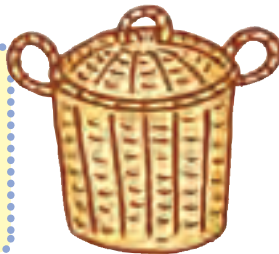
Make a compost container in which organic waste can be smoothly fermented.



Prepare a container



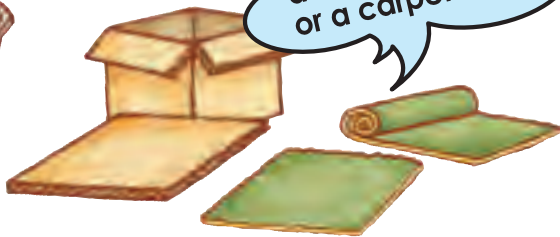
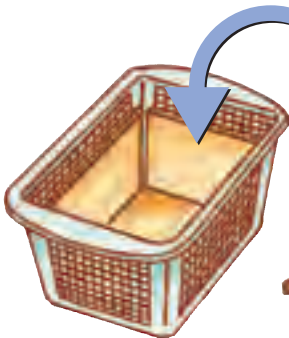
Prepare a container of approx. 60 litres in capacity (with holes on every side) which allows air to pass through easily from all directions.



A breathable container



Place a cardboard box or a carpet on the inner side of the container



Cardboard/
a cardboard box
or a carpet

By placing a cardboard box or a carpet on the inner side of the container, the spilling of seed compost and the infestation of insects can be prevented. Cover the container with a cloth or a storage sack made of cloth or nonwoven fabric to prevent insects from entering.

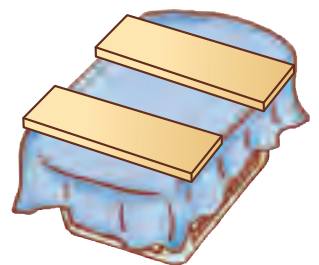
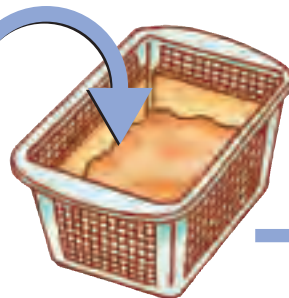
Fill the container to 60% capacity with seed compost and cover it with a cloth



Seed compost



Using a plastic scoop (garden trowel) is recommended because it doesn't rust and lasts long.



The whole container can also be stored in a nonwoven fabric sack.

2 Composting



Chop up organic waste, put it into the container and mix well.

- The more finely organic waste is chopped up, the more quickly it ferments.



Maintain the moisture level at **40-60%**

- Drain excess liquid by squeezing.
- It is effective to loosen boiled rice with water beforehand, because it easily becomes lumpy.
- Keep the seed compost rather dry when the amount of vegetable scraps is large, because vegetables have high moisture content.

Be careful not to let the moisture content become too high. Otherwise, the fermentation will be inhibited resulting in the generation of offensive odours.

If steam rises while the content is being stirred, it indicates the fermentation is in a good condition with the temperature reaching 40-50°C. (Excess moisture vaporises as the temperature rises.)

ⓘ Point

Set aside orange peels, onion skins and used tea leaves after drying as they can be used for the adjustment of moisture used content.

Cover the organic waste with seed compost

- Lastly, cover the organic waste with a layer of seed compost until it becomes completely invisible.
- Keep it warm by covering the container with a cloth or by closing the mouth of the nonwoven fabric sack.



ⓘ Point

Fermentation process gets extremely slow if the temperature is low. In that case, raise the temperature by adopting the following means:

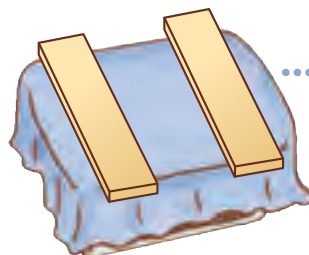
- Place the container in a cardboard box.
- Place it in a polystyrene foam container with holes.
- Put a plastic bottle containing hot water in the container.

- Usually, organic waste decomposes and loses shape in 1-2 days.

Be sure to stir the entire content once a day.

This intensifies fermentation and inhibits the growth of undesirable microorganisms such as putrefying microorganisms.

Repeat ↺



Prevent insects from entering.

The whole container can also be stored in a storage sack made of nonwoven fabric.

Take out the compost and let it mature.

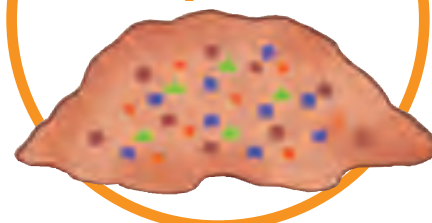
Repeat the process every time you put in organic waste until the container becomes full. When the composting is going well, it takes 3-6 months for the container to become full with 500g of organic waste input every day.



Take the compost out of the container and check the moisture content. If it is too dry, adjust the rate by adding some water.

Put the compost in a breathable container such as a cardboard box or a sack for storage. Leave the compost for more than 2 weeks to reach full maturity before use.

Composting is completed!



How to compost organic waste [For composting centres]

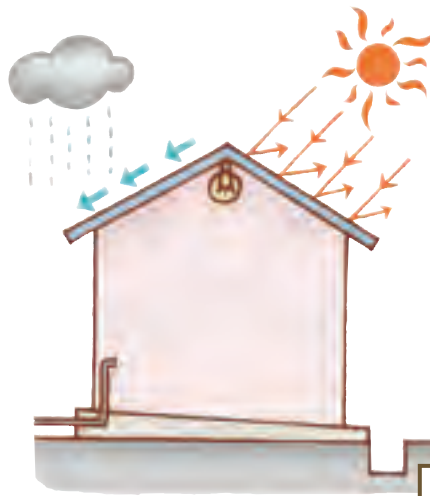
Organic waste collected from local households, markets and business establishments is composted at a composting centre.



1 Establishing a composting centre

Basic conditions for establishing a composting centre

- ★ Protection against rain and strong winds
- ★ No inflow of rain water and good drainage
- ★ Easy access to water supply



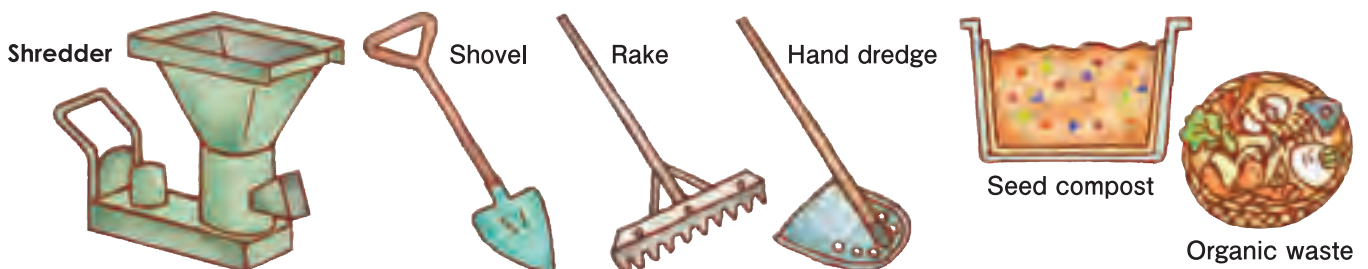
- ★ No direct sunlight
- ★ Lighting for nighttime work is available.
- ★ Not adjacent to houses; a certain distance is maintained.
- ★ Subsidiary materials such as rice bran and rice husks are readily available.

Either a concrete floor or an earth floor is fine. Choose whichever is suitable depending on working properties, fermentation methods and other factors.

Although no fluid seeps out of compost, it will be convenient for cleaning if the floor has drainage gradient.



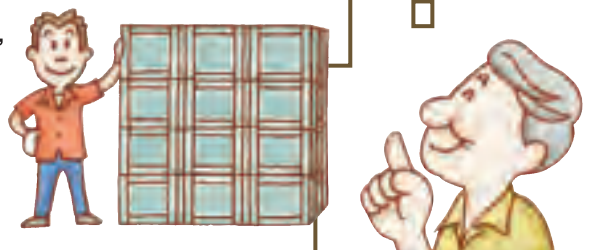
Things to prepare



When composting the organic waste collected from many households...

It is necessary to control the activities of putrefying microorganisms by employing the following means, since the collected waste is already rotten in some cases:

1. Mix organic waste and seed compost in the proportion of 1:1, and put the mixture in baskets. Ensure proper ventilation.
2. Stack the baskets and leave them for about 3 days. (The temperature rises as they ferment.)
3. Shred the content.
The process 1 and 2 are not necessary if the collected organic waste is fresh.



2 Composting



Mix seed compost with organic waste, then shred the mixture

Shredding homogenises the mixture and intensifies fermentation.

Organic waste:
Seed compost (dry) = 1:1



Mixing



Shredding

● Shortening of fermentation time



Collect fresh organic waste from fruit and vegetable markets. Remove foreign substances when noticed.

Seed compost. Compost products from a composting centre can be used as seed compost after drying.

★ Organic waste has high moisture content (80-90%).

★ Target moisture content is 40-60%.

➔ It is necessary to dry seed compost before mixing.

Pile up the mixture and stir it once a day

Pile up the mixture in a trapezoidal shape with a height of roughly 0.6-1.5m. Do not make the pile too high; otherwise the bottom part will become anaerobic due to compaction.

Piling up



Stirring



On the following day, the temperature of the central part increases and steam rises while stirring. High temperature accelerates fermentation and kills or inactivates undesirable microorganisms and weed seeds. Maintain the temperature at approximately over 60°C. If it exceeds 80°C, release the heat by spreading the pile.

Repeat the stirring for about 7 days

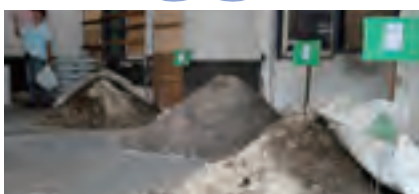
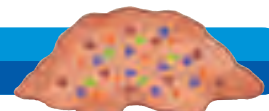


Repeat the once-a-day stirring for about 7 days and finish the fermentation process after confirming the following:

- The produced compost has an appropriate moisture content (40-60%) and maintains the temperature at approximately 30°C even after stirring.
- Organic waste has lost shape almost completely.
- It smells like soil.
- Extend fermentation period if fermentation is not yet completed.

Used as seed compost

Dry the finished compost and ship it



When fermentation is completed, dry the compost by spreading and ship it.

A part of dried compost is used as seed compost.

There is no need to make new seed compost every time since the dried compost can be substituted for it.

Fermentation performance is enhanced by replenishing new seed compost little by little continuously.



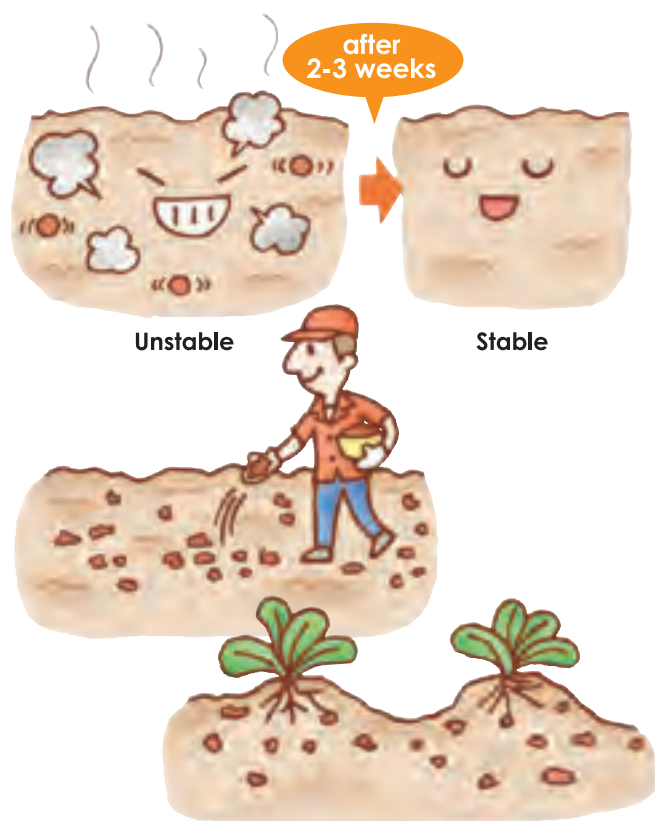
Technical Supervision: Jpec Co., Ltd. Wakamatsu Environment Research Institute

How to use compost

How to make effective use of the matured compost is described here.



When applying the compost by mixing with soil



Semi-matured compost sometimes damages the roots of crop plants during 2-3 weeks after being mixed with soil, because of the impact of gas and organic acid caused by the activity of fermentative microorganisms.

The produced compost is called semi-matured compost, in which organic matter has not been fully decomposed yet. Therefore, fermentative microorganisms remain active after the application of the compost. When applying compost by mixing with soil, be sure to let the mixture stand for more than 2-3 weeks before planting or seeding so that fermentative microorganisms will stabilise.



Spread the compost on the whole area of a field, and plough it to a depth of about 20cm.

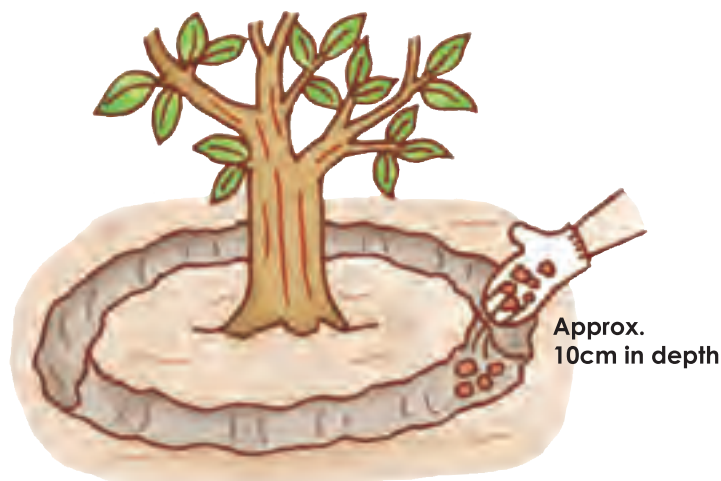
※This method has the effect of improving topsoil as well as of softening the entire field.

When applying the compost to plants



Cover the soil with the compost after planting crops. (Mulching)

※The decomposition of the compost gets stimulated, which gradually brings about effect.



Cut a 10-cm deep circular furrow around a tree (ahead of its root tips) and put the compost into it.

Q&A about compost



Q1 Can any type of organic waste be composted?

A1

In principle, anything that people eat can be composted. Fish bones, which some people eat by deep frying, can be decomposed, whereas the bones of chicken, cow and pig are too hard to be decomposed. Egg shells are an appropriate ingredient for composting as they supply calcium.

Q2 Why is a basket used as a composting container? Can I use a cardboard box instead?

A2

A cardboard box alone can function well as a compost container. However it decomposes gradually because it is also organic matter. A basket will last longer. When a thin carpet is applied inside the cardboard box, it will last longer.

Q3 Can a container without holes, such as a dustbin, be used as a compost container?

A3

A compost container needs to have holes for ventilation since fermentative microorganisms which breathe (called aerobic microorganisms) are used for composting. Although if a cardboard box or a carpet is placed on the inner side of the container, both of them allow air to pass through easily.

Q4 Why is the once-a-day stirring necessary?

A4

Organic waste is decomposed by the action of fermentative microorganisms which require oxygen for their activity. Therefore, fermentative microorganisms (aerobic microorganism) need to be supplied with air (oxygen) by means of stirring so that they can always stay active.

Q5 The temperature does not rise and the organic waste does not decompose. Why is this?

A5

There are several possible causes.

- Since fermentative microorganisms breathe constantly, it is necessary to stir the content for aeration at least once a day regardless of whether organic waste is put in or not.
- If organic waste contains too much moisture, it does not ferment and the temperature does not rise. Drain organic waste thoroughly before adding.
- The pieces of organic waste may be too large! Chop it up finely, then the decomposition will be accelerated.

Q6 I am bothered by an offensive odour. Why is it generated?

A6

If the content lacks oxygen (or is in anaerobic condition), it starts rotting and generates the offensive odour. Stir it at least once a day to let the air in and keep the moisture content at 40-60%.

Q7 I am troubled by harmful insects such as fruit flies, soldier flies and maggots. How can I prevent this?

A7

If fruit flies and other insects deposit eggs on organic waste before it is put in the container, the content inevitably gets infested with them. Treat organic waste immediately after each meal without leaving it unattended.

Q8 The surface of the content is covered with tiny white insects. Why is this?

A8

The tiny white insects may be mites. The content sometimes gets infested with them when temperature does not rise and the decomposition process is slow. In many cases, the situation can be improved by stirring the content once a day to aerate it.

Q9 Can the produced compost be used right away?

A9

The compost product at a household is made from organic waste which was put in at different times ranging from several months earlier to the previous day. Therefore, it is necessary to let it reach maturity by storing it in a breathable container for more than 2 weeks before use.



Replication in Thailand

Kitakyushu City and IGES are also promoting waste reduction projects in Thailand, which is also a replication of successful solid waste management models based on the promotion of composting practices in Surabaya, Indonesia. The key partner in Thailand is Bangkok Metropolitan Authority (BMA) which has a long environmental co-operation relationship with Kitakyushu City and is also a core member of Kitakyushu Initiative Network.



The official population in Bangkok is around six million, but it is said that it exceeds ten million, including unregistered inhabitants. Bangkok has a large amount of waste generation (about 9,000 tonnes a day), which is caused by its large population and rapid urbanisation. Solid waste management costs including waste collection, transportation and final disposal, which is about THB1,000 (USD30) a tonne, or THB9 million (USD270,000) a day, are also high as the landfill sites are located 100 kilometres away from the downtown area. Reflecting these facts, the demand for waste reduction is also high in Bangkok.

BMA has targeted the reduction of waste generation by 15% by 2012. To achieve this target, it is inevitable that BMA will have to reduce the amount of organic waste, which makes up about half of the total amount of waste. In that sense, the promotion of composting practices at households and establishing composting centres to deal with organic waste from vegetable markets complement the

demand and policy of BMA.

Model composting practices initiated in some areas of Bangkok have gradually spread to other parts of the city, as well as to other cities through workshops and trainings organised by BMA, Kitakyushu City and IGES. Technical co-operation has started at a composting centre in Sankamphaeng and replications are expected at Chiang Mai and Chonburi, where Kitakyushu City has city-to-city environmental co-operation relationships.

Activities by Bangkok Metropolitan Authority (BMA)



A BMA officer explaining the use of a compost basket to District officers and residents



A sample compost basket and manual prepared and distributed by BMA

BMA officers in the Environmental Bureau have developed and distributed samples of household compost baskets and composting manuals to most of the Districts of BMA to promote composting practices at the household level. BMA officers have also organised a series of seminars for District officers and residents to explain how to use the compost baskets. There are several model communities where household compost baskets are being used and such practices are gradually spreading to other areas.



Checking the condition of household compost baskets

Establishing Model Composting Centres



Din Daeng Composting Centre

A model composting centre was established in Din Daeng District in November 2008 owing to the full support by the District, which processes about 500 kilograms of organic waste a day. The scale is expected to gradually increase to around two to three tonnes a day as the facility has a large floor area, the performance of the electric shredder is good, and there is an ample supply of organic waste from many markets in the District, which is located in the city centre.

Previously, there was another composting centre in Don Muang District, but it was closed in 2009 as the parking area it belonged to was returned to a private owner. Kitakyushu City and IGES have requested to resume the operation of a composting centre in another area as the District has a well-trained composting expert.



Don Muang Composting Centre



Nongjok Composting Centre

There is another small composting centre in Nongjok District which is located about 30 kilometres east from the city centre and processes about 200 kilograms of organic waste a day. The procurement of a shredding machine and expansion of the floor space is expected to increase the capacity of the facility, as currently all of the waste is shredded manually in a small place.

As seen above, there are currently only two operational composting centres in Bangkok, and Kitakyushu City and IGES are proposing that BMA increase their capacity and replicate them in other Districts.

Organising Workshops and Seminars



Workshop in Bangkok in November 2008

A workshop was organised in Bangkok in November 2008 for BMA and District officers to promote composting practices for waste reduction. District officers and residents from 36 Districts participated in the workshop. Another workshop and composting training session was organised in March 2009 for officers in other cities. Twenty-two cities in Thailand and nine cities from overseas participated in the workshop. In this way, Kitakyushu City and IGES are promoting the replication of composting practices not only by showing actual model cases, but also by presenting their economic as well as environmental and social impacts and promoting the political support necessary to implement these practices.



Workshop in Bangkok in March 2009

Proposal for BMA

BMA has expressed a target to reduce the total amount of waste by 15% by 2012, which literally means more than 1,000 tonnes of waste reduction a day from the current 9,000 tonnes to less than 8,000 tonnes. This target is five times larger than what Surabaya City has achieved in three years, which was 200 tonnes of waste reduction a day. Theoretically, BMA has to input five times of what Surabaya has done to achieve the target, but that is too large to begin with, so two times the amount of Surabaya's input is recommended.

In particular, processing 80 tonnes of organic waste a day at composting centres is recommended for BMA compared to 40 tonnes in Surabaya. Furthermore, the distribution of 30,000 units of household compost baskets is recommended compared to the 16,000 units in Surabaya.

For example, if BMA starts the operation of a composting centre applying the Takakura Method at a large underutilised building in On Nut Waste Transport Station which has a floor area of about 5,000m², and half of that floor space is utilised, more than 40 tonnes of organic waste can be processed a day. In addition, if a model composting centre in Din Daeng District was replicated in 20-30 more Districts, the city can process another 30-50 tonnes a day. In that way, processing 80 tonnes a day is not an unrealistic target.

If 10,000 household compost baskets were distributed every year for three years, the total cost would be around THB20 million (USD600,000), assuming the unit cost is THB350 (USD10) and the distribution cost is also the same, which is only 1% of what BMA spends for waste collection and transportation annually (BHT1.8 billion (USD54 million)). The waste reduction effect of that would be around 30 tonnes a day assuming each household processes one kilogram of organic waste a day. However, that could bring about a higher reduction by encouraging waste segregation at source as seen in Surabaya. The 30 tonnes a day of waste reduction is equivalent to about 11,000 tonnes a year, which could be considered as the reduction in solid waste management cost by THB11 million (USD330,000) a year. Thereby, the initial investment can be paid back in two years.

There are several other measures recommended to BMA to support composting practices such as organising a network of community environmental leaders, as was done in Surabaya, who distributes the baskets, motivates and monitors the performance in co-operation with community groups and NGOs, organising a Green & Clean Campaign to encourage communities to compete with each other, and creating a market for compost products by utilising compost at city parks.

Achievements in Surabaya, Indonesia and Proposals for BMA

Item	Achievements in Surabaya, Indonesia (Population: 3 million)	Proposals for BMA (Population: 6 million)
Waste generation	1,500t/day → 1,300t/day (200t/day reduction)	9,000t/day → 8,000t/day (1,000t/day reduction)
Composting centre	Processing 40t/day at 13 locations	Processing 80t/day Establishing a centralised system with 40t/day capacity at On Nut Waste Transfer Station Replicating Din Daeng Composting Centre in 20-30 Districts → 40-50t/day capacity
Household compost baskets	Distribution of 16,000 units for free (Distribution cost: USD320,000)	Distribution of 30,000 units for free (Distribution cost: USD600,000)
Community environmental leaders	Organised by PKK (women's group) and NGOs	Proposing
Community clean-up campaign	Organising Green & Clean Campaign with 20% of communities participating	Proposing
Marketing of compost	Use at city parks; purchasing from households	Proposing



An underutilised building in On Nut Waste Transport Station that could be used as a centralised composting centre



Residents practicing composting at each household in SuanPrik community, Bangkok

Replication in the Philippines



IGES is promoting the replication of the solid waste management model, especially composting practices, of Surabaya, Indonesia, which achieved a substantial reduction in waste generation, in cities in the Philippines.

IGES supported a project in Bago City, Negros Occidental, in 2008. The project was initiated based on a request from Bago City who participated in a workshop in Surabaya in 2007 and acquired information about the city's solid waste management practices. Bago City, a rural city surrounded by rice and sugar cane fields with a population of 150,000, is one of the active member cities of Kitakyushu Initiative Network. Bago City has been promoting community-based solid waste management and this project is add-on to their existing activities.

Following the implementation of the project in Bago, similar practices have spread to other cities including Bacolod, Talisay (Negros Occidental), Cebu, Talisay (Cebu), Cavite and Puerto Princesa. Among them, notably, an NGO called Pagtambayaong in Cebu has distributed hundreds of household compost baskets to low-income groups and migrants which help them keep the living environment clean and produce vegetables using the produced compost.

Starting up a Model Project in Bago

Collecting materials for seed compost production



Looking for seed compost materials at a local market

Vegetable waste from a market which is dumped at a final disposal site can be used as raw materials for compost production

Explanation to the residents



Explaining the use of household compost baskets to residents in a selected model barangay (community)

Distribution of household compost baskets



Monitoring how the compost baskets are used by residents

Training



Training for seed compost production. The dark coloured materials on the left are vermi composting using earthworms, which requires more than three months for production.

Training for fermentative solution production

Household compost baskets



Compost baskets in Bago were initially made of plastic with many holes



They were changed to ceramic pots because they were cheaper and locally made

The composting project in Bago started in April 2008. First, a hands-on composting training session on the Takakura Method was organised for workers at the Eco-Centre, where vermi composting had been practiced using earthworms. After comparing the processing period and output, it was confirmed that the Takakura Method was more efficient, and now, most of the organic waste from fresh produce markets, about 500kg a day, is composted using this method.

Next, Bago City distributed 100 household compost baskets to selected model barangays (communities), and after confirming the results, distributed more to other barangays. Initially, sturdy plastic containers with many openings that were manually made were distributed, but they were replaced by specially ordered, locally made ceramic pots which were cheaper and looked better in appearance.

Replication in Other Cities



Participants in a workshop in Bago



Demonstration of shredding vegetable waste



Distribution of compost baskets to residents

Bacolod City



Participants in a workshop in Bacolod

Ternate, Cavite City



Participants in a workshop in Ternate, Cavite



A composting centre built by an NGO in Ternate, Cavite

Cebu City



Participants in a workshop in Cebu



Waste is piled up at a final disposal site in Cebu. Demand for waste reduction is high.

Activities of Pagtambayayong Foundation, an NGO in Cebu



Seed compost is produced in a small space under a shade



A person using a compost basket provided by Pagtambayayong



Explaining how to produce seed compost and how to use compost baskets to the residents and students



A small vegetable garden next to a make-shift house using compost made from kitchen waste

IGES organised a workshop in Bago in May 2008 to introduce the project in Bago to other cities. At the same time, IGES also held workshops and composting training sessions in Cebu and Bacolod for city staff and residents in response to requests from those cities.

As a result, Pagtambayayong Foundation, an NGO in Cebu, started producing household compost baskets and distributing them to households in low-income areas and migrants. Furthermore, Pagtambayayong trained users on how to grow vegetables and flowers using the produced compost which helps their livelihoods. Pagtambayayong originally provides support to these low-income groups and migrants to settle and make their own living, and take advantage of the use of the compost baskets. Pagtambayayong has also submitted a proposal to the Japan Consulate in Cebu for a grassroots grant to establish a composting centre and expand the practice to more households, which will yield a larger impact once approved. Cebu City has also organised another workshop in November 2008 to introduce the activities of Pagtambayayong and city's policies that support these activities. As a result, similar practices are also gradually spreading to other cities.

Apart from Cebu, an NGO in Ternate, Cavite, which participated in a workshop in Bago, has also established a small composting centre and has started distributing household compost baskets to residents. Talisay City near Bago has also initiated a similar project, and officers from Bago have been assisting the development of a similar project in Puerto Princesa as well.

Replication in Indonesia

Kitakyushu City and IGES, with support from the JICA Indonesia Office, have developed a project to replicate a solid waste management model being carried out in Surabaya in five other cities in Indonesia, namely Makassar, Palembang, Central Jakarta, Balikpapan and Tarakan. A study team visited these five cities and has introduced a programme called PESAMAS (community-based waste reduction through composting), which aims to reduce waste by 10% in two years, with the full support of each city mayor and the Indonesian Government, including the National Development Planning Agency (BAPPENAS), Ministry of Environment (KLH) and Ministry of Public Works (PU).



Makassar City plans to establish five model communities and distribute 100 compost baskets to households in co-operation with PKK (a women's group) and other NGOs, as well as construct a composting centre at a vegetable market.

▲A community group which practices composting. City has already distributed 800 baskets ▶

Makassar: Population 1.2 million. Capital of South Sulawesi. Daily waste generation: 1,100t/day (= 0.9kg/person/day)



Composting Centre at PT PUSRI, a state-owned fertiliser company

Palembang: Population 1.5 million. Capital of South Sumatra. Daily waste generation: 1,100t/day (= 0.7kg/person/day)

Palembang City plans to establish composting centres in 17 communities and expand their ongoing environmentally friendly community campaign by involving more communities. Further, the city plans to increase composting capacity by incorporating activities with PT PUSRI, a state-owned fertiliser company.



A community group manufacturing eco-goods from plastic waste.

Balikpapan: Population 600,000. A port city in East Kalimantan. Daily waste generation: 330t/day (= 0.5kg/person/day)



Balikpapan City plans to improve the environment of its communities by establishing one or two model communities in each sub-district and organising community environmental leaders to promote activities. Further, the city plans to expand the ongoing Clean, Green and Healthy City Campaign by involving more communities, and increase the number of composting centres to six sites from the current two.

◀Active participation of NGOs & PKK



Workers separating the waste at a composting centre.

Central Jakarta: Population 1.2 million. Business centre of Capital Jakarta. Daily waste generation: 1,600t/day (= 1.3kg/person/day)

Central Jakarta plans to expand ongoing waste reduction and community clean-up activities to other communities. There is already a large-scale community composting centre in operation in the city. Central Jakarta plans to expand the capacity of this centre and replicate this in other areas.



Mayor praising the street sweepers of the city.

Tarakan: Population 200,000. An island city in the northern tip of Kalimantan. Daily waste generation: 130t/day (= 0.7kg/person/day)

Tarakan City plans to establish more than two community composting centres a year for the next three years, as well as a market-waste composting centre. Further, the city plans to distribute household compost baskets by organising a network of community environmental leaders and holding training sessions for them in Surabaya. Training sessions will also be held in Kitakyushu City for selected city officers.

During the workshop

A workshop on community-based solid waste management was organised in Surabaya in August 2008 with attendance by representatives from 12 Indonesian cities, three ministries, eight overseas cities and a number of institutes, private companies and residents' groups. The participants learned about the successful waste management system in Surabaya, as well as cases in other cities, and discussed the factors for successful implementation of these activities and the means to support their implementation. There was an idea proposed at that time to replicate Surabaya's model in other cities as part of a national programme. Following consultations with the National Development Planning Agency (BAPPENAS) and Ministries of Environment (KLH) and Public Works (PU), as well as JICA Indonesia Office, the idea culminated in the PESAMAS (community-based waste reduction through composting) programme, which targeted the five above-mentioned cities.



▲ Participants of the workshop visited a composting centre and an adjacent city park where the compost is being used for plants.
◀ Seminar during the workshop. Ms. Dyah Katarina, representative of PKK Surabaya, explains the roles of PKK.

Co-operation with JICA

JICA experts, volunteers and local counterparts who participated in the composting seminar organised by JICA Indonesia Office and Kitakyushu City visited Puskota's composting centre in Surabaya.



Kitakyushu City and IGES have also co-operated with Japanese experts and volunteers in environmental education, rural development, agriculture and waste management under a JICA programme to promote composting practices.

Main Components of Proposals for each City

To reduce waste generation by more than 10% in two years

① Establishing market-waste composting centres

Utilise compost at city parks.

② Establishing community composting centres

Produce compost in model communities from segregated organic waste.

③ Distributing household compost baskets for free

Organise a network of community environmental leaders and promote the use of baskets in each household.

④ Organising community clean-up campaigns

Encourage communities to compete with each other to reduce waste and clean up the community, as well as involve private companies and media groups in the campaign.

⑤ Purchasing and marketing of compost products

Purchase compost products produced by community composting centres and individual households and promote use by farmers.

⑥ Facilitating technical co-operation by Kitakyushu City and IGES

Provide hands-on composting trainings for trainers and technical advice to improve solid waste management system.



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