ZERO WASTE SCOTLAND

The ultimate guide

Treating food waste on-site

Exploring anaerobic digestion, composting and wormeries

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European Regional Development Fund
Investing in a Smart, Sustainable and Inclusive Future

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1. Introduction

Sites producing food and drink waste should follow the Food and Drink Waste Hierarchy:

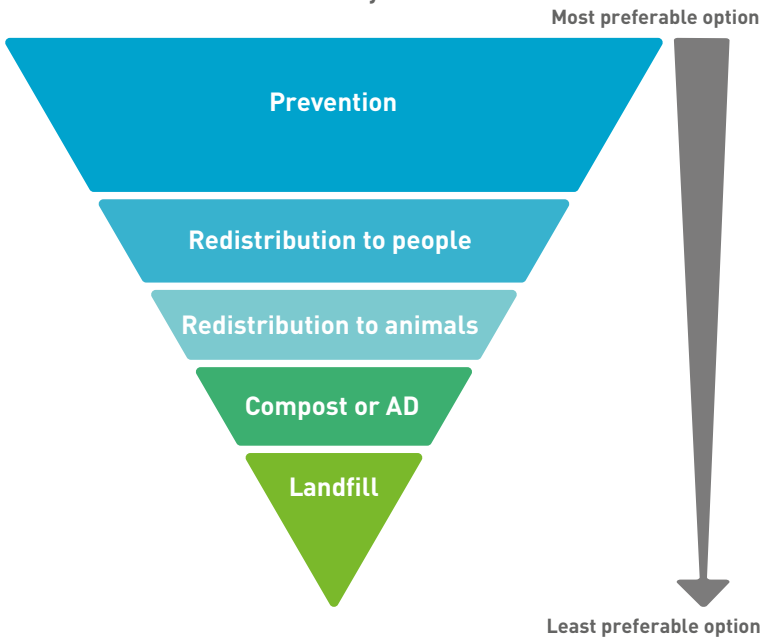
However, even when all reasonable efforts are made to prevent or redistribute food and drink waste, not all food waste is entirely avoidable. It is likely that there will still be some waste that will need to be managed and disposed of responsibly. Typically, this is disposed of via an external food waste contractor. However, in the case of some sites, it may be beneficial to put infrastructure in place to process this food waste on-site.

On-site processing has the potential to not only reduce the total cost paid for food and drink waste disposal, but also to convert the food and drink from a waste product into a valuable resource for the site - typically in the form of:

- Biogas which can be burned to produce:
  - heat
  - electricity
  - vehicle fuel
- Digestate, which can be used as an agricultural fertiliser.
- Compost, which can be used as on-site fertiliser.

Rather than incurring the cost of having your food waste collected and managed by a third party, this document details the options of on-site food waste processing, including anaerobic digestion, composting and wormeries.

Food and drink material hierarchy



2. On-site processing options

This guidance note considers the following three common technology categories for the on-site processing of food and drink waste:

- anaerobic digestion
- composting
- wormeries

Each have their advantages and disadvantages, and, as such, suitability of use differs from site to site.

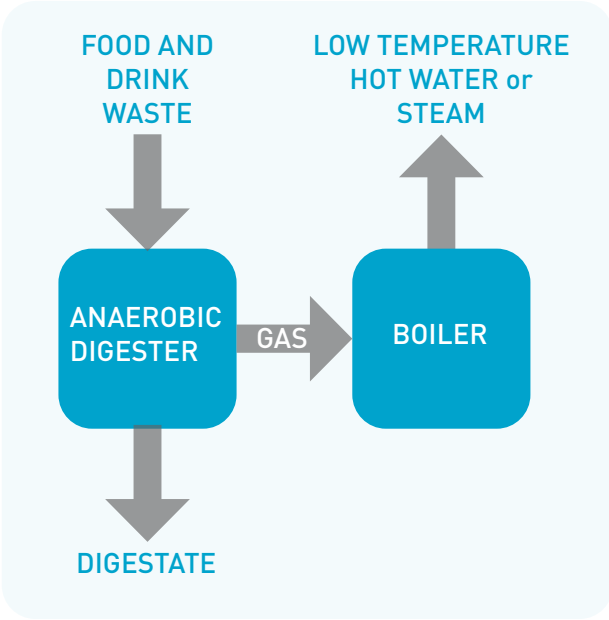
The following sections of this guide describes each in more detail, including information regarding their applicability to different food and drink waste producing sites.

Also, unlike measures intended to monitor food waste generation levels and increase efficiency to prevent food and drink waste, on-site processing of food and drink waste is not suitable for all sites and may require additional resourcing. This should be considered when evaluating implementation.

3. Anaerobic digestion

Anaerobic digestion (AD) is the decomposition of organic material by microorganisms in the absence of oxygen (anaerobic conditions). The process produces gases known as biogas (such as methane) which can be burned as an energy source, for example in a boiler. The leftover waste (known as digestate) from an AD vessel can then be used as a fertiliser. An overview of the anaerobic digestion process is shown in the diagram (right).

Alternatives to utilising the biogas in a gas boiler include installing a combined heat and power (CHP) engine to generate electricity and heat; or further refining the gas to produce fuel for vehicles.



3. Anaerobic digestion

Is it suitable for my site?

For AD to be considered as a means of processing food and drink waste, the site must meet a number of criteria:

Volume of food waste

Economies of scale mean that larger AD schemes are more cost effective. For AD to be a viable option for a site, it should produce at least 150 tonnes/year of food waste.

Disposal routes

AD systems produce large quantities of digestate. A management route for this digestate must be established. Typically, it can be provided to a local farm for land spreading, if relevant regulations are adhered to.

Space considerations

Anaerobic digesters are industrial equipment of significant size. Therefore a reasonable space allocation is required for them to be located on-site. As a minimum you will require around 15 m2 (about the size of a 20 ft shipping container) plus space for access.

Use of produced energy

While energy from an AD system is typically connected to the grid, schemes are usually more feasible if there is an on-site use for the generated energy. Consider if the site has demand for gas or electricity and specify the AD capacity accordingly.

Capital investment

Installing an AD system is a high capital investment, with entry costs starting at £100,000 for small systems. The installation of an AD scheme is a significant financial commitment. Even if all the above criteria are met, the typical return on investment for AD schemes is around 10 years. We can assist you with deciding if installation is feasible. Should you wish to proceed, Scottish Government funding is available with an unsecured SME Loan for resource efficient capital equipment.

3. Anaerobic digestion

Regulations

The regulations covering AD vary according to site location, maximum treatment capacity, and feedstock utilised within the plant, but principle regulations include:

- Pollution Prevention and Control (Scotland) Regulations 2012.
- Waste Management Licencing (Scotland) Regulations 2011.

There are additional regulatory requirements if animal by-products such as meat are included as a feedstock.

Since energy is generated sustainably, it is possible to access an additional income from the energy produced by on-site AD systems. This income is in the form of Renewable Heat Incentives and Feed-in Tariffs (if CHP is used to generate electricity). Both schemes are regulated, and tariff levels set (and regularly revised) by Ofgem. Further information and current tariff levels are available online.

Additional information on anaerobic digestion can be found on the Zero Waste Scotland website.

[5]https://www.foodsecurity.ac.uk/

4. Composting

For sites with insufficient volumes of waste for AD (under 150 tonnes per annum), composting (also known as in-vessel composting) can be a viable waste processing option. Composting systems are essentially vessels which are used to break down organic matter to produce compost which is an excellent soil conditioner.

However, composting is undertaken in aerobic conditions (in the presence of oxygen) and therefore unlike anaerobic digestion it doesn't produce energy. This means that composting units are simpler and by design, less expensive to install than their AD counterparts. However the only savings delivered are reduced waste disposal costs, which given the weight of food can be considerable.

4. Composting

Is it suitable for my site?

Volume of food waste
Composting can be viable for sites producing as little as 5 tonnes/year of food waste.

Type of food waste
While all types of food waste can theoretically be used for composting, drier foods work better than foods with a high water content, for example, soup. There are additional regulatory requirements if animal by-products such as meat are included as a feedstock.

Space considerations
Composting has a much lower footprint than AD systems, with the smallest units being approximately 2 metres by 1 metre.

Regulations
The key regulation for composting schemes is the Waste Management (Scotland) Regulations 2011. Treating, keeping, or disposing of a waste stream via a means such as composting requires a waste management licence, unless an exemption for one has been granted. Additionally, if animal by-products are involved in the composting process, compliance with the Animal By-Products Regulations (ABPR) is also necessary. Finally, in the case of very large sites which process more than 10 tonnes/day of animal by-products, a PPC (Pollution Prevention and Control) permit is required.

Further information on regulatory issues can be found in the 'Composting Industry Code of Practice'.

Additional information on in-vessel composting can be found at the following Zero Waste Scotland webpage.

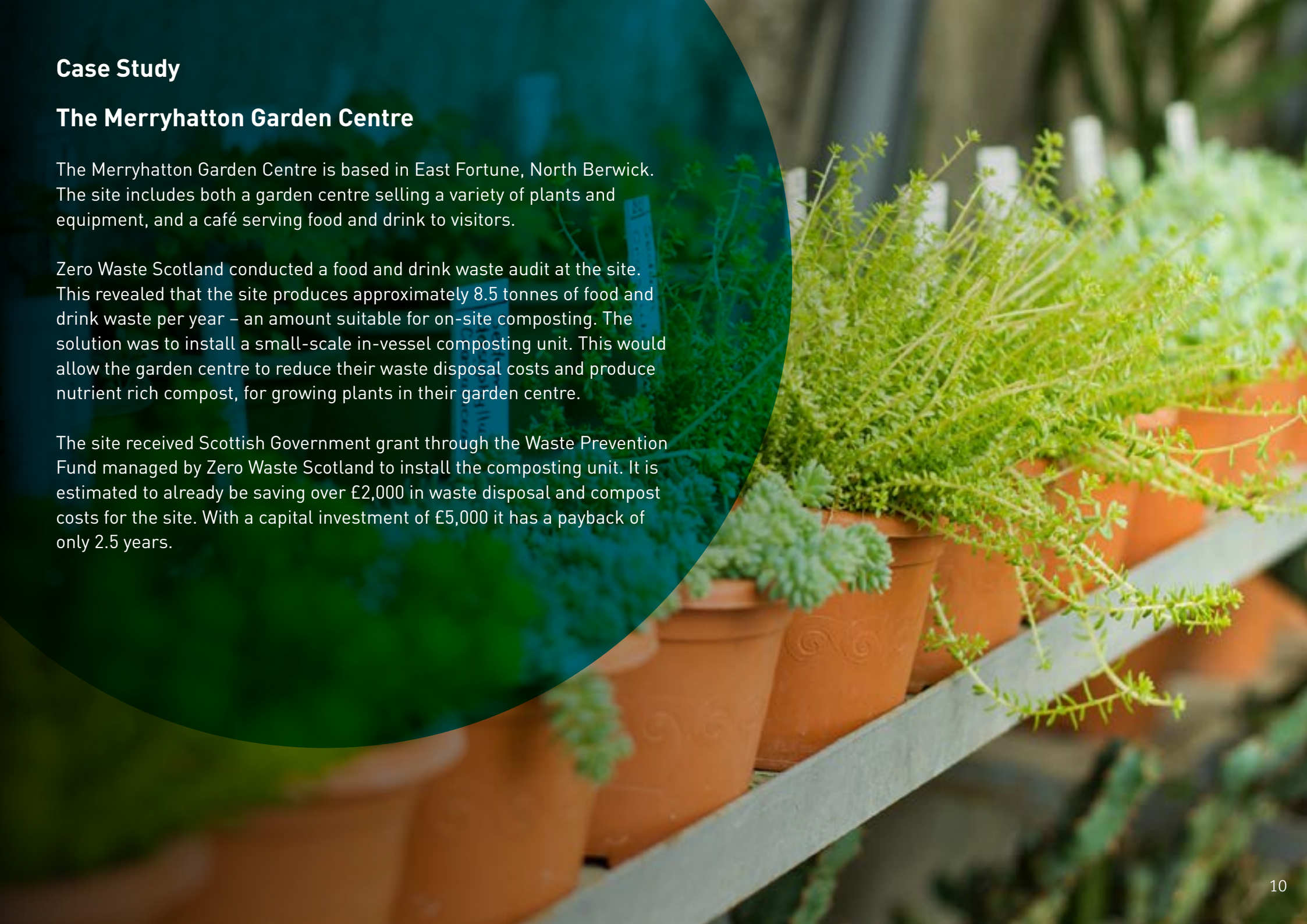
Case Study

The Merryhatton Garden Centre

The Merryhatton Garden Centre is based in East Fortune, North Berwick. The site includes both a garden centre selling a variety of plants and equipment, and a café serving food and drink to visitors.

Zero Waste Scotland conducted a food and drink waste audit at the site. This revealed that the site produces approximately 8.5 tonnes of food and drink waste per year – an amount suitable for on-site composting. The solution was to install a small-scale in-vessel composting unit. This would allow the garden centre to reduce their waste disposal costs and produce nutrient rich compost, for growing plants in their garden centre.

The site received Scottish Government grant through the Waste Prevention Fund managed by Zero Waste Scotland to install the composting unit. It is estimated to already be saving over £2,000 in waste disposal and compost costs for the site. With a capital investment of £5,000 it has a payback of only 2.5 years.



5. Wormeries

A wormery operates according to the same principles as a composting unit but uses the presence of worms (also known as vermiculture) to break down food waste, but more effectively and quickly.

Wormeries work best when operating at a smaller scale and are therefore best utilised to process smaller volumes of food waste. As a result, they are more suitable for smaller operations, or operations that are not seeking a full-scale solution for processing all food waste.

Given the interest they can generate, wormeries can be particularly effective for sites that include an educational element and want to showcase their sustainability, such as schools, museums and garden centres.

Is it suitable for my site?

Wormeries are best used when processing small amounts of food waste, and they are viable for sites producing as little as 100 kg/year. They are relatively inexpensive, costing around £100 for basic models, and also have a small footprint, typically measuring 50 cm by 50 cm at their base.

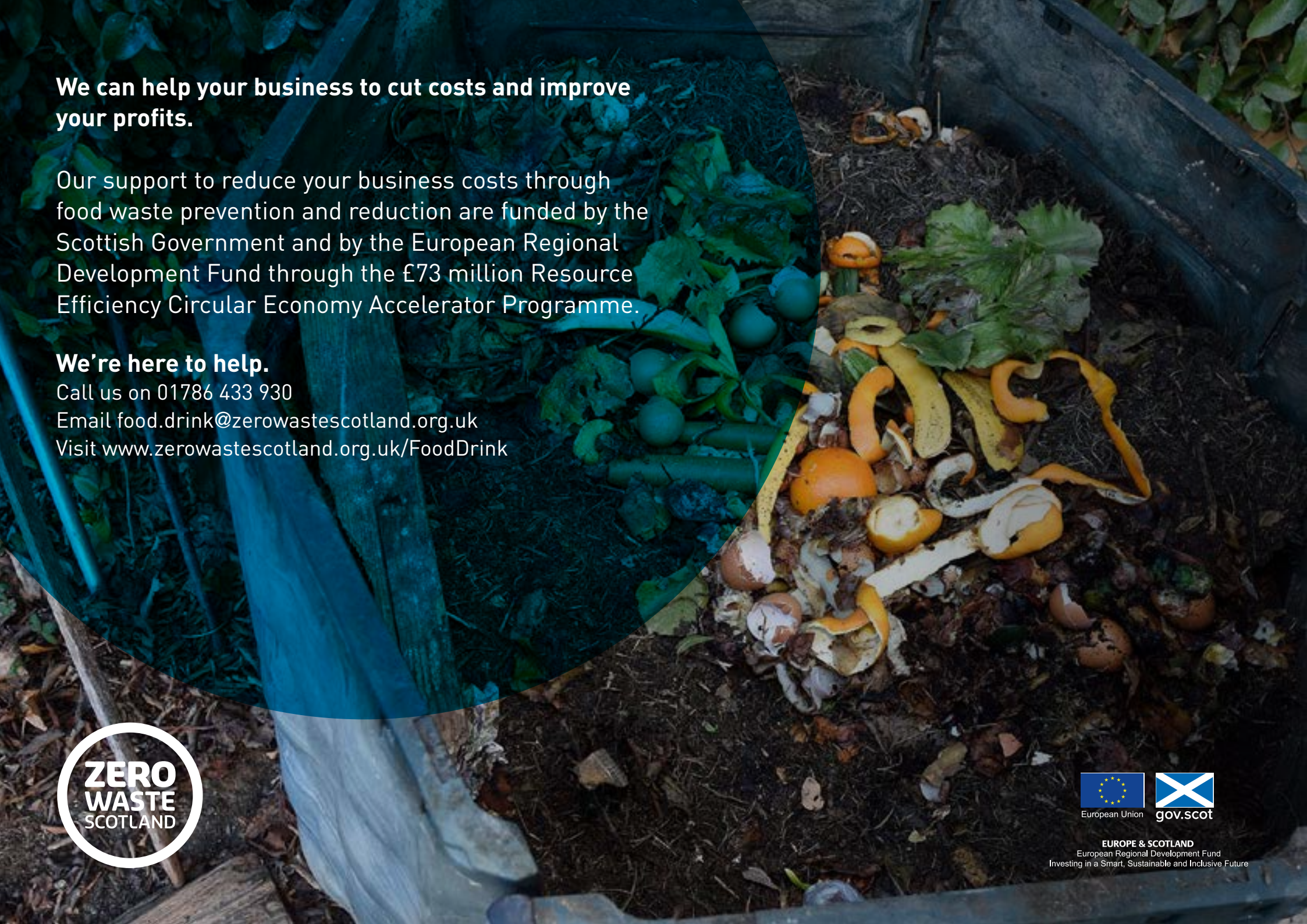
Regulations

Given the small scale of wormeries, exemptions to standard waste management regulations are typically possible. The key exemption which applies is known as the 'Waste Exemption: T26 treatment of kitchen waste in a wormery'.

6. Summary

On-site waste processing options for food and drink waste producing sites can be an attractive means of not only disposing of food waste, but also using it to provide benefits in the form of energy, compost or educational opportunities.

In addition to these benefits, on-site food waste processing also provides the opportunity to promote the green credentials of the organisation. But don't forget the waste hierarchy – preventing food waste creation in the first instance should always be the top priority!



We can help your business to cut costs and improve your profits.

Our support to reduce your business costs through food waste prevention and reduction are funded by the Scottish Government and by the European Regional Development Fund through the £73 million Resource Efficiency Circular Economy Accelerator Programme.

We're here to help.
Call us on 01786 433 930
Email food.drink@zerowastescotland.org.uk
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