

Ecofeed, animal feed produced from recycled food waste

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Summary

Due to the price hike of imported grains for feed, the production of Ecofeed, feed produced from recycled food waste, has increased in recent years. Food dregs from the food and beverage processing industry and out-of-date food from supermarkets and convenience stores are most often used as raw materials for Ecofeed. As food waste usually contains a lot of moisture and is easily spoiled, guidelines prescribing measures to be taken when collecting, transporting and storing raw materials, and for the production, shipment, storage and use of Ecofeed products, have been developed to ensure the safety of Ecofeed. The guidelines also include measures that should be taken to prevent the spread of bovine spongiform encephalopathy when producing and using Ecofeed. A certification system was introduced in March 2009 to ensure the quality and safety of Ecofeed and thus promote its use.

Keywords

Animal, Feed, Food, Japan, Recycled, Safety, Waste.

Ecofeed: mangime zootecnico ottenuto dal riciclaggio di scarti alimentari

Riassunto

Negli ultimi anni, a causa dell'impennata dei prezzi di importazione dei cereali per uso zootecnico, la produzione di Ecofeed, mangime ottenuto dal riciclaggio di scarti alimentari, è aumentata. Nella maggior parte dei casi le materie prime per la produzione di Ecofeed sono rappresentate da scarti dell'industria alimentare e da cibi scaduti della piccola e grande distribuzione. Poiché gli scarti alimentari per l'elevato contenuto di umidità si deteriorano facilmente, sono state messe a punto alcune linee guida che regolamentano raccolta, trasporto e conservazione delle materie prime nonché produzione, spedizione, conservazione e utilizzo dei prodotti Ecofeed al fine di garantirne la sicurezza. Le linee guida elaborate prevedono anche le misure da adottare a scopo preventivo per evitare la diffusione dell'encefalopatia spongiforme bovina durante la produzione e l'utilizzo di Ecofeed. Nel marzo 2009 è stato introdotto un sistema di certificazione per assicurare la qualità e la sicurezza di Ecofeed e promuoverne l'impiego.

Parole chiave

Alimenti, Animale, Giappone, Mangime, Riciclato, Scarto, Sicurezza.

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Introduction

Although the livestock industry is one of the most important agricultural sectors in Japan, representing 28.5% of total agricultural output, Japan depends heavily on imports for feed supplies (5). In the 2007 fiscal year, 75% of the 25 286 000 metric tons of feed in terms of total digestive nutrition (TDN) consumed in Japan was imported (6). Figure 1 shows the self-sufficiency rate for forage feed and grains used for the production of compound feeds.

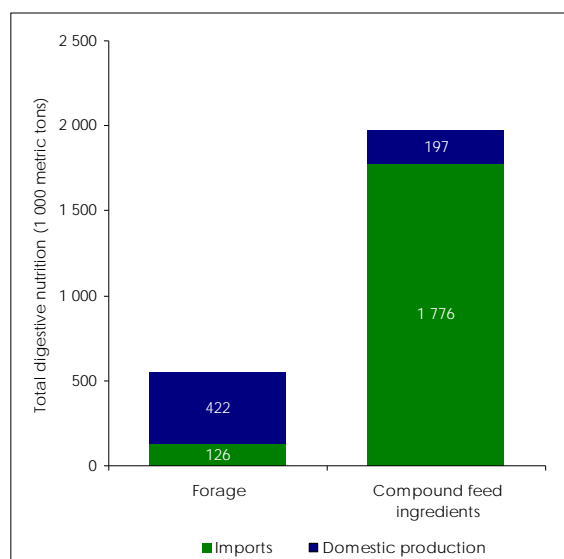


Figure 1
Quantity of forage and grains used for concentrated feed in Japan during the 2006 fiscal year (6)
Forage includes hay, silaged grass, corn, rice and rice straw
Grains for concentrated feed include corn, rice, sorghum, rice bran, soybean oil residue, beet pulp, beer residue, bean curd residue, fish meal, etc.

Despite this feed situation, a large amount of food waste is produced in the food processing and catering industries, most of which is incinerated or buried without being recycled. Figures 2 and 3 show the amount of food waste recycled for animal feed, fertilizer and other purposes by year and by source, respectively.

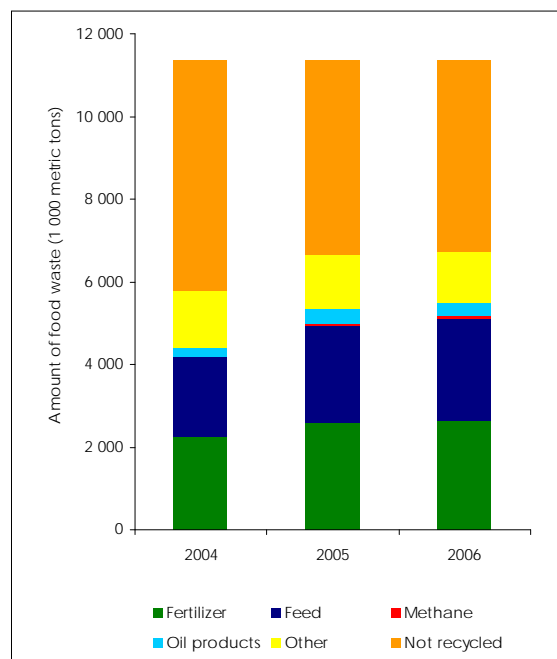


Figure 2
Quantity of food waste produced and recycled for different purposes during the 2004, 2005 and 2006 fiscal years (7)

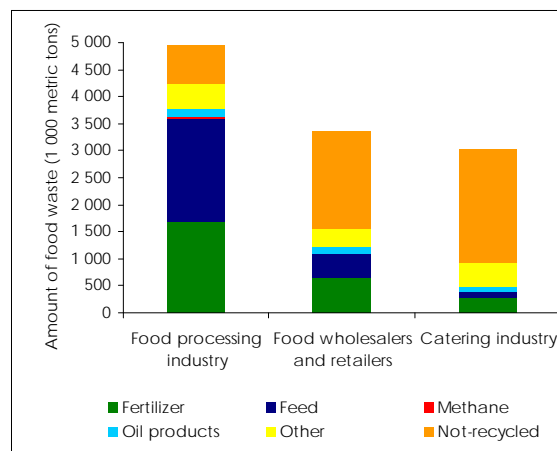


Figure 3
Quantity of food waste produced from different food sectors that was recycled for different purposes in 2007 (7)

Among the reasons that prevent food waste from being recycled for animal feed are the following:

- the food waste contains a lot of moisture and its quality deteriorates easily
- the food waste used as feed materials is not always available on a regular basis
- the feed produced from food waste is not constant in terms of its nutritional value

- high production costs.

Nevertheless, there are producers of recycled feed who have overcome these problems with creative ideas and they have successfully recycled food waste for feed at relatively low cost.

In accordance with the Basic Law on Agriculture, a cabinet decision was passed on 25 March 2005 on the Basic Plan on Food, Agriculture and Rural Areas. This plan aims to increase the self-sufficiency of feed from 25% to 35% by 2015. Based on this plan, a Strategic Council for the Improvement of Self-sufficiency of Feed was established on 12 May 2005 and a Recycled Feed Promotion Taskforce was created on 16 June 2005. Both comprised participants from government, agricultural organisations and scientists, with the aim of improving self-sufficiency in compound feed and to lower livestock production costs. In addition to these conferences, an expert panel was formed on 4 November 2005 to develop guidelines that should be observed to ensure safety of recycled feed.

Animal feed made from recycled food waste, scraps and leftovers is called Ecofeed in Japan. Ecofeed is a trademark registered by the Patent Agency upon application by the Compound Feed Supply Stabilisation Organisation (2).

This article outlines the methods used to produce Ecofeed and the guidelines developed for safety assurance of Ecofeed.

Methods used to produce Ecofeed

Different food waste and methods are used for the production of Ecofeed.

Food waste used for the production of Ecofeed

Food waste used as raw materials for the production of Ecofeed is as follows:

- by-products produced from the food processing industry – rice bran, rice wine lees, rice noodle debris, shochu dregs, soy sauce lees, starch residue, beer dregs, wheat bran, sesame oil residue, corn gluten meal, soybean oil residue, juice pulp, bean curd

(tofu) residue, bread crumbs, cake crumbs, beet pulp, sugarcane crush residue, tea residue, molasses, corn steep liquor, etc.

- surplus food which was not used during processing – rice, bread, noodles, bean curd, vegetables, cakes, milk, ice cream, delicatessen items, juice, boxed lunches, etc.
- cooking waste and scraps produced by the catering industry and households
- leftovers produced by the catering industry and households.

Whether or not this food waste can be used as raw materials for Ecofeed depends on the stability of supply, stability of quality and nutritional values. Based on the study of 171 Ecofeed plants at the end of December 2007, food dregs are the raw materials most frequently used (55 plants), followed by out-of-date food from supermarkets and convenience stores (30 plants) and bread, noodles and similar products (23 plants) (Fig. 4).

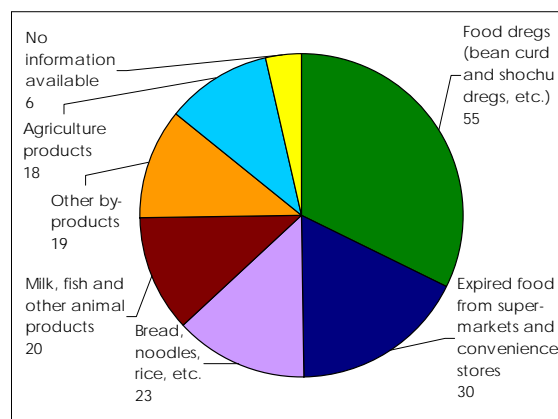


Figure 4
Number of Ecofeed plants by type of food waste used, December 2007 (1)

Methods used for the production of Ecofeed

Food waste can be silaged or dried to enhance conservation before being used as feed.

Silaging (fermentation with lactic acid bacteria) – vegetable scraps, beer residue and bean curd refuse can be silaged in the same way as corn silage or grass silage.

Drying – a low pressure frying method, boiling drying method, high temperature fermentation

drying method, or high temperature drying method are all used.

Food waste can be also used without being dried. Food waste is mixed with water or milk and supplied to farms using pipelines. Food waste is usually fermented with lactic acid bacteria into liquid at pH4. This method has a low energy cost but does not allow preservation for a long period of time. An example of Ecofeed production procedures is given in Figure 5.

Safety assurance of Ecofeed

To promote the production of feed produced from recycled food waste, it is important to guarantee safety, regularity of supply, nutrient values, quality and preservation and to have low production costs. The Ministry of Agriculture, Forestry and Fisheries (MAFF) issued a guideline for the safety assurance of Ecofeed products in August 2006. The guideline is targeted not only to control general animal health and public health problems but also to prevent bovine spongiform encephalopathy (BSE) (4). Needless to say, Ecofeed manufacturers are subjected to obligations under the Feed Safety Law. They are obliged to report to the MAFF before starting their feed production business. They are not allowed to use feed additives that are not approved by the Minister or to manufacture feed containing harmful substances.

Collection of raw materials

Raw materials used for the production of Ecofeed should be as follows:

- by-products that do not contain mammal, poultry and/or fish proteins
- surplus food from which packaging has been removed
- cooking scraps from which foreign objects, such as broken pieces of cookware, have been removed
- leftovers from the catering industry from which foreign objects, such as chopsticks, and toothpicks, have been removed.

Only leftovers from identifiable sources can be used as raw materials in the preparation of

Ecofeed. Leftovers from households cannot be used because they are vulnerable to contamination by a variety of foreign objects in comparison to leftovers from the catering industry.

Transportation and storage of raw materials

Raw materials should be collected from the food and catering industry as swiftly as possible and should be kept in containers with lids to keep them from crows and rodents and from contamination with bacteria and/or foreign objects. Refrigerated vehicles should be used to transport raw materials to prevent spoilage, oxidisation and quality deterioration.

Production of Ecofeed

At the reception point of the raw materials, mouldy food waste should be rejected as raw materials for the production of Ecofeed. Packaging and other foreign objects, such as metal objects, chopsticks and toothpicks that were not removed at the time of collection, should be removed. After this, the Ecofeed producers should:

- cook raw materials potentially containing uncooked meat at 70°C for 30 min or at 80°C for 3 min before use
- preferably cook raw materials not containing uncooked meat before use for prevention of microbiological contamination
- not use raw materials containing mammal, poultry and/or fish proteins for the production of Ecofeed for ruminants.

In addition, Ecofeed destined for use as a raw material in compound feeds should be dried so that the moisture content is 13.5% or less and if antioxidants and antifungal agents are used, they must be among those that have been officially approved.

Storage and shipment of Ecofeed

Ecofeed producers should:

- keep Ecofeed in hermetic containers or bags to protect the content from crows and rodents to prevent contents from contamination by foreign objects
- ship Ecofeed as expeditiously as possible after production



Figure 5
Examples of Ecofeed production procedures
Photos: Courtesy of Kyoto Yukishitsushigen Co., Ltd

- ship Ecofeed containing mammal, poultry and/or fish proteins only to pig and/or poultry farmers
- not use non-ruminant feed containers for Ecofeed destined for ruminants.

Feeding of Ecofeed

Ecofeed users should:

- not feed Ecofeed containing mammal proteins to ruminants
- use Ecofeed expeditiously after arrival
- use the correct amount of Ecofeed in terms of its salt and nitrate contents and other nutrient values
- cook Ecofeed potentially containing uncooked meat at 70°C for 30 min or at 80°C for 3 min before use
- preferably cook Ecofeed that does not contain uncooked meat before use to prevent microbiological contamination.

Certification of Ecofeed

At December 2007, there were 171 Ecofeed producers in Japan that provided a total of 150 000 metric tons of Ecofeed in terms of TDN. Of these, the details of 113 producers are available on the public domain website (1).

These plants are operated with the involvement of local governments, swill collectors, agricultural co-operatives, farmers, food processing companies, food distributors and/or non-government organisations. A typical example is raw materials collected by a company established by a local government with the involvement of several swill collectors; the materials are processed into a dried meal at a plant owned by a private compound feed company. There are cases where Ecofeed plants are owned and operated by swill collectors and dried meal made from recycled food waste is supplied directly to farmers or supplied to compound feed producers as feed ingredients. In many cases, livestock products, such as pig meat produced from Ecofeed, are consumed locally at the restaurants involved in providing raw materials and sold at local meat shops.

To promote the use of Ecofeed, a certification system has been in operation since March

2009. An Ecofeed product must meet the following requirements in order to be certified (4, 5):

- recycled food waste represents a certain proportion in the product (total food waste represents no less than 20% and promoted food waste represents no less than 5% of the product)
- raw materials used for production satisfy written specifications
- the product is produced in accordance with specified procedures stating the mixing ratios of raw materials, production procedures and product specifications
- the product is produced in accordance with the guidelines for assurance of Ecofeed.

Ordinary and promoted food waste examples are shown in Table I. Certification is provided by the Japan Scientific Feed Association (JSFA), after confirming that these requirements have been met. The procedure for certification is shown in Figure 6. A certified product is authorised to display the Ecofeed label, as shown in Figure 7.

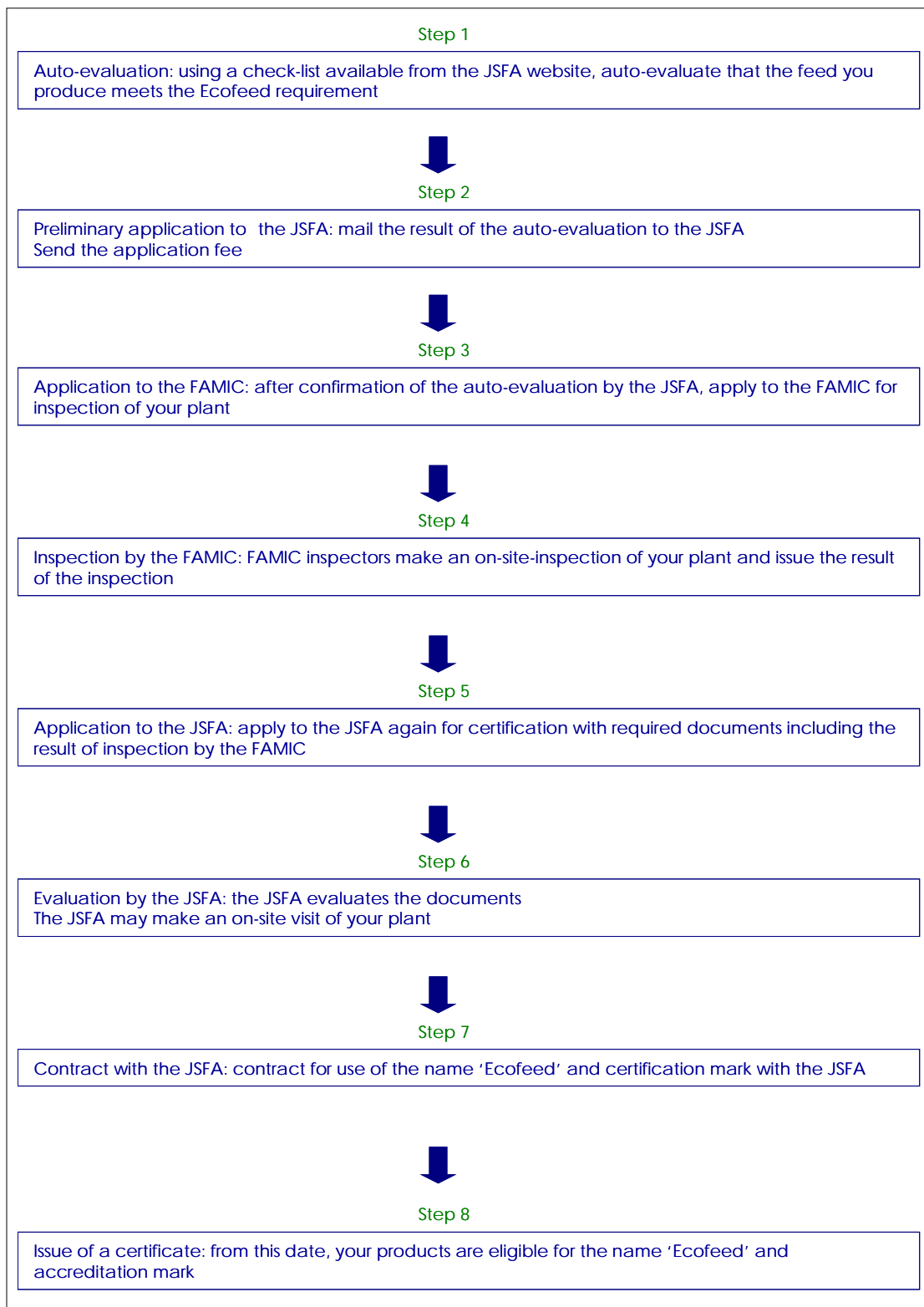
By the end of July 2009, there were two plants that had obtained for certification of their Ecofeed products.

Table I
Examples of food waste used for the production of Ecofeed

Type of waste	Example of food waste
Ordinary	Rice bran, wheat bran, soybean dregs (other than imported soybean dregs), beet pulp, beer dregs
Promoted	Noodle debris, bread crumbs, cake crumbs, gluten debris, bean curd meal, mushroom-growing bed waste, soy sauce lees, sake (rice wine) lees, rice vinegar lees, sweet sake lees, shochu dregs, tea dregs, squeezed fruit waste, coffee grounds, cacao grounds, dairy plant waste, frozen food plant waste, cooking waste, waste oil, boxed lunches, plate scraps

Ordinary food waste includes waste that has been used as feed for a long time

Promoted food waste includes waste that is not usually used as feed but promoted to be used as feed (2)



JSFA Japan Scientific Feed Association

FAMIC Food and Agricultural Materials Inspection Centre

Figure 6
Procedures for Ecofeed certification (2, 3)



Figure 7
Ecofeed certification label
The certification number is placed at the top of the square and the proportion of recycled food waste in the product indicated at the bottom

Conclusions and future prospects

To achieve the targeted increase in self-sufficiency of feed from 25% in 2006 to 35% in 2015, the Recycled Feed Promotion Conference has established a plan to increase the amount of food waste to be used for feed from 2 482 000 metric tons (22% of the total amount of food waste produced in Japan) to 5 092 000 metric tons (45%). In addition, following the amendment of the Law for the

Promotion of Recycling and Related Activities for the Treatment of Cyclical Food Resources (Law No. 116, 2000) (Food Waste Recycling Law), which was enforced in December 2007, the recycling of food waste into feed has been given a priority over recycling for other uses. There are various actions being taken by government to realise this plan. In addition to the certification system introduced in March 2009, the government has been supporting research and development of efficient Ecofeed production methods. To increase the production of Ecofeed and its use in more extensive areas, collaboration between compound feed producers and Ecofeed producers is in progress. To promote the production of Ecofeed in areas where food waste is not sufficiently recycled for feed, technical advisors are being trained so that they can provide the necessary technical advice to the local governments in these areas. With these efforts, the MAFF expect an increase in Ecofeed production by 50 000 metric tons in terms of TDN in the 2008 fiscal year.

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