

ON-SITE GARBAGE RECYCLE SYSTEM IN URBAN AREA




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errata

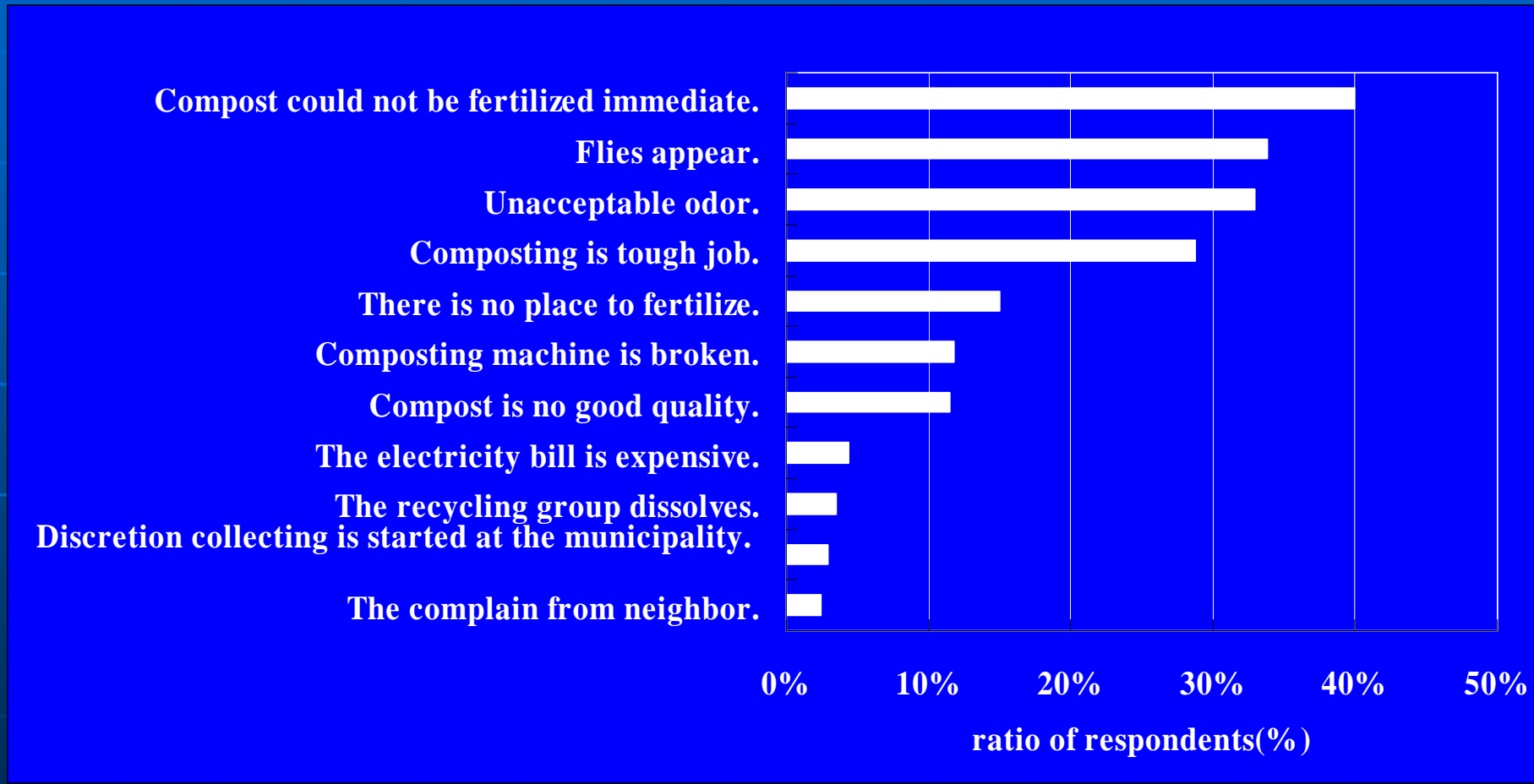
Page 3, 5th line

unrecompensed → undecomposed

Current state of garbage processing in JAPAN

- 30-40% of whole household waste is kitchen garbage.
 - 80-90% of kitchen garbage is water.
 - But, kitchen garbage is burned at waste treatment center.
 - It is means that energy is used for vaporizing water.
- 
- Disposal costs have increased.
 - Landfills are left no much. Investment of facility have increased to remove contamination.
- 
- If the kitchen garbage is recycled as compost, heat value of household waste will be gained and poisonous ash will be reduced.
 - Compost can be used for gardening in an environmentally friendly manner.
- 
- 40% people stopped, who had composted garbage.

The reasons, stop composting at home.



Requirement for composting

- Quality of Compost
- No electric power
- No odor of unacceptable
- Easy to use
- Durable

Small multi-cell composting tank



Factors of decomposition speed with thermophilic aerobic bacteria.

- 1, Temperature 40-65°C
- 2, Water Content 40-60%
- 3, Content of Oxygen more than 10%
- 4, Size of Garbage under 3cm
- 5, PH 8-10
- 6, C/N 10-30

Fill up the composting tank with leaf mold



Pull out the cartridge of composting four days



Dump compost in the mixing box.
Put back this empty cartridge.



Dump garbage, rice bran and fallen leaves in the mixing box.



Mix material.
If it is too dry, add water.



Dump mixture in the empty cartridge.



Set thermometer



It is done for 5-10 minutes.

After Four Days



Decompose

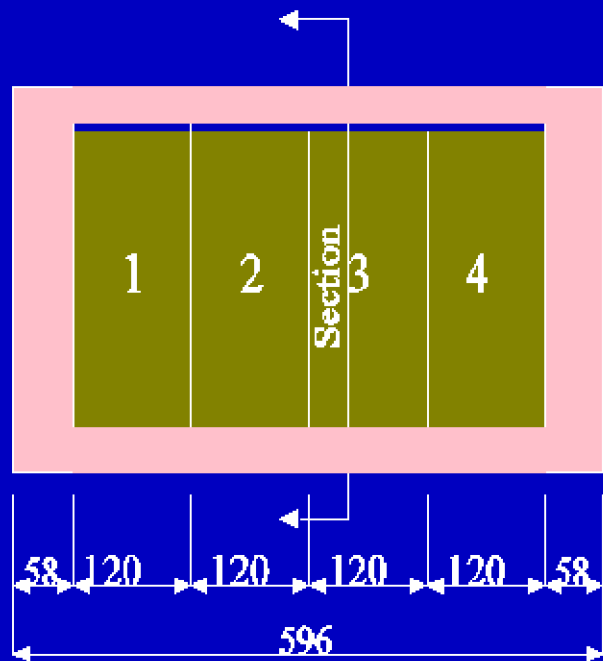
Compost to fertilize

Rough compost are putted back to the compost tank .

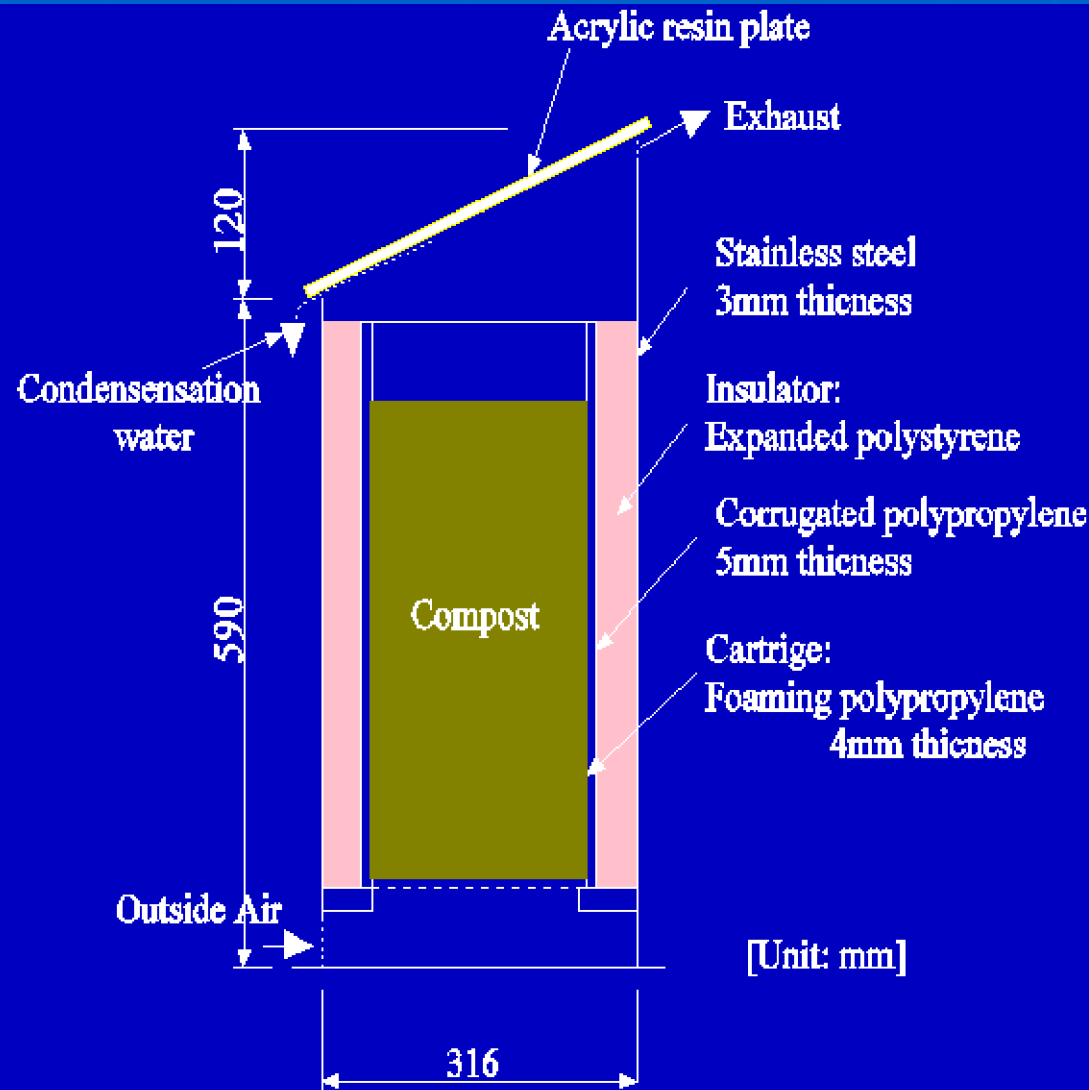


Compost of fine grains is taken out to fertilize.

Plan and Section



PLAN



[Unit: mm]

SECTION

How to control the factors.

1, Temperature 40-65°

The amount of rice bran is changed according to outside temperature and water content of garbage.

2, Water Content 40-60%

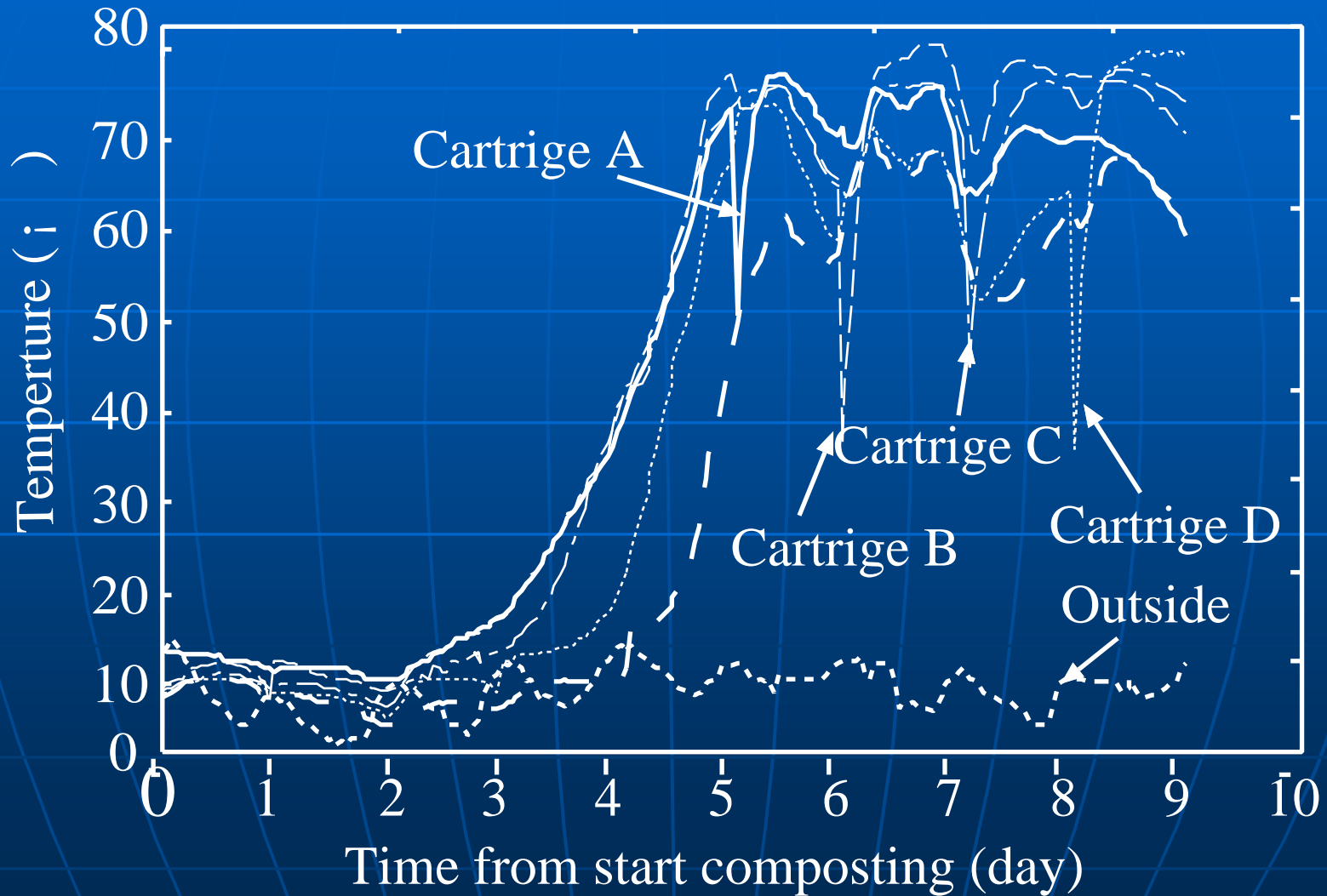
If it is too dry, add water.

Sliding cartridges are against condensation at beside wall.

3, Content of Oxygen more than 10%

Mix fallen leaves and rough compost are putted back to keep gravitational ventilation.

Temperature in winter season

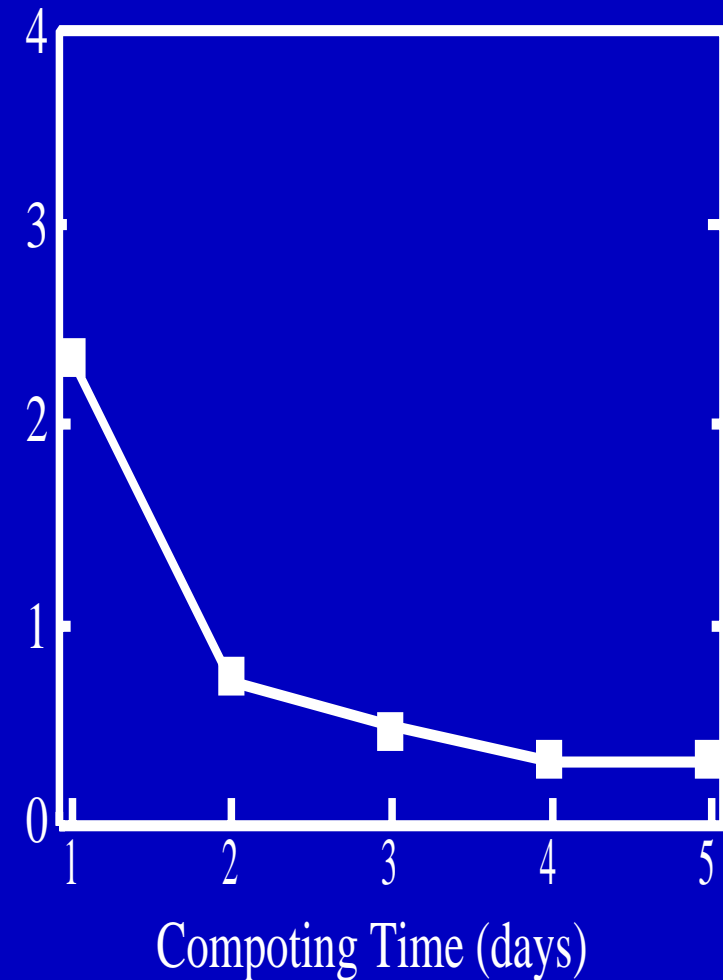
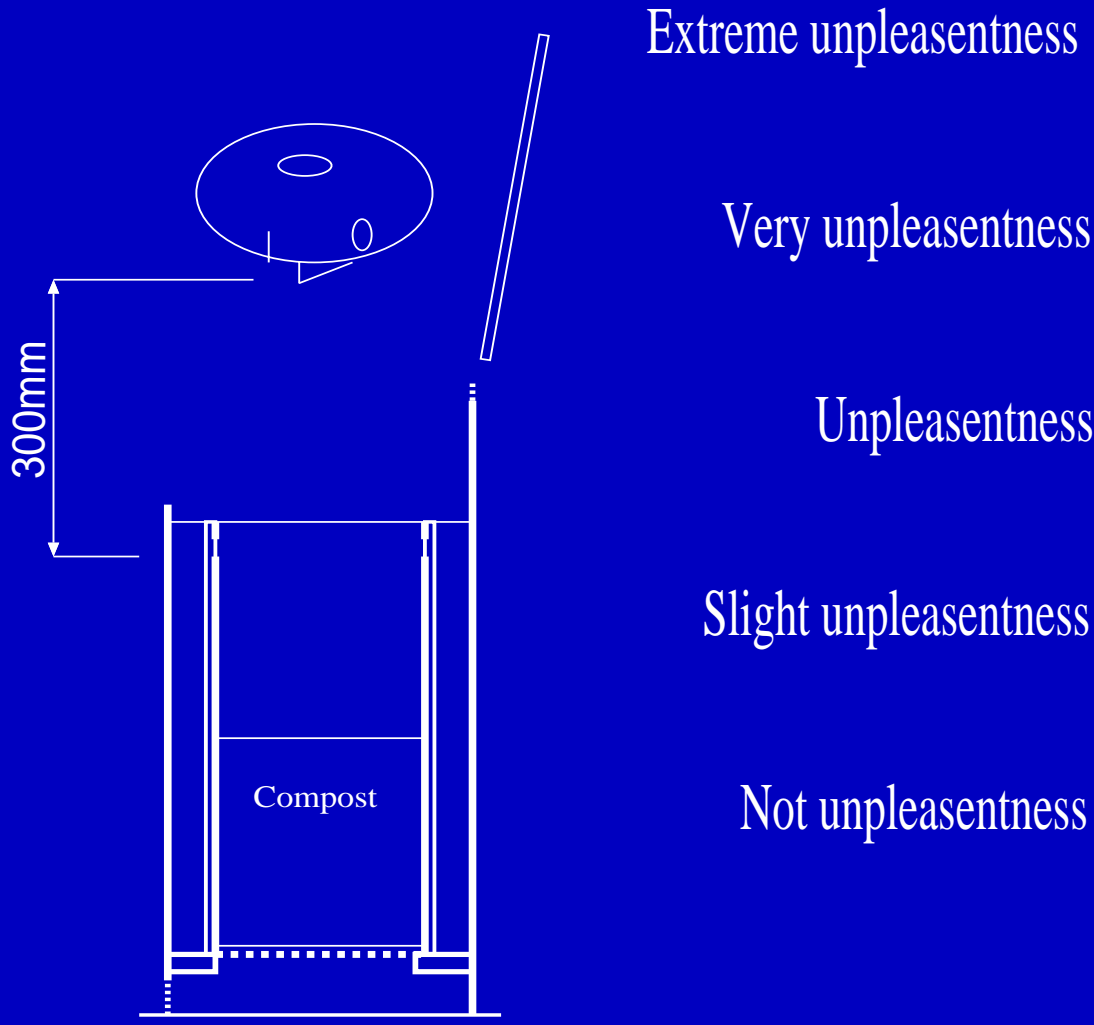


Airflow Control

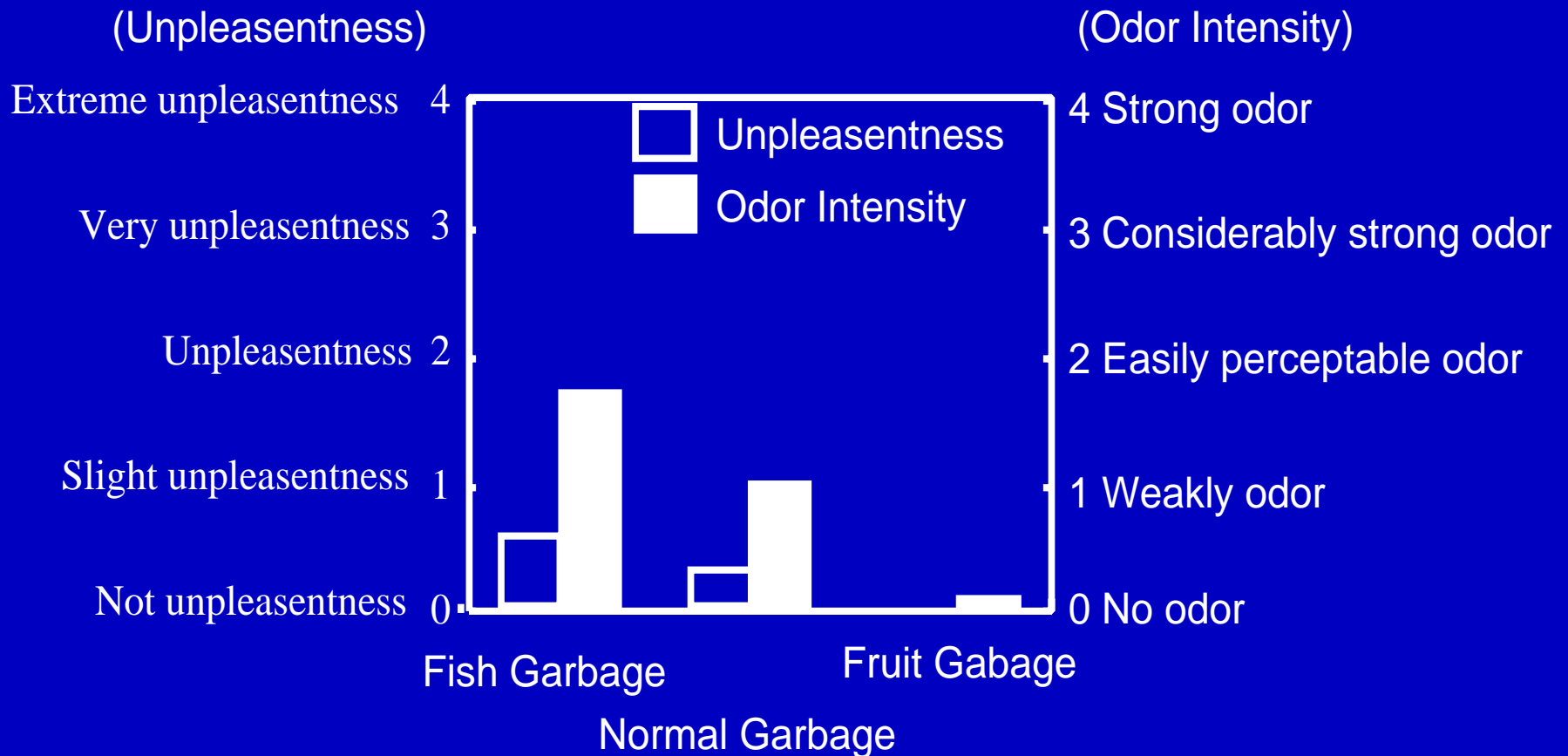


This door is closed at cold windy day.

Comparison of Odor Unpleasantness and Composting Time



Relationship between Odor from compost after 4 days and different garbage



The Value of Compost after one month used.

	content
Nitrogen (N)	2.69
Phosphate (P)	2.52
Potassium (K)	2.77

The black soldier fly (*Hermetia illucens*)

Aesthetic problem



Larvae

The larvae have been fed to fish or chicken.

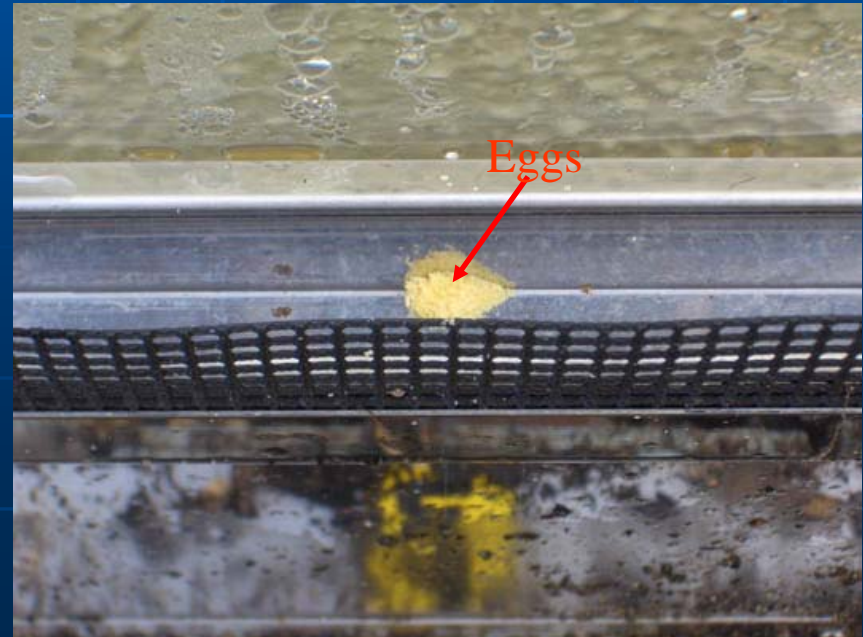
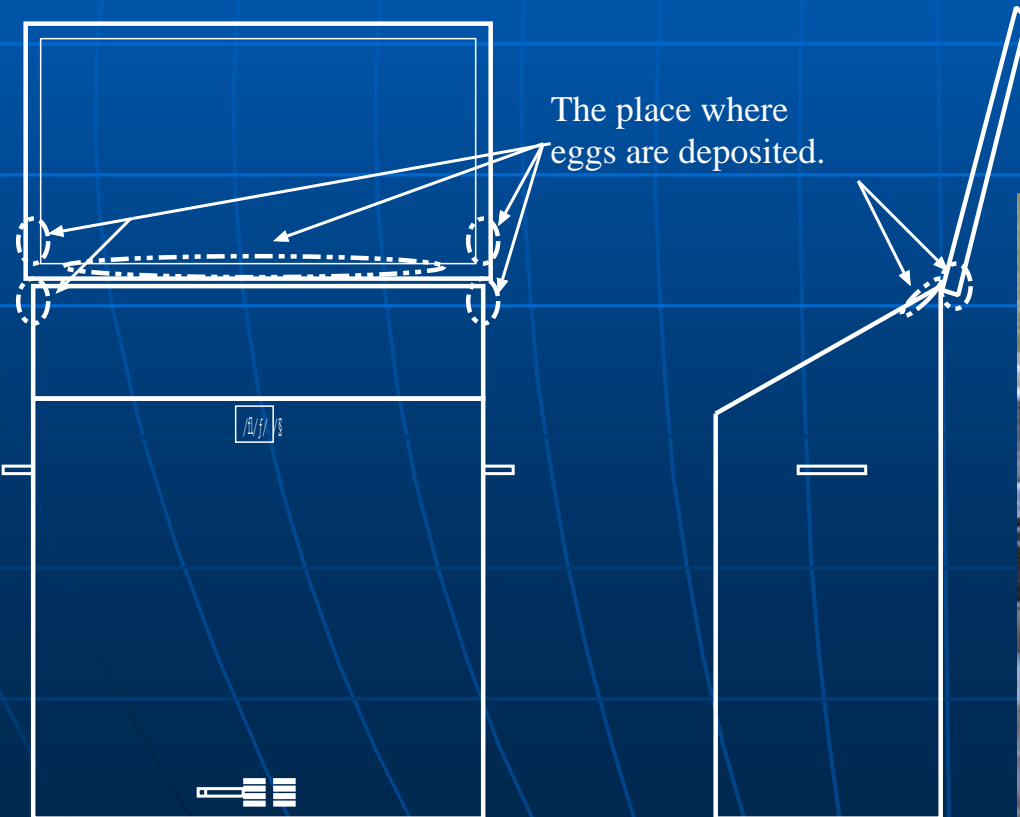


Adult fly

Adult superficially resemble wasp, but have no stinger and are harmless.

How to bug.

- Do not leave garbage outside.
- Remove eggs with a brush.
- Pick larvae for feeding.
- Destruction larvae with lime nitrogen, If you want to.



The social experiment in Kobe City

- Some residents complain of cleaning fallen leaves from trees lining streets.
- Many residents have garden.

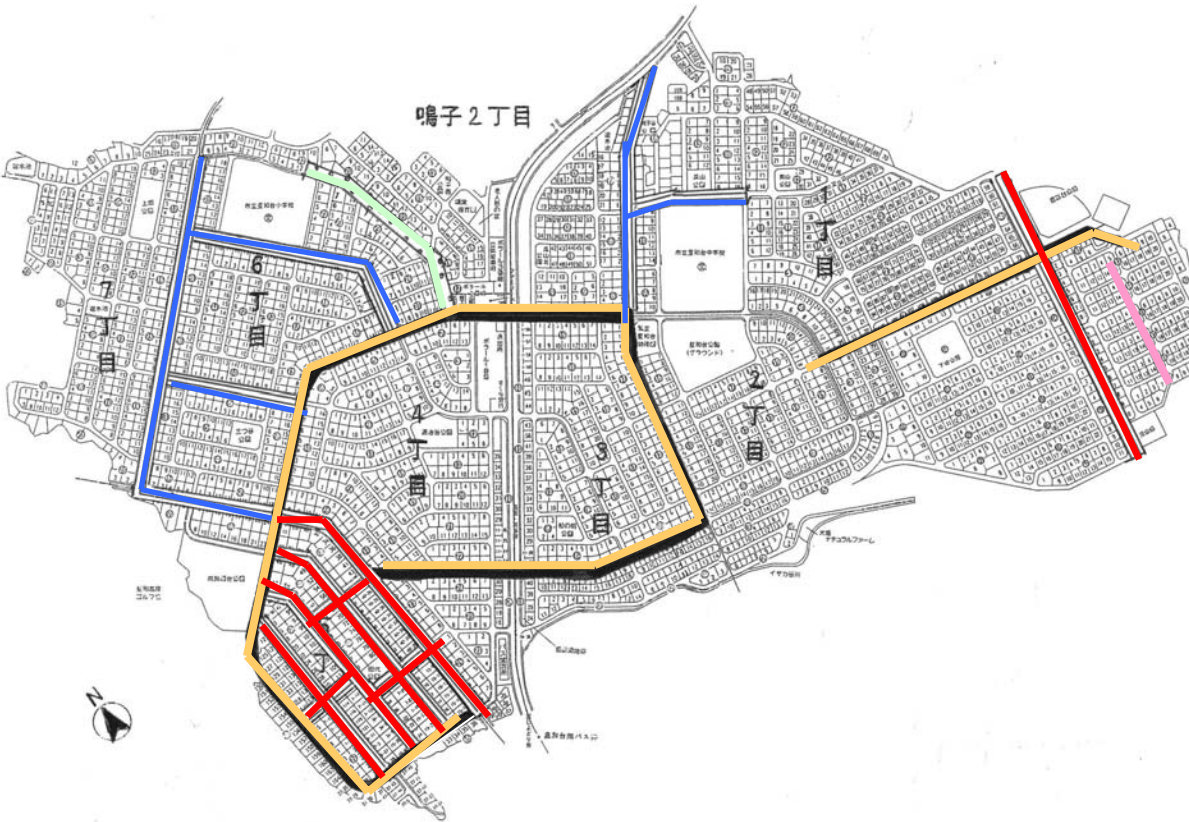


5 composting tanks were bought by city government and retrusted a resident association. The resident association is lending this composting tank to the residents and residents are composting kitchen garbage and fallen leaves.

The Map of trees lining streets

Developed since 1976
Aging society

7,341 people
2,597 families
in 2005



- Ginkgo
(*Ginkgo biloba* Linne)
- Trident maple
(*Acer buergerianum*)
- American linden
(*Liquidambar styraciflua*)
- Vegetable tallow
(*Sapium sebiferum*)
- Lily tree
(*Magnolia heptapeta* Danc)

Different idea, because of where to live.



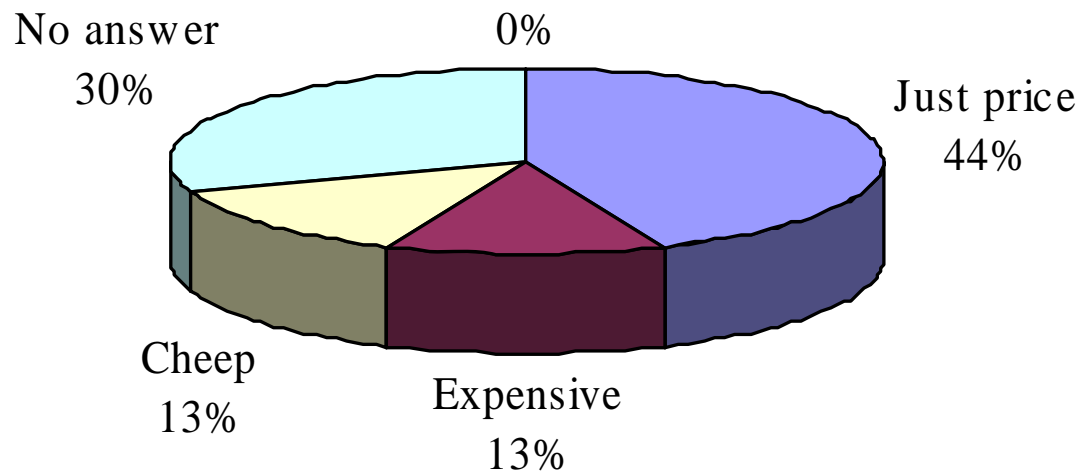
There are no tree lining the street.



There are trees lining the street.

Rental Price

How about the rental price is 500Yen?

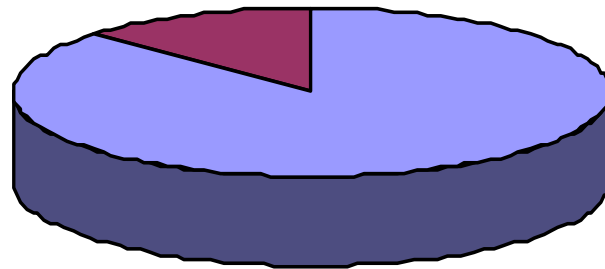


N=46

Place to use

Where is compost used?

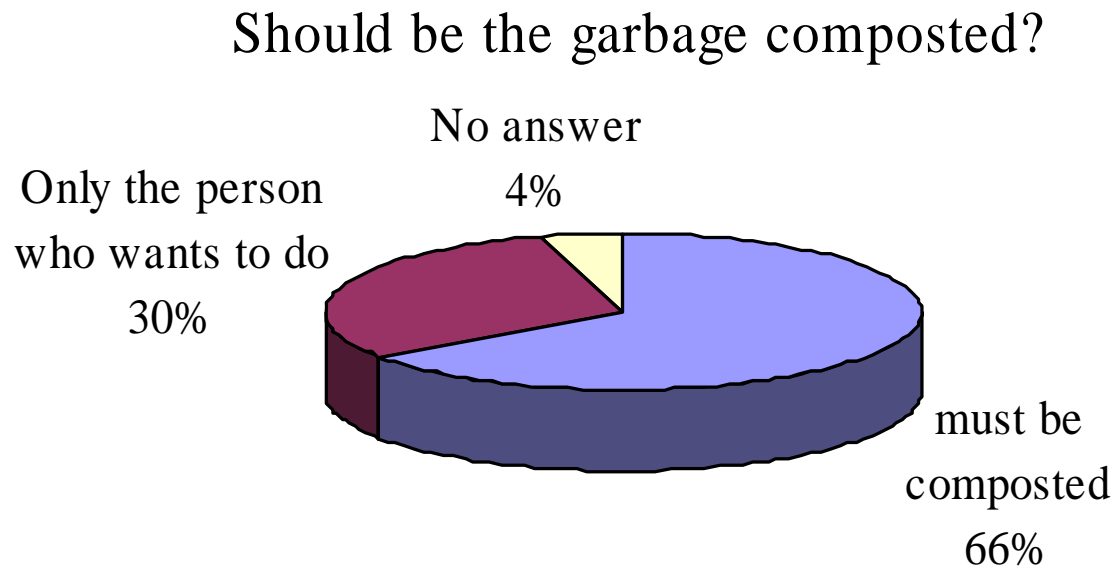
No place
13%



Garden
87%

N=46

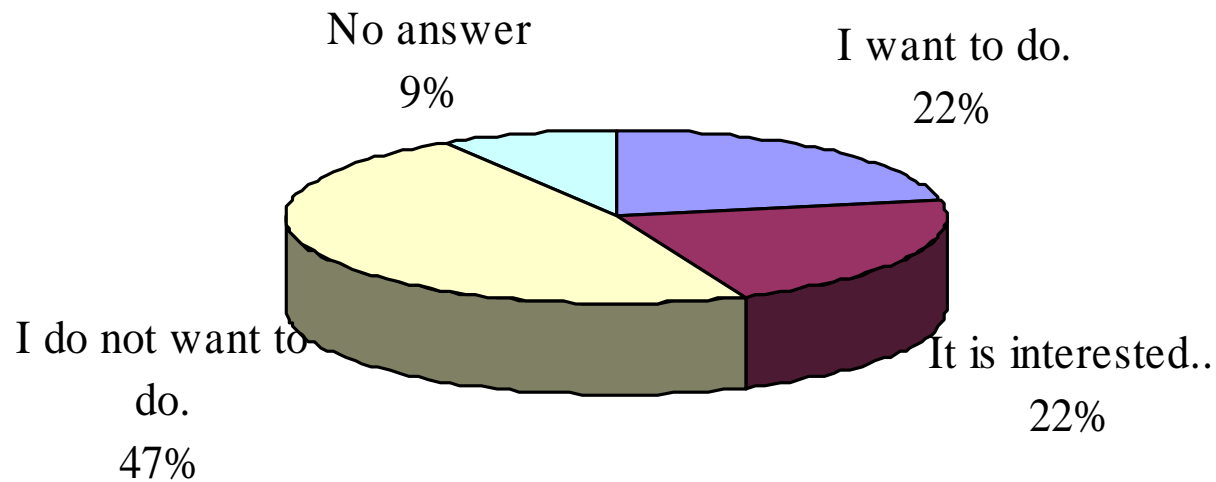
What they think about composting.



N=46

Do you want to?

Do you want to compost garbage?



N=46

Fallen leaves are stocked in bags.



If the fallen leaves remain,
these could be composted.



Organic Vegetables in Kitchen Garden



We need incentive

Positive

1. Good quality compost to do gardening can be obtained.
2. The odor is removed from garbage in the kitchen.

Negative

1. 25,000 to 30,000Yen per person a year is spent disposal costs in Kobe City. There is no economical incentive to reduce garbage.

15m² kitchen garden

- According to some reports, the amount of exhaust of kitchen garbage in one day is about 200g a person.
- Thus, the garbage of 365kg a year is exhausted in the family of five people. The compost of 45kg can be obtained, 10% of 450kg materials adding 85kg fallen leaves.
- The supply compost amount is corresponding to demand of using to 15m² kitchen garden matured 3kg/ m² year.

Environmental education at elementary school



They wondered at the temperature increase.



Vegetables are eaten by themselves
or sold to local community.

Elementary School



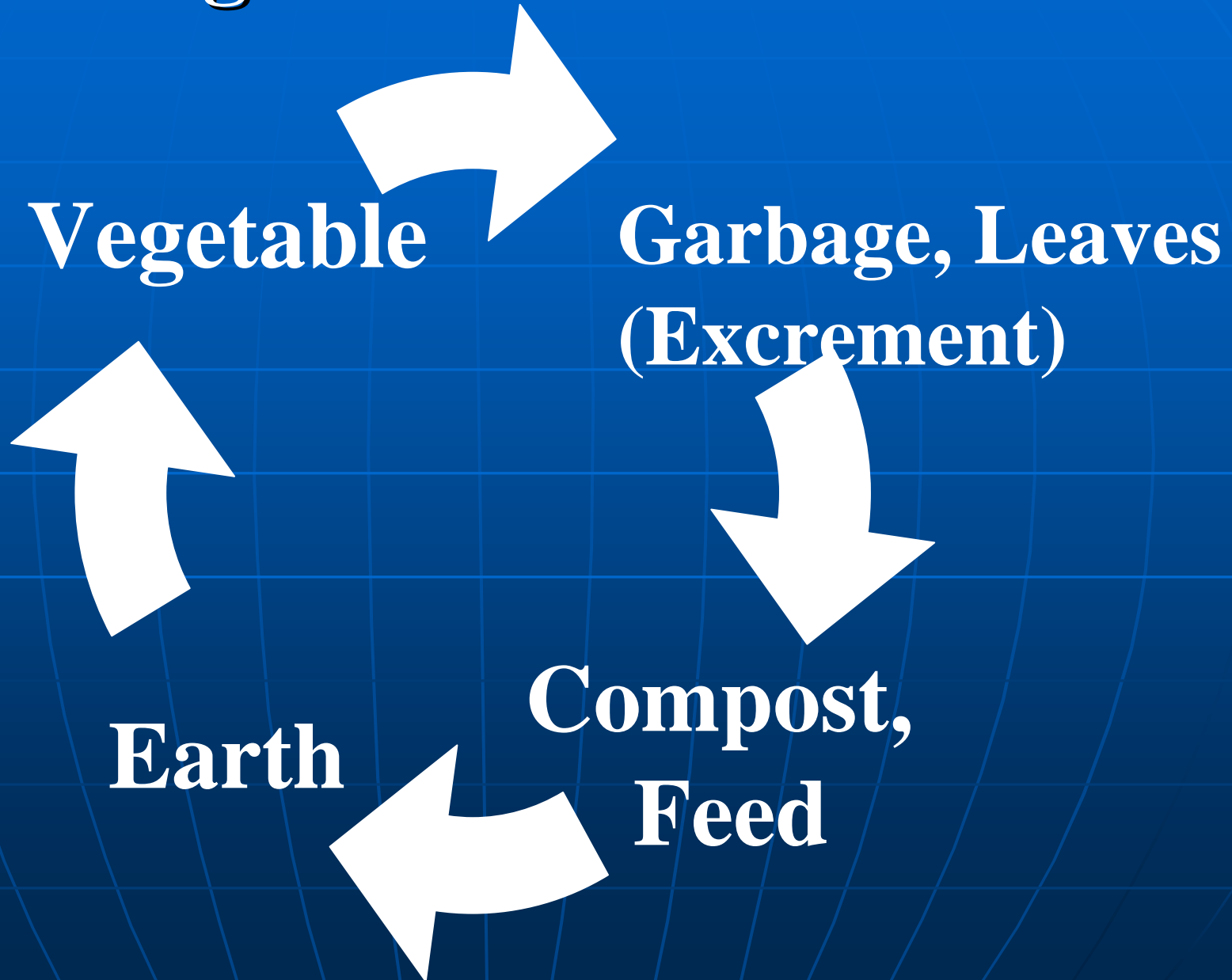
Garbage of school lunch is composted
with the compost tank



There are earthworms.

Compost is used in the study kitchen garden.

Ecological Sound Manner



Life Style with the Composting Tank

1. Recycle without electric power.

2. Gardening without chemicals and pesticides.

3. Enjoy organic gardening.

4. Make community of ecological garden.