Recycling of food waste in Japan

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1 Recycling situation of food waste in Japan (FY2010 estimation)

**Supplies for food (84.24 Mt/year)**
- Food-related business operators
  - manufacturers
  - wholesalers
  - retailers
  - restaurants

**Industrial food waste (18.74 Mt)**
- By-products traded as valuable products (12.33 Mt)

**Business waste (6.41 Mt)**
- Edible food (3 to 4 Mt)

**Household waste (10.72 Mt)**
- Edible food (2 to 4 Mt)

**Food waste (17.13 Mt)**
- Edible food (5 to 8 Mt)

**Food waste scope in Food Recycling Law**
- Feed or fertilizer 12.33 Mt
  - Feed: 2.04 Mt
  - Fertilizer: 0.64 Mt
  - Energy: 0.41 Mt

**Recycling**
- Incineration / landfill 3.32 Mt
  - Fertilizer/energy 0.67 Mt
  - Feed or fertilizer 10.05 Mt

**Households**

**Food waste scope in Waste Disposal and Public Cleaning Law**
In FY2010, recycling of food waste are, 1- feed (51%), 2- fertilizer (12%), 3- methane fermentation (3%), and 4- oil and fat products (2%). The amount of recycled food waste to methane fermentation tends to increasing, but feed and fertilizer decreasing.
### 3 Feed

#### Target of the feed self – sufficiency rate

<table>
<thead>
<tr>
<th>All animal feed</th>
<th>FY2012</th>
<th>FY2021</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>26%</td>
<td>38%</td>
</tr>
</tbody>
</table>

#### Eco - Feed

Eco-feed is animal feed made from food waste; food manufacturing by-products, food residue and excess cooking foods.

1. **Eco – feed Approval**
2. **Livestock Approval used Eco - feed**

#### Supply and demand of animal feed situation

(TDN Mt※)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>demand</td>
<td>25.5</td>
<td>25.3</td>
<td>24.9</td>
<td>25.6</td>
<td>25.2</td>
</tr>
<tr>
<td>roughage</td>
<td>5.8</td>
<td>5.5</td>
<td>5.5</td>
<td>5.4</td>
<td>5.4</td>
</tr>
<tr>
<td>Concentrated feed</td>
<td>19.7</td>
<td>19.8</td>
<td>19.4</td>
<td>20.2</td>
<td>19.8</td>
</tr>
<tr>
<td>of which, domestic material</td>
<td>2.2</td>
<td>2.1</td>
<td>2.1</td>
<td>2.2</td>
<td>2.1</td>
</tr>
<tr>
<td>of which Eco- feed</td>
<td>–</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>1.0</td>
</tr>
<tr>
<td>proportion among concentrated feed (%)</td>
<td>–</td>
<td>4.4</td>
<td>4.7</td>
<td>4.7</td>
<td>4.9</td>
</tr>
</tbody>
</table>

※ TDN : criteria of animal feed energy
The amount of recycled feed and the number of the registered recycling operators

Feed utilization needs
- appropriate segregation of food residue as a material
- precise component management of feed

The guideline for safety feed utilization of food residues
(established in August 2006)
- Conditions for ensuring feed safety in the use of by-products associated with food production and food waste associated with cooking or leftovers.
- Regulations of the conditions in each step of the following: feed collection, sorting, storage and shipment of materials, transportation and storage of feed product, and the use of farmers.
The fertilizer demand tends to decrease recently because of proper fertilization and reduction of farm land area. By effects of policy development of eco-Farmer and livestock farmer with agriculture cooperation, compost demand is increasing. But compost derived from food residue is difficult to spread widely because of the competitiveness of that from animal manure.

To promote compost derived from food residue, it is important to pay attention to supply and demand balance between regions because the amount of animal manure generation is variety across the country.

The amount of recycled fertilizer and number of registered recycling business operators

The amount of animal manure generation per cultivated area
### 5 Methane fermentation

<table>
<thead>
<tr>
<th>Business category</th>
<th>Food waste type</th>
<th>Separation</th>
<th>Suitable recycling treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food manufacture</td>
<td>● soybean cake, rice bran</td>
<td>easy</td>
<td>feed</td>
</tr>
<tr>
<td></td>
<td>● bakery • confection garbage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● okara (bean curd refuse)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● food residue (factory)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● returned food • excessed production</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food wholesaler</td>
<td>● cooking residue</td>
<td></td>
<td>fertilizer</td>
</tr>
<tr>
<td></td>
<td>● unsold (processed food)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● unsold (boxed lunch)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restaurant industry</td>
<td>● cooking garbage (restaurant)</td>
<td></td>
<td>Methane fermentation</td>
</tr>
<tr>
<td></td>
<td>● leftover (restaurant)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household</td>
<td>● cooking garbage</td>
<td>difficult</td>
<td></td>
</tr>
<tr>
<td></td>
<td>● leftover</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- The amount of methane fermentation and number of registered recycling business operators

![Graph showing the amount of methane fermentation and the number of registered recycling business operators from FY2007 to FY2011.](image)
### 6 Feed-In Tariff Scheme in Japan (Tariff and Purchase Duration)

<table>
<thead>
<tr>
<th>Energy source</th>
<th>Biomass</th>
<th>Biomass type</th>
<th>Tariff (tax inclusive)</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass type</td>
<td>Biogas</td>
<td>Wood fired power plant (Timber from forest thinning)</td>
<td>40.95 yen</td>
<td>20 years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wood fired power plant (Other woody materials)</td>
<td>33.6 yen</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Waste (excluding woody waste)</td>
<td>25.2 yen</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wood fired power plant (Recycled wood)</td>
<td>17.85 yen</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>13.65 yen</td>
<td></td>
</tr>
</tbody>
</table>

Methane fermentation
As unplanned, **238.3 t/year** is sold in markets or to other companies.

Koso-no-sato Ltd. uses the fertilizer (362 t/year) to grow vegetables, fruits, rice, soybeans and flowers (284 t/year).

**Branding**

Agricultural products grown with the fertilizer from food waste to have bland "cyclical vegetable."
Livestock operators

Food retailer

28 retailers of Odakyu group

Collection and transportation by Nagata Service Ltd.

Odakyu Group purchases 65 t of pig per year (equivalent to 1,301 pigs) to sell

Food residue (692 t/year)

Food recycling loop by ODAGKYU Co., Ltd.

Recycling business operator

Odakyu Building Service Co., Ltd.

Liquid fertilizer (1,038 t/year)

The liquid fertilizer is fed into many pigs (1,301 pigs/ year)
Biogas is utilized by gas turbines power generation within the facility and surplus biogas is transferred/sold as boiler fuel to the nearby factories. Fertilizer made from the pruned branches and mowed grass is named “Meta-chan organic” or “Toyama eco organic” and is approved for the Toyama prefecture recycled products. They are sold to the nearby vegetable farmers and vegetables produced using the fertilizer are sold at supermarkets.

Overview and flow of food waste recycling

“Hopper”
receives raw garbage

Non-industrial waste
- Delivery: 14 business operators in Toyama city and other’s
- Discharge about 140 business locations

Industrial waste
- Delivery: 19 business operators
- Discharge about 70 business locations

“Automatic sorter”
Evetron

Automatically sorts and pulverizes raw garbage and foreign material (Plastic bag)

“MGT power generator”
30 kW x 3 units

“Methane fermenter”
Bioreactor

“Biogas boiler”
0.9 t x 2 units

“Mitsubishi Rayon Toyama Plant”
CO2 reduction of 1,900 tons per year
(Published by Mitsubishi Rayon)

(Reference) Created based on the material of the 5th biomass business strategy study team
KAISEI Co., Ltd. established energy plant in 2012 that utilizes food waste and sewage sludge from local spa town to produce biogas.

- Electricity by bio-gasification is sold to power company under the Feed-In Tariff Scheme.
- Residual heat is used for greenhouse to grow tropical fruit in cold area.
- Digestive liquid is used for organic fertilizer to grow rice.

Example 4: Food waste recycling by KAISEI Co., Ltd.
(bio-gasification leading to high value added agricultural production)