





Food Wise Campus

Pilot Programme on Provision of Small Food Waste Composters at School

Education Kit (Primary School Version)









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Appendix 1: Food Waste Composter Operation Data



Food Wise Campus

The Chief Executive announced in his 2017 Policy Agenda that "Provide appropriate professional support for organisations such as tertiary institutions, and primary and secondary schools with suitable venues for on-site treatment of food waste, so as to reduce food waste disposal at landfills and at the same time enhance teachers' and students' awareness of the food waste problems and food wise culture". To take forward this initiative, the Environmental Protection Department (EPD) has launched the Pilot Programme on Provision of Small Food Waste Composters at School (Pilot Programme) in 2018 through the Environment and Conservation Fund (ECF) to provide the primary and secondary schools with a small food waste composter, Education Kits and educational materials in order to assist the school in cultivating the teachers' and students' "Food Wise" culture, reducing food waste and demonstrating the recycling of food waste into compost for use in planting on camp



This Education Kit is designed for teachers and students in primary schools, with the aim of providing various food waste related information, including an introduction of the food culture in Hong Kong, the problems of food waste and food waste management strategies. This Education Kit will also explain the causes of food waste in schools, the concept of Green Lunch and the operation of Composter, to facilitate the school to prevent and reduce food waste generation as well as recycle unavoidable food waste into compost, reducing food waste disposal of at landfills.

The Education Kit also provides methods of food waste separation, quantification and recording, so as to facilitate the onsite food waste recycling by teachers and students.

If participating schools of the Pilot Programme have any opinions on the contents of the Education Kit or any questions during the process of recycling food wastes. Please contact the Pilot Programme through the hotline and email as below:

Hotline: 2411 962213

Email: yeukmannghoitingchan@epd.gov.hk

Eating Habits in Hong Kong

Hong Kong's eating habit is primarily Chinese cuisine (mainly Cantonese cuisine) and Western cuisine.

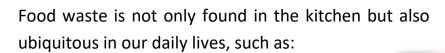
- Traditional Chinese culture emphasizes "Be Well-fed and Well-clothed";
- ➤ In traditional festivals (such as New Year, winter solstice, etc.) and banquets, Hong Kong people will prepare more food than usual
- Hong Kong-style banquet generally has 8-10 dishes, which is far exceeds the usual eating amount





What is food waste

Food waste refers to any waste generated, including raw/cooked food, edible and inedible, during the processes of food production, distribution, storage and preparation or consumption.



- Leftovers at home
- Leftovers in restaurant
- Expired food from supermarket





Classification of food waste

Avoidable food waste

Edible but disposed food (for example, fresh fruit, meat, cooked food like noodles and rice, packaged food, etc.)







Possibly avoidable food waste

Food that is consumed only by some people (such as bread crusts, potato skins, fruit peels, vegetable stalks, etc.)

Unavoidable food waste

Food parts that are not edible (such as egg shells, tips of vegetables; left-over bones, shells from shellfishes, etc.)





What are leftovers

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Leftovers are foods that are still edible and are not harmful to human body, for example:

- Foods that have not expired and deteriorated
- Foods with unsatisfactory taste or unsold food, can also be considered as leftovers





The "Oil Street Art Space" located at Oil Street in North Point in Hong Kong, launched a "XCHANGE: Social Gastronomy" project in August 2018 for sharing leftovers.

Besides, Environment and Conservation Fund (ECF) has subsidised Hong Kong community organisations to implement the surplus food recycling projects and then distribute the leftovers to the needy for free since July 2014.













A community organisation applied for "The Social Innovation and Entrepreneurship Development Fund" in 2017 to launch a food assistance project. Through the mobile application, food donors and service providers can share information on the situation of food supply and demand and the related services information.





Problems produced by food waste

Impacts on carbon footprint

Carbon footprint refers to the total amount of greenhouse gases emitted from human activities. Carbon dioxide is emitted during food production and transportation. Therefore, food wastage increases greenhouse gases emissions and exacerbates the climate change.







Impacts on environment

Most of the food waste is now disposed of at landfills. This treatment approach not only takes up landfill space but also wastes useful organic matters in the food waste.



Food waste will indirectly increase carbon footprint.

- Food waste accounts for 7% of all global greenhouse gases (GHG) emissions, which equals to 3.3 billion tonnes of carbon dioxide equivalent (CO₂-e) per year.
- ➢ GHG emissions per capita in Hong Kong from 1990 to 2012 was ranged from 3,300 to 4,310 tonnes of CO₂-e. In 2012, the emission on waste treatment accounts for 5% of the emission source.

Impacts on water resources

Around 70% of the world's total fresh water is used in agriculture. Food production uses a large amount of water resources:

- disposing a kilogram of beef will waste around 15,000 litres of virtual water (i.e. the amount of water embedded in the production and transportation of products).
- ➤ The daily consumption of potable water in Hong Kong in 2017/18 was about 2.72 million cubic metres and the daily water consumption per capita was about 370 liters.

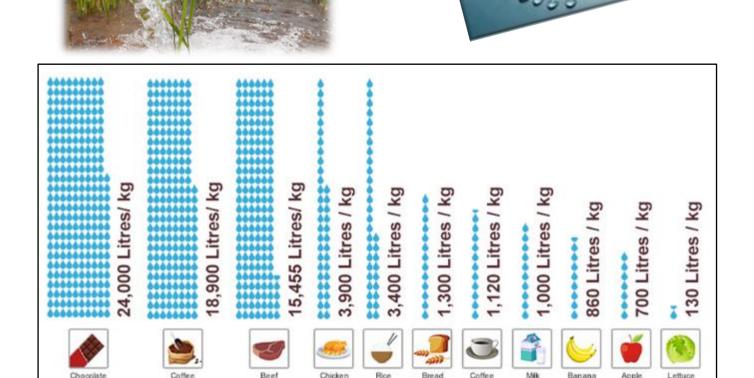


Figure 1: Fresh water used to produce one kilogram of food / one litre of drinks

Impacts on social cost

Disposing of large amount of food waste will increase the pressure on landfills and accelerate their saturation. At the same time, this will increase the costs of operating landfills and other waste processing facilities. These social and economic costs will be borne by the society.



The Hong Kong government will implement the municipal solid waste (MSW) charging. Citizens will need to pay for the MSW (including food waste) disposed by themselves. This implies that food waste reduction at source or proper food waste recycling are effective approaches of saving expenditure.











Figure 2: Designated garbage bags of MSW Charging

Food waste situations in Hong Kong

On a daily average basis, 11,057428 tonnes of municipal solid waste (MSW) were disposed of at landfills in 20198, including 3,353565 tonnes of food waste, which accounts for 304% of the MSW. Therefore, the reduction of food waste generation and disposal is one of the components of waste management in Hong Kong that cannot be neglected. As shown in Figure 3, food waste disposal consists of household and industrial and commercial food waste.





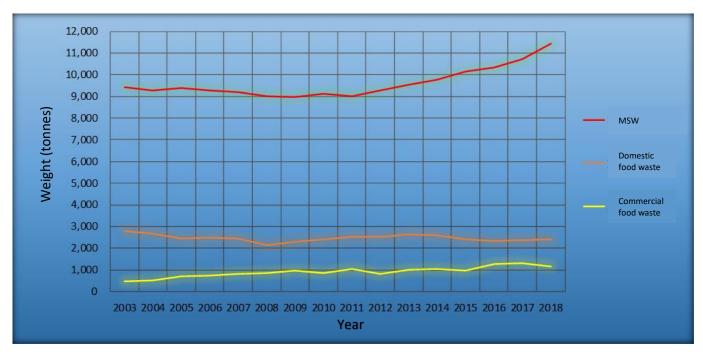


Fig. 3 Trends of disposal of food waste and MSW from 2003 to 2018

Current situation of food waste in nearby cities

Seoul

As early as 1995, South Korea has implemented municipal solid waste (MSW) charging. Residents must purchase prepaid garbage bags for the waste disposal and separate the household waste into the following four categories:

- 1) General recyclable items
- 2) Food waste
- 3) Bulky waste
- 4) Residual waste









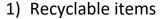
Since 2013, a quantity-based charging scheme for food waste has been implemented throughout Seoul and separated food waste can be collected using:

- Pre-paid garbage bags which are disposed of in a special collection box
- Food waste collection box/bin with small signs or stickers
- 3) Collection bins with Radio Frequency Identification (RFID)

Through the above ways, the collected food waste will eventually deliver to the food waste recycling facility.

Taipei

Since March 2001, Taipei has implemented municipal solid waste (MSW) charging and residents had to purchase prepaid garbage bags for the disposal of MSW. Residents need to separate their waste into the following four broad categories:



- 2) Food waste
- 3) Bulky waste
- 4) Residual waste









Taipei started promoting the food waste recycling policy in 2003 and the residents must first subdivide the food waste into:

- Food waste suitable to be converted to livestock feed
- Food waste that can be converted into compost

Residents can collect their food waste in a different ways:

- 1) Ordinary plastic buckets or bags
- 2) Food waste bins provided by Environmental Protection Bureau
- 3) Fixed collection stations or dedicated food waste collection stations in the city



To increase the treatment capacity of the food waste and turn waste into energy, Taipei City Government is planning to build the first anaerobic digestion facility with a capacity of 200 tonnes per day. The facility is expected to be completed in 2021.

Government's food waste management plan

In February 2014, the Environment Bureau unveiled "A Food Waste & Yard Waste Plan for Hong Kong 2014-2022" (the Food Waste Plan) that maps out a comprehensive strategy, targets, policies and action plans for the management of food waste and yard waste in the coming years. According to the Food Waste Plan, the Government has formulated four strategies (as shown in Fig. 4) to tackle food waste, including reduction at source, reuse and donation, recyclable collection, and turning food waste into energy.

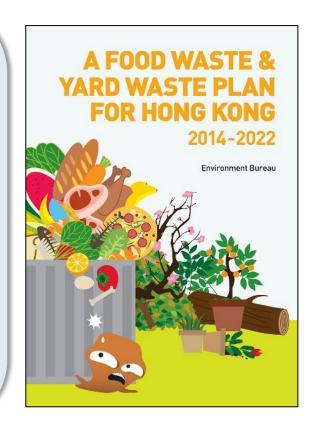




Fig. 4 Food waste management hierarchy

Chapter 3. Hong Kong Food Waste Management Strategies





The Food Wise Hong Kong Campaign, launched in May 2013, is a territory-wide food waste reduction campaign which aims to promote public awareness of the food waste problem and instill behavioural changes in various sectors of the community, including C&I sectors as well as domestic households. As of December 2019:

- Around 860 local organizations and companies have signed the "Food Wise Charter"
- Around 860 eateries have participated in the Food Wise Eateries Scheme and adopted food waste reduction measures, e.g. provide food portion options



The Food Wise Hong Kong Campaign also developed "Food Waste Reduction Good Practice Guides" for six different sectors, including schools, to provide these sectors with practical advice to prevent and reduce the food waste generation.













Market Sector

School

Food & Beverage

Hotel

Residentia

Shopping Mall

Reuse and donation



In August 2013, the Government of HKSAR issued a set of food safety principles to be observed when donating food to charitable organizations. Some NGOs have also reached food donation agreements with donors to clarify the responsibilities.

The ECF also subsidizes NGOs to collect surplus food from wet market, food retailers and wholesalers, and then distribute them in the community. As of December 2019:



- 55 food recovery projects have been approved by ECF
- about 12,590 tonnes of leftovers is expected to be recovered and more than 20.53 million headcounts would be benefited







Chapter 3. Hong Kong Food Waste Management Strategies

Recyclable collection

The Government has launched a pilot scheme for free food waste collection service which now primarily collects the food waste generated from:

- Markets and cooked food centres under the Food and Environmental Hygiene Department
- Markets and shopping centres managed by the Hong Kong Housing Authority







The pilot scheme will also include free food waste collection services for all primary and secondary schools, and tertiary institutions in Hong Kong. This will help educate and encourage students to practise separation of food waste at source, and disseminate the messages of "Food Wise, Waste Reduction" and "Turning Waste into Energy" in educational establishments and the community.

To accumulate the experience in food waste collection and separation, ECF had supported some housing estates to install a composter for onsite recycling of the generated food waste under the fund of "Food Waste Recycling Projects in Housing Estates". In addition, the project also encourages the housing estates to organize promotional and educational activities to cultivate the residents to develop a habit on food waste separation and reduction.



Turing food waste into energy

In the "Food Waste Plan", the Environmental Bureau analyses the food waste challenges in Hong Kong and elucidates recycling of food waste at centralized treatment as the main stream approach to handle food waste. This includes a series of "Organic Resource Recovery Centres (ORRCs)" which adopt an appropriate advanced technology to convert food waste into biogas as renewable energy to generate heat and electricity. The residue produced during the conversion process can be processed and used as compost for landscaping.

O·PARK1, located in Siu Ho Wan at Lantau Island, has commissioned in mid-2018 and can treat 200 tonnes of food waste per day. O·PARK1 has launched a new mile stone of large-scale food waste recycling in Hong Kong. O·PARK2, located in Shaling at North District, is under construction and expected to be commissioned in 2022 with a treatment capacity of 300 tonnes of food waste per day.

To further expedite and increase the throughput of turning food waste into energy, Environmental Protection Department and Drainage Services Department are collaborating to study the use of the existing and planned sewage treatment works for "Food waste/sewage sludge anaerobic co-digestion". Among these sewage treatment works, Tai Po Sewage Treatment Works Pilot Trial has commissioned in May 2019. Its daily treatment capacity can up to 50 tonnes.



Schools food waste problems

A community organisation had conducted food waste audit in Hong Kong from 2013 to 2016. It was estimated that the average daily food waste generated by a primary school was about 55 kilograms daily. It can be seen that food waste is a problem that most schools have to face and tackle.



Causes of school food waste



The following 3 points are the causes of school food waste:

- Some of the students have inadequate understanding of cherishing food and waste food easily
- Students who are young or with small eating amount cannot finish the whole portion of meal because the quantity of the meal is fixed
- Students' surplus food because of picky eating or the taste of food

Food waste reduction at Schools

At schools, teaching students about the avoidance of food waste generation is the most important job and the most effective solution to the food waste problem at schools. Therefore, the successful implementation of food waste reduction at source requires the stakeholders, including schools, students, parents and lunch suppliers, to collaborate and reduce food wastes through a three-pronged approach:



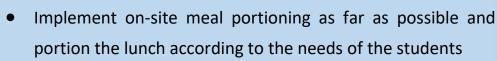
1. Cultivation of "food wise" culture



"Don't be a Big Waster"

- Organise study tours related to food waste
- Appoint students as "Food Wise" ambassadors
- Display posters related to "Food Wise" in schools
- Organise subject talks and workshops regularly
- Teach students on food wise knowledge in appropriate subjects
- Organise food donation programs by collaborating with voluntary organisations and invite parents and students to participate

2. Reducing food waste generation





- Request lunch suppliers to adjust the number and portion of the lunch set according to the needs of the students
- Monitor the food waste generation amount regularly

3. Encouraging food waste recycling

- Implement food waste source separation
- Request lunch suppliers to recycle food waste properly
- Install food waste composters in schools to convert food waste into useful resources (such as compost)
- Organise planting activities in schools, so students can use the compost converted from food waste for planting



Food Wise Tips

- Schools can adopt On-site Portioning (OMP) for lunch (cook the meals on-site or re-heat the food cooked in the central kitchen, and then distribute them to students on-site
- The meal portion can be adjusted on-site according to the needs of the students.
 As the food is fresher, students have less chance of wasting food due to the taste of food
- Schools that are interested in adopting OMP can apply for funding from Environment and Conservation Fund
- Parents can prepare lunches according to the eating amount of the students for reducing the wastage of food and assuring the freshness of food, which is economical and environmentally friendly



Students can take part in supporting food wise from multiple aspects:

- Cut down on snacks before meals or during recess
- Recognize the eating amount of oneself, take and buy the amount that can be consumed
- Participate in talks and workshops to know more about the food wise culture and convey the message of food wise to family and friends
- Participate in the activities related to food waste recycling in schools

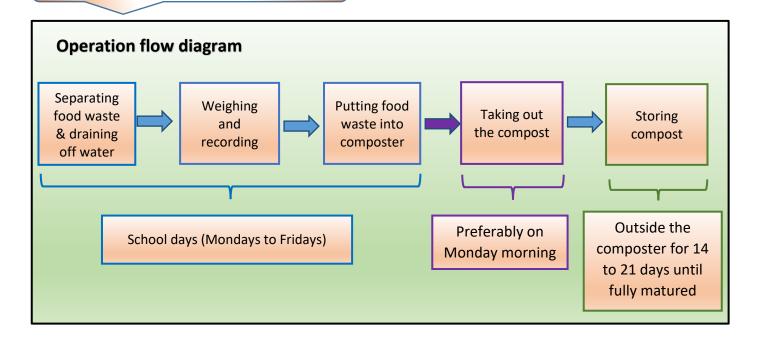
Food waste source-separation

Schools are required to separate the generated food waste before recycling. Food waste can be classified as recyclable and non-recyclable as below:



Figure 5: Food waste classification

Food waste on-site recycling



A. Food waste separation and drain off the water

- 1) Put the recyclable food waste (see Figure 5 for reference) into the collection container
- 2) Use the colander to drain off the water (till there is no more dripping)

B. Weigh the food waste by the digital scale and record

- 1) Measure the weight of the collecting container (weight 1)
- 2) Put the drained food waste into the collection container
- 3) Put the collection container with food waste onto the scale to weigh (weight 2)
- 4) Record the net weight of the food waste (i.e. weight 2 weight 1)
- C. Put not more than 5 kilograms of food waste into the composter (please refer to the precautions when operating the composter)
- **D.** Take out the compost next Monday, store it in the compost storage box (please leave the storage box open and wait until the compost becomes mature)

Precautions

A. Collection and transportation of food waste

- Formulate the routes for transporting food waste to avoid generating nuisance to other students
- Prevent food waste, juices or odour from leaking out during transportation of food waste
- Clean up the food waste immediately if there is spillage
- Transport the food waste to the food waste composter in a container with lid
- Food waste composter and nearby area should be kept clean for prevention of pests

B. Space reserved for placing the following items

- Food Waste composter
- Tools for measuring and handling the separated food waste (for example: colander, buckets, digital scale etc.)
- Separated food waste
- Compost storage box
- Compost (Since the compost taken out from the composter is not fully mature, this
 compost should be stored in the compost storage box and left in the cool and
 ventilated locations for 14 to 21 days until it is fully mature)
- Fully mature and readily usable compost
- Safety passage to the equipment
- Space for operating the equipment, for example: a) measuring and recording the weight of collected food waste, and b) sorting the non-recyclable items



Precautions (con't)

 C. Operating the food waste composter (the food waste composter must be operated by trained operator)



Food waste composter has two main parts: 1) Composting tank and 2) Odour treatment unit

- 1) Composting tank
 - Observe whether the compost inside the chamber is normal or not (normal compost should be loose, dark brown in colour with earthly smell; if the compost is too wet or hard, this indicates the humidity inside the composter is too high)

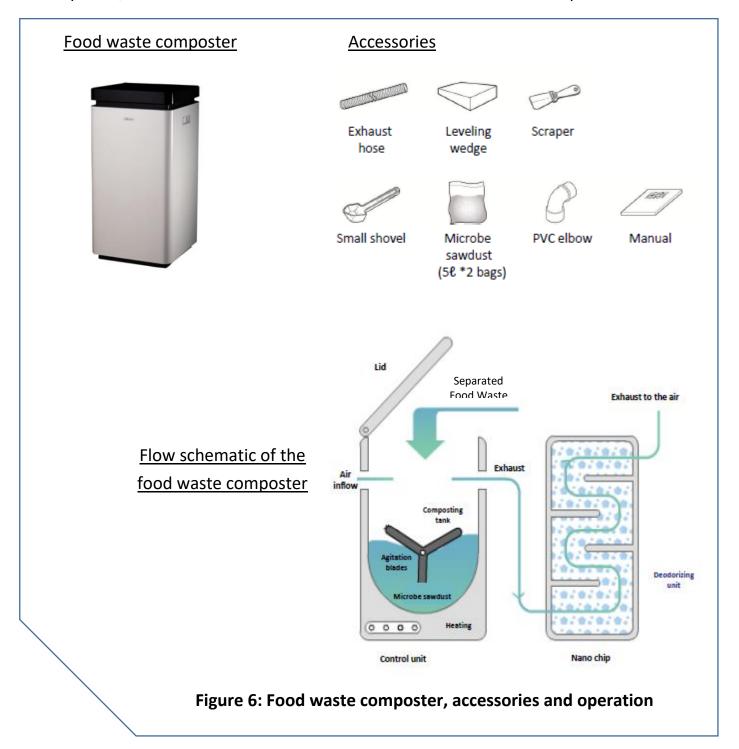


- Observe whether there are water droplets inside the chamber (the presence of water droplets indicates the exhaust devices such as the air supply screen, exhaust screen or the deodorizing unit have been blocked)
- Clean the air supply/ exhaust screens regularly (once every one to two days is preferable)
- Check whether the agitation blades have been damaged or not
- Put not more than 5kg of separated food waste into the composter and ensure that the volume of the food waste does not exceed the maximum indication line
- Close the lid and the food waste composter will operate automatically; observe whether there are unusual vibrations or noises generated
- Open the lid after about five minutes of operation, and observe whether the food waste is mixed well in the composting tank
- 2) Odour treatment unit (OTU)
 - Check whether the discharge flow of the OTU is normal or not (low discharge flow indicates that the air supply screen, exhaust screen or an OTU have been blocked)

Contact the food waste composter supplier if there are unusual conditions

Electric food waste composter

Participating school of "Pilot Programme on Provision of Small Food Waste Composters at School" will receive a food waste composter. Figure 6 shows the provided food waste composter, accessories and the flow schematic of the food waste composter.



Technology and principles behind the electric composter

In Hong Kong, small to medium size of food waste composters mainly use aerobic composting technology. Aerobic composting will turn food waste into carbon dioxide, water and organic matter (compost) (As shown in figure 7).

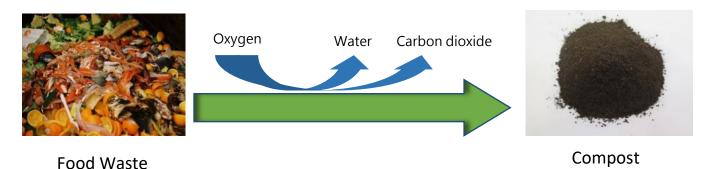
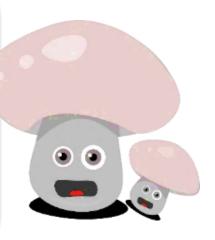


Figure 7: Principles of aerobic composting

Principles of composting and Usage

There are large amounts of microorganisms in the nature, such as bacteria and fungi. Composting uses the microorganisms to convert organic materials (food waste) into compost.

Compost can improve the physical, chemical and biological properties of the soil to improve the soil conditions and facilitate the future growth of plants.



Application of compost



1. Use as basal dressing

To use compost as basal dressing, user can mix the soil and compost thoroughly during the turning up of soil with a recommended amount of 5 to 10 kg compost per meter square of land.

2. Use as top dressing

User can directly add compost around the root of the plant, or dilute the compost with water and then spray the mixture on the plant or irrigate the mixture onto the soil for the root to absorb.



3. Use for garden ornamentals

Compost and soil should be mixed in a 1:10 ratio by volume to enhance the decomposition and effect of compost. If the compost is immature, it is necessary to mix it with soil before use. As a common practice, user can adopt the ditching or burrowing approach to apply the compost and then cover it with soil; or spread the compost evenly on the soil and then plough it into the soil.

4. Use for domestic pot planting

As the amount of compost used for potted plants is relatively less, the recommended compost to soil volume ratio is 1:20 to 1:30.



Improve soil structure



Improve fertility of soil



Apart from the food wise information in the Education Kit, teachers can deepen the student's understanding of the problems of food waste and the awareness of food wise through

- A. Quiz game (Answers to the questions and the explanations are shown in page 28)
 - 1. Which of the following is not food waste?
 - A. Coffee grounds
 - B. Rice
 - C. Toothpicks
 - D. Fish bones
 - 2. Which of the following is not a way to reduce food waste when dining out?
 - A. Ask for less rice
 - B. Take away unfinished food
 - C. Ask for no appetizers or side dishes
 - D. Take as much as you can at buffets
 - 3. Which of the following is not a way to reduce food waste at source and avoid food waste generation?
 - A. Ask for appropriate portion according to the eating amount of oneself during lunch
 - B. Avoid buying too much food when shopping at supermarket.
 - C. Check the expiry dates of food at home regularly to prevent food disposal because of food expiry
 - D. Recycle the food waste into compost
 - 4. Which of the following is the optimal temperature range for the refrigerator (not the freezer)?
 - A. 15 to -10°C
 - B. -5 to -0°C
 - C. 0 to 4°C
 - D. 10 to 20°C
 - 5. Which of the following is the correct description of food expiry date?
 - A. Food must be deteriorated after the "best before date" and not suitable for consumption
 - B. Consuming food after the "use by date" may pose a considerable health risk
 - C. The meanings of "best before date" and "use by date" are the same
 - D. All of the above are correct

6.	Please provide three possible causes that lead to food expiration or deterioration.			



B. Group discussions:

Please ask students to:

- 1) Recall the food that they disposed of yesterday; and
- 2) Introspect why they dispose the food.

Invite students to share their thought within the group, and discuss the causes of food waste generation at schools and at home.

C. The school can also use the resources online to nurture the "food wise" culture of teachers and students:

YouTube:

Food waste recycling: Central treatment processing Power generation (Chinese only) https://www.youtube.com/playlist?list=PLFUFDG9b1H4cQv91ARV6OVY5X JURCF20

Educational videos:

Food wastage footprint: https://www.youtube.com/watch?v=loCVrkcaH6Q

Food wastage footprint 2: https://www.youtube.com/watch?v=Md3ddmtja6s

On-line quizzes:

WWF: https://www.worldwildlife.org/pages/take-the-food-waste-quiz

James Beard Foundation: https://www.jamesbeard.org/blog/food-waste-eat-q



Answers to the questions:

1) C

Toothpick is not food waste because it is neither part of the food nor the materials for preparing dishes or drinks. On the contrary, rice is food, fish bone is part of the fish (food) and coffee grounds is the residue left after brewing coffee.

2) **D**

Customers take as much as possible during the buffets may end up in wastage of food if they cannot finish all the food. The other three options are good practices of reducing food waste when dining out.

3) **D**

Food waste recycling is the treatment process after food waste generation and it is not a way to reduce food waste at source. The other three options are the approaches that avoid the food waste generation.

4) **C**

The $0^{\circ}\text{C} - 4^{\circ}\text{C}$ environment in the refrigerator allows most foods to maintain in low temperatures without freezing. This can inhibit the growth of bacteria and slow down the food deterioration to attain the purpose of food preservation.

5) **B**

The meanings of "best before date" and "use by date" are different.

The former is formulated based on the quality and appearance of the food. In other words, food that has passed the "best before date" does not necessarily maintain its best condition in terms of taste and appearance, but it does not mean the food has deteriorated.

The latter is marked on highly perishable foods such as sandwiches and fresh milk. These kinds of food are not suitable for consumption after the "use by date", otherwise, they may have adverse impacts on health.



Progress monitoring



Participating schools of the Pilot Programme on Provision of Small Food Waste Composters at School should submit the "Food Waste Composter Operation Data" every 3 months through the Pilot Programme website (http://www.hd-sfwc.org). Participating school can refer to the template in Appendix 1.

"Food waste composter operation data" helps students and teachers to understand the operation condition of the food waste composter and whether technical support is required. The progress report records:

- the quantity of food waste generated and recycled at school; and
- the quantity of compost generated,used and the usage of compost



References

12

13



Secretary for Environment's Facebook Fan Page:

https://www.facebook.com/wong.k.sing.98

https://www.instagram.com/wongkamsinghk/

Secretary for Environment's Instagram:

Pilot Programme on Provision of Small Food Waste Composters at School Food Waste Composter Operation Data (Record Template)

50	cnool Name ·	_ (20		(month)
A.	The quantity of food waste generated and recy	cled, the c	ompost g	enerated and
	the composter condition			

Date	Daily Production of food waste (kg)	Food waste put in the composter (No more than 5 kg per day)	Compost taken out that day (kg)	Please briefly describe the unusual condition of the composter (if any):
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Date	Daily Production of food waste (kg)	Food waste put in the composter (No more than 5 kg per day)	Compost taken out that day (kg)	Please briefly describe the unusual condition of the composter (if any):
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				

Total quantity of food waste generated in this month*	Total amount of food waste added into the composter in this month	Total amount of compost taken out in this month	
kg	kg	kg	

^{*}The above quantity of food waste generated is collected from about _____ students/teachers.

B. Usage and quantity of compost used in this month

Please list the usage of the compost and its corresponding quantity (such as used for planting and greening in the school, distributed to students, donated to charities#)

Usage	Used quantity (kg)

^{*}Note: If the compost is donated to any parties outside the school, please provide the name of benefiting parties

Participating schools of the Pilot Programme should submit the "Food waste composter operation data" every 3 months through the Pilot Programme website (http://www.hd-sfwc.org).