

**Scotland's Rural College**

## **Food waste as animal feed**

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## Food waste as animal feed



### Summary

- Food loss and food waste throughout the supply chain has a considerable climate impact, and there is room for improvement.
- Food waste which currently ends up in landfill, incineration or anaerobic digestion would save more GHG emissions if recycled into animal feed.
- Pigs are omnivores and have been (part-) fed on food waste throughout most of their domesticated history globally.
- Regulations brought in following BSE and foot and mouth crises are stricter in the UK and EU than in other developed countries, and prevent many forms of food waste which could contain animal products from being used in animal feed.
- Other countries use heat processing of food waste to ensure it is safe for use as animal feed and poses no disease risk to animals and humans.
- Insect farming has some potential in this area, but is currently not able to realise its potential due to regulations which treat insects as livestock which cannot be fed on animal products or fed to (most) other animals.

# Environmental impact of food waste

Around 1/3 of all food produced is lost or wasted before it is eaten. The carbon footprint of food waste is estimated at 3.3 billion tonnes of CO<sub>2</sub>e, equivalent to approximately 8% of global GHG emissions<sup>1</sup>. UN Sustainable Development Goal 12.3 aims to halve food waste and reduce food loss by 2030<sup>2</sup>.

The UN defines 'food loss' as occurring in the supply chain before it reaches shops or food service (i.e. on-farm, during transport, processing or distribution). 'Food waste' from the retail, food service and home account for 931 million tonnes, 61 per cent of which came from households, 26 per cent from food service and 13 per cent from retail<sup>2</sup>.

In the UK, post-farm gate food waste is estimated at 9.5 million tonnes, 70% of which was intended to be consumed by people (30% being the 'inedible parts'). This was worth £19 billion and caused emissions of 36 million tonnes of greenhouse gas (Figure 1)<sup>3</sup>.

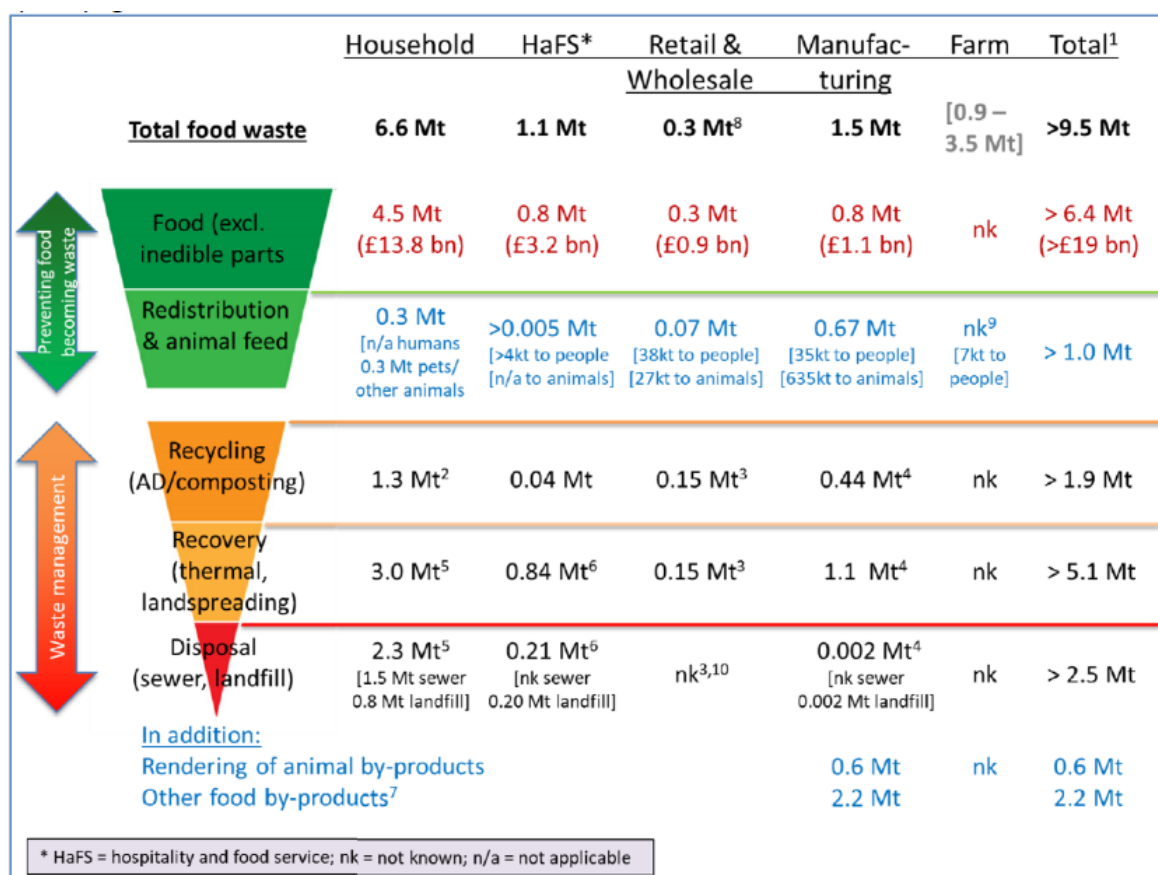


Figure 1: Summary of food surplus, waste and related material arisings in the UK, and their respective treatment and disposal routes (from WRAP 2021)<sup>3</sup>

WRAP<sup>3</sup> analysed the quantity, sources and fates of UK food waste. Household food waste (4.5 million tonnes per annum) is by far the largest element, and although some is composted the bulk of it ends up being incinerated or disposed of in sewers and landfill. In March 2016 WRAP launched the Courtauld Commitment 2025 (Now Courtauld 2030)<sup>4</sup>, a voluntary agreement encouraging food supply chain actors to reduce waste, and some progress has already been achieved.

# Food waste as animal feed– current situation and opportunities

There are already businesses that collect and process unwanted by-products or pre-consumer food waste for use as animal feed. Sources include by-products from brewers and distillers, sold to major feed suppliers such as ForFarmers and AbAgri. More specialist intermediaries such as SugaRich and Duynie process wastes from baking and confectionary manufacture into animal feed ingredients. 660,000 tonnes of food surplus from manufacturing, retail and hospitality and food service are used as animal feed<sup>5</sup> and there is potential for an additional 200,000 tonnes to be used.

Feeding unprocessed food waste to animals (e.g. pig 'swill') had been standard practice since the early domestication of pigs. The more modern incarnation of this involves highly regulated heat-treatment to limit disease transmission. For example, 'rendering' of abattoir waste products into products such as meat and bone meal, and dried blood. However, following BSE in cattle and scrapy in sheep in the 1980–1990s and the foot and mouth outbreak in farmed mammals in 2001, the UK and then the EU introduced legal restrictions which prevent the use of wastes that include any form of animal product in feed for any animal meant for human consumption<sup>6</sup>. Animal by-products are still permitted in pet food, but under strict regulation<sup>7</sup>.

Europe went further than Australia, New Zealand and the US, where it was specifically the feeding of animal-derived products to cattle that was prohibited. As well as ruling out abattoir by-products and offal, these regulations also in practice rule out the use of post-consumer and post-kitchen waste streams, because of the risk of cross-contamination. In contrast, in other developed countries such as the USA, Japan and Taiwan, post-kitchen and post-consumer food waste is allowed to be heat treated, following specific regulations (e.g. USA 30 mins at 100°C, Japan 30 min at 70°C or 3 min at 80°C) and processed into livestock feed. In Japan, this practice is promoted under an 'ecofeed' label, highlighting its environmental benefits to consumers<sup>8,9</sup>.

Two EU-funded projects FUSIONS and then REFRESH have looked at the issue of food waste. REFRESH produced technical guidelines and practical recommendations for the safe processing of surplus food for omnivorous livestock (i.e. non ruminants)<sup>10</sup>. Alongside these projects, various other scientists<sup>8,9,11</sup> and the campaigning group Feedback<sup>12</sup> have argued that a return to processing of food waste for farm animal feed can be done safely and would have environmental benefits.





## Other options for dealing with food waste

The food waste pyramid in Figure 1 highlights that prevention of food waste throughout the food supply chain should be the first priority. The charity WRAP focuses on this area<sup>3,5,13</sup>, encouraging food supply chain companies to commit to improvements. Redistributing unwanted food to consumers who need it is the next most ethical and environmentally friendly option (e.g. food-banks, and apps such as Too Good To Go).

Next in the pyramid is recycling of food through anaerobic digestion or industrial composting, where some energy is recovered in the form of methane. However, using food waste as animal feed has greater benefits for the environment<sup>14</sup> – it has been estimated that it saves three times the level of GHG emissions as sending it to anaerobic digestion<sup>15</sup>. Incineration recovers some energy, and is a little better for GHG emissions than landfill.

Insect farming is another potential alternative. Insects can be produced and processed for human food or for animal feed, and a variety of food sources could be used. Animal food wastes cannot be fed to insects in the EU and UK, as insects are considered farm animals<sup>16</sup> which cannot be fed on animal-derived wastes<sup>6</sup>. Furthermore, insect-derived protein is considered an animal product which itself cannot be fed to farm animals although its use in fish feed has been allowed since 2017<sup>17</sup>. The regulations on insect farming (what they can be fed, and how they can be used) vary widely between different countries. The EU may allow insect-derived feed ingredients to be allowed for pig and poultry feed in 2022. And the industry is lobbying for non-ruminant derived food wastes to be permitted as insect food (e.g. abattoir, food processing, or kitchen waste).

Under current rules banning the feeding of animal-derived food waste to insects, and even if these rules were relaxed, GHG emissions per kilo of protein produced are higher for insects than for fishmeal or soya. Insects only look like the most environmentally friendly option where they are grown on materials which humans and livestock cannot eat<sup>18</sup>.

## What are the objections?

### Consumer concerns

The experience of 'ecofeed' in Japan has shown that consumers will accept food waste being recycled as pig feed if they are given the right information. Concepts such as 'circular economy' and 'Net zero' are very current in people's minds. Research in Japan showed that the more consumers knew about the pig industry the more open they were to purchasing 'ecofeed' labelled pork<sup>19</sup>.



*“The experience of ‘ecofeed’ in Japan has shown that consumers will accept food waste being recycled as pig feed as long as they are given the right information.”*

## Producer concerns

Pig farmers stand to gain economically by replacing costly grain and soya feed sources with 'ecofeed', since slightly slower growth is more than compensated for by the lower input costs. In addition, an 'ecofeed' label could command a price premium from GHG-conscious consumers as it does in Japan<sup>8</sup>.

Animal health remains a concern: Feeding of untreated food waste to pigs by back-yard producers in various countries is still thought to be a major factor in the spread of African swine fever virus<sup>20</sup>. However, well-regulated heat treatment to a certain standard is known to be highly effective against Salmonella, Escherichia coli, and Staphylococcus aureus as well as a range of viruses including classical and African swine fever, and foot and mouth<sup>20</sup>. Treatment methods other than heat are also being tested. Prion proteins (which cause BSE in cattle) are more difficult to make safe, and require a combination of high heat and pressure to destroy. Prion disease is not present in pigs and poultry, so heat treatment combined with a ban on feeding animal-derived feeds to ruminants would be effective in prevention, as it has been in developed nations outside the EU. A well-regulated (or even government-run – like in Taiwan) processing system would be needed to ensure producer confidence. The REFRESH project's technical guidelines detail the measures that would be needed<sup>10</sup>.

## Recommendations

- The Japanese 'ecofeed' model shows how food waste processing into animal feed can be done safely, and is viewed positively by consumers as part of a 'circular economy'.
- Research into industrial-scale processing of food waste into animal feed is required– we can learn from best practice internationally.
- Regulations concerning the processing of food waste into animal feed would need to be changed, and there is a risk to exports to the EU if our regulations move ahead of theirs.

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