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Composting provides a solution to some of the major issues that society is grappling with in many parts of the world today.

The degradation of soils through loss of structure and nutrients has a major impact on man's ability to produce food. Between 1980 and 1995, approximately 18% of the organic matter present in arable topsoils in the UK has been lost (Defra Soil Factsheet). The UK is not alone in suffering a significant reduction in soil organic matter; in many parts of the world where soils are naturally more fragile than in the UK the situation is much worse.

A reduction in soil organic matter is associated with poorer crop establishment and growth and a greater susceptibility to soil damage and loss from heavy rainfall. Ultimately, a decline in organic matter can lead to the total destruction of soils, perhaps exposing underlying rock as has happened in much of Iceland.

The situation in Australia – where older, more fragile soils are more quickly damaged than in the UK – is also alarming. Significant soil damage has been caused by agricultural activities. The loss of soil organic matter by respiration or wind erosion, or the loss of complete soils by water erosion, is a serious global issue. If left unchecked, these problems will significantly compromise our ability to feed the world's population in the near future. For soils to support crop growth plant nutrients need to be present in appropriate quantities. The major plant nutrients are nitrogen (N), phosphorus (P) and potassium (K). Modern farming systems rely on manufactured 'chemical' fertiliser being applied periodically to soils to replace nutrients removed when crops are harvested.

Nitrogen is usually applied as ammonium nitrate in the UK. The chemical is manufactured using the Haber process: combining atmospheric air with natural gas at very high temperature and pressure.

That is extremely energy- intensive and clearly involves using significant quantities of fossil resources. Phosphorus and potassium are extracted from mined ores, again energy-intensive

and depleting finite resources.

Organic waste materials (domestic, catering and food manufacturing waste) are rich in N, P and K to varying degrees as well as organic carbon. Composting provides an ideal mechanism for recycling plant nutrients as well as rebuilding or maintaining soil organic matter by recycling organic carbon. Soils that have been depleted of organic matter are also able to act as carbon sinks when previously lost organic carbon is replaced.

Managing soil structure, organic matter content and nutrient balance is essential for agricultural production. The pressure on crop and livestock farming over the next decades will be intense as global population grows and diets change. We need to be doing all in our power to improve and maintain soils without undue recourse to finite fossil fuels and other mined elements. Resource recycling will inevitably play a key role in addressing this issue as well as other finite resource problems.

Manufacturing compost from society's waste products The manufacture of quality compost using appropriate technologies is a proven method of recycling organic carbon and plant nutrients from waste organic materials.

Traditional composting techniques (open windrows and modern variants) are limited in their ability to manufacture composts able to replace chemical fertilisers to any significant degree. The reasons are:
• Organic matter high in N tends to be protein (animal or fish) based. Regulatory and practical considerations preclude using open windrowing for waste containing meat or fish. Food wastes of all types tend to be mixed and thus contain meat and fish.
• The two other major plant nutrients, P and K, tend to be more highly concentrated in waste streams that are unsuitable for open windrowing.
• Open windrows are often associated with odour problems, and in a crowded island like the UK it is becoming increasingly difficult to find suitably remote sites where open windrows can be operated. So called 'in-vessel' composting plants are, in the main, able to process a wider variety of waste streams and thus produce composts with greater concentrations of N, P and K. Some in-vessel processes are essentially just windrows inside a building or tent; others are much more akin to process manufacturing plants, where material is composted and processed using technology such as rotating drums (Bioganix Plc), top-loaded cages (Teg Plc) or silos (VCU). The advantages of this more process manufacturing-based approach are:
• A much higher degree of control over the composting process and an ability to ensure compliance with regulations (eg minimal by-products regulations, IPPC etc)
• The ability to process a wider range of waste materials, including those with low dry matter

contents.
• A faster process, thus less site area is required to process a given quantity of material (important in our crowded island).
• Enhanced ability to produce a consistent fertiliser replacement product with specific plant nutrient content, as opposed to simply a soil conditioner.

In summary, advanced composting techniques represent ideal technologies to manufacture fertiliser replacement products and have the ability to contribute significantly to some of society's key issues by:
• Helping to maintain and improve soil organic matter.
• Recycling energy-hungry and finite fossil resources (N, P and K) that are required to grow crops.
• Contributing to CO2 and other greenhouse gas reduction targets by adding organic carbon back to depleted soils and through better management of organic N.
• Alleviating the need to dispose of organic waste through land-filling.