

## INTRODUCTION

Compost is formed when organic matter is broken down by bacteria and fungi in the presence of oxygen. First, high energy compounds are consumed producing heat, with temperatures of 65 – 75°C often reached. This 'thermophilic' phase kills weed seeds and biological pathogens. Later, micro-organisms degrade large compounds such as lignin. As compost cools, its texture and colour change and after three months it resembles soil.

Organic matter (OM) is an indicator of soil health and to a large extent determines soil physical structure and water holding capacity. Levels of OM in UK soils have declined due to intensive agriculture: returning OM to soil as compost counteracts this. Regular applications of good quality compost improve soil structure and fertility. This may reduce the need for bagged fertiliser.

## IN-VESSEL SYSTEMS

There are several in-vessel composting technologies available, such as the EcoPOD® system. Sealed systems may accelerate the composting process and reduce the production of unpleasant smells and leachate but they use more energy and materials and are more expensive than open-air windrows. For on-farm uses, in-vessel systems are usually unnecessary. However, composting food-waste will be a growth area in the next decade and to comply with animal by-products regulations this must be performed in sealed vessels.



In the EcoPOD® system, a hydraulic ram pushes material from a feed-hopper into LDPE bags. A 60 m bag holds 100 m<sup>3</sup> of wastes aerated by perforated pipe connected to a fan.

## REGULATORY REQUIREMENTS

Composting is controlled under Waste Management Licensing (WML) and is regulated by the Environment Agency (EA). Regulations will change in July 2007, when an amendment to WML is adopted. It is therefore advisable to contact the EA for advice. There are two main routes for compliance depending on the amount of material that you will compost and how you will use it. In general, commercial operators require a full waste management license. Exemptions to WML are available for smaller operators or for producing compost for use on the farm, provided that less than 1000m<sup>3</sup> of wastes are stored on site at any time.

## PRODUCING A QUALITY PRODUCT

Finding markets for compost is difficult and commercial operators often make money by charging a gate fee – not by selling a product. Compost produced to the specifications of a new Publicly Available Standard (PAS 100) has a key advantage. Certified PAS 100, compost ceases to be waste and becomes a marketable product. At present, only compost produced from green-waste meets PAS 100 specifications but in Spring 2007, a Quality Protocol (QP) for Source Segregated Wastes will be introduced to cover compost produced from other organic wastes. It is important to note that compost is a controlled waste unless certified to PAS

100 or QP standard. Hauliers of un-certified compost require a waste transport licence and disposal to land requires an exemption to WML.

### CONTROLLING THE COMPOSTING PROCESS

Appropriate selection and handling of feedstock wastes allows efficient composting without producing bad smells and leachate. All organic wastes can be composted presuming that legal requirements are met, but green-waste is the most common feedstock for on-farm composting. Feedstock moisture, texture / porosity, carbon-to-nitrogen ratio and turning frequency (for windrows) determine the length of composting and the quality of the product. Ideal moisture content is 40 - 60 %. Above 60 %, permeability to air is reduced and methane and unpleasant odours are produced. Below 40 %, organic compounds are less available to microorganisms so consider adding water.

### THE CARBON-TO-NITROGEN RATIO

The ideal C: N ratio for composting is about 30 : 1 (30 parts carbon to 1 part nitrogen). Below 20 : 1, nitrogen is lost as ammonia or nitrous oxides, reducing the fertility of the finished product and causing unpleasant smells. To ameliorate a low C : N ratio, add material of high carbon content (see table 1). Organic material with a C : N ratio above 30 will likely produce compost of lower fertility and coarser texture.

**Table 1: C:N ratios for various materials**

	<b>C : N ratio</b>
<b>Materials high in Carbon</b>	
Straw	40 - 100 : 1
Autumn leaves	30 - 80 : 1
Wood-chips or sawdust	100 - 500 : 1
Newspaper	560 : 1
<b>Materials high in Nitrogen</b>	
Manure	5 - 25 : 1
Vegetable scraps	15 - 20 : 1
Grass clippings	15 - 25 : 1

### CONCLUSIONS

Composting organic wastes and spreading the compost to agricultural land helps reverse declining levels of soil organic matter, mitigate climate change and reduce use of chemical fertiliser. Regulations surrounding the production and use of compost are complicated but there are many sources of advice. There are a number of technologies available, but in general open-air windrows are recommended for on-farm composting unless feedstock wastes contain food-waste or other animal by-products.

### SOURCES OF INFORMATION

The Waste and Resources Action Programme (for PAS 100) - [www.wrap.org.uk/composting](http://www.wrap.org.uk/composting)

The Composting Association (for PAS 100) – [www.compost.org.co.uk](http://www.compost.org.co.uk)

Environment Agency (for WML) - [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

TWIRLS - Treating Waste for Restoring Land Sustainability (for advice and research)

<http://www.bangor.ac.uk/ies/TWIRLS/Composting.htm>