

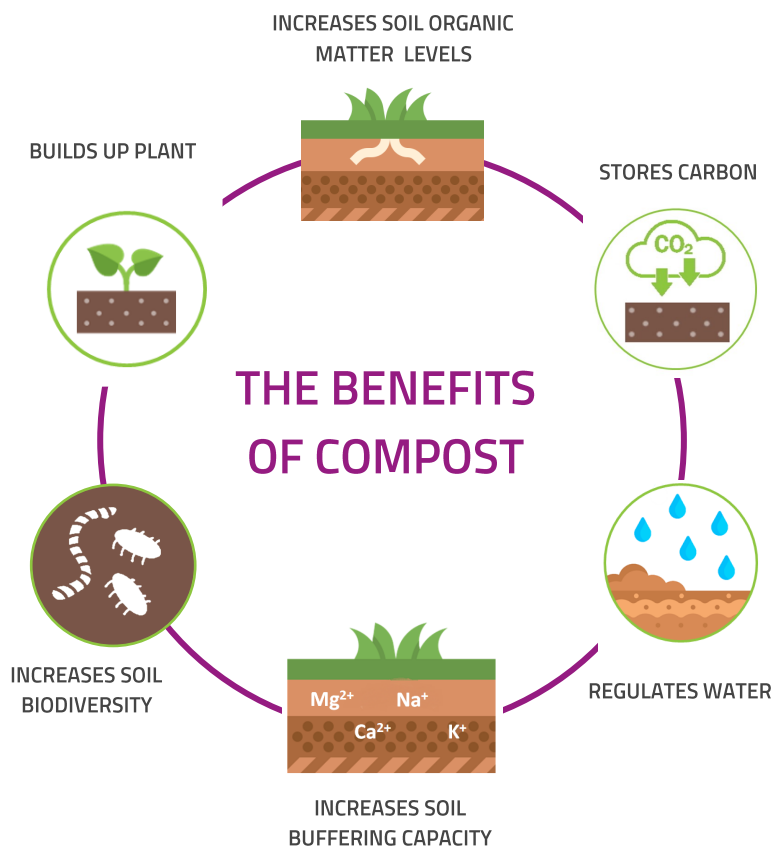
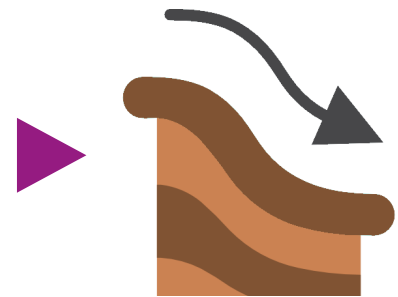
SOIL FERTILITY & PRODUCTIVITY

INTRODUCTION

Sustainable agriculture and horticulture both rely on healthy soils and nutrient recycling. This is not only common sense, but it also forms the basis of the EU's **Circular Economy Strategy** set out in the **European Green Deal**. However, current agricultural practices have, in many instances, eroded soil, thereby reducing its productivity and resilience. One estimate suggests that across the EU, about 12 million hectares of agricultural land suffer from severe erosion, and that this is thought to cost in the region of €1.25 billion annually; equivalent to a loss of crop productivity of around 0.43% every year.¹

ERODED SOILS

- **ARE LESS PRODUCTIVE** – that is, they grow fewer crops;
- **RETAIN LESS WATER** – this means that they dry out quicker and are not as good at absorbing water ; and
- **STORE LESS CARBON** – this is because soil organic matter is mostly carbon, and it can stay in the soil for many decades if not centuries.



THE BENEFITS OF COMPOST

Repeat applications of quality assured compost can help improve the health and productivity of agricultural and horticultural soils. Compost does this in a number of different ways. It can:

- Increase soil organic matter, helping to store carbon.
- Improve soil structure, which reduces compaction.
- Increase the soil's water holding capacity, reducing irrigation and storing water during heavy rainfall events.
- Increase the number and diversity of organisms in the soil.
- Increase plant nutrient levels, which reduces the need for artificial inorganic chemicals.
- Increase the buffering capacity of the soil, helping it to hold onto nutrients for longer.

¹ Panagos, P., Standardi, G., Borrelli, P., Lugato, E., Montanarella, L. & Bosello, F. (2018) Cost of agricultural productivity loss due to soil erosion in the European Union: From direct cost evaluation approaches to the use of macroeconomic models. *Land Degradation & Development* 29: 471-484. DOI: 10.1002/ldr.2879

SOIL MICROBES

There are a vast number of micro-organisms in soil, with some estimates suggesting that there may be over ten billion in a single gram. These micro-organisms (or microbes for short) include bacteria, actinomycetes, fungi, algae and protozoa, with each performing very specific roles.

They form part of the food web and play an important role in the biological carbon and nutrient cycles. They are an indicator of soil health and they are active in:

- Stabilising soil structure;
- Enabling nutrient uptake by plants;
- Controlling pests and diseases;
- Decomposing organic material; and
- Degrading harmful chemicals that may be present in the soil.

REGULARLY APPLYING COMPOST TO SOIL HAS THE FOLLOWING BENEFITS ON SOIL BIODIVERSITY

IT INCREASES SOIL MICROBIAL BIOMASS - this means that there are more microbes present to carry out important functions.

IT INCREASES SOIL MICROBIAL ACTIVITY - this helps fertilise the soil as well as improve its structure.



IT IMPROVES NUTRIENT RECYCLING - this means that plant growth is improved and farmers require fewer fertilisers.

IT INCREASES RESISTANCE OF CROPS TO DISEASES - this means that farmers can reduce pesticide use.

IT IMPROVES SOIL STRUCTURE AND STABILITY - this means that crop roots grow better and that the soil is healthier.

COMPOST INCREASES THE NUMBER OF SOIL ORGANISMS

Compost can play an important role in improving the biological activity of degraded or eroded soil. Regular application of compost can increase the activity and number of soil organisms, including microbes and invertebrates such as earth worms.

Scientific research has shown that after compost has been applied to soil²:

- Increases of up to 100% in soil microbial biomass have been measured experimentally;
- Increases in enzyme activities associated with carbon, nitrogen and phosphorus recycling have been measured;
- Increases in earthworm densities have been recorded; and
- It can be effective in suppressing horticulturally significant soil-borne plant pathogens.

² Gilbert, J., Ricci-Jürgensen, M. and Ramola, A. (2020) A Summary of the Benefits of Compost and Anaerobic Digestate When Applied to Soil, ISWA, Rotterdam.

COMPOST AS A FERTILISER

Compost is a useful source of plant nutrients, including:

- **NITROGEN (N)** – which is needed by plants to grow leaves and stems;
- **PHOSPHORUS (P)** – which is needed by plants to grow roots and shoots; and
- **POTASSIUM (K)** – which is needed by plants to grow flowers and fruit.

Compost also has an alkaline pH, which means that it can help reduce soil acidification.

Recycling nutrients in compost and returning them to soil benefits the environment in a number of important ways:

- **IT REDUCES DEMAND FOR CHEMICALLY MANUFACTURED NITROGEN FERTILISERS** – as the manufacturing process is very energy intensive this significantly reduces greenhouse gas emissions, which are thought to be about 1% of total global emissions.
- **IT REDUCES EMISSIONS TO THE AIR AND WATER COURSES** – the organic matter in compost helps bind plant nutrients, preventing them from being washed into watercourses. In addition, as nitrogen in compost is bound up with other compounds, it is released slowly over time and helps form a nutrient 'bank' in the soil so that the nutrients are present for plant growth for a number of years.
- **IT REDUCES MINING OF ELEMENTS, SUCH AS PHOSPHORUS AND POTASSIUM, AND LIME** – as phosphorus is an EU Critical Raw Material, recycling P helps conserve this valuable resource within Europe.

ONE TONNE OF COMPOST (FRESH MASS) CONTAINS THE FOLLOWING NUTRIENTS



BIO-WASTE-DERIVED COMPOST

Total N; Total phosphate P_2O_5 ; Total potash K_2O ; Total neutralising value % CaO; 66% dry mass³.



NITROGEN: 12 kg

PHOSPHATE: 4 kg

POTASH: 6 kg

LIMING POTENTIAL: 4 %

ORGANIC MATTER: 21 %

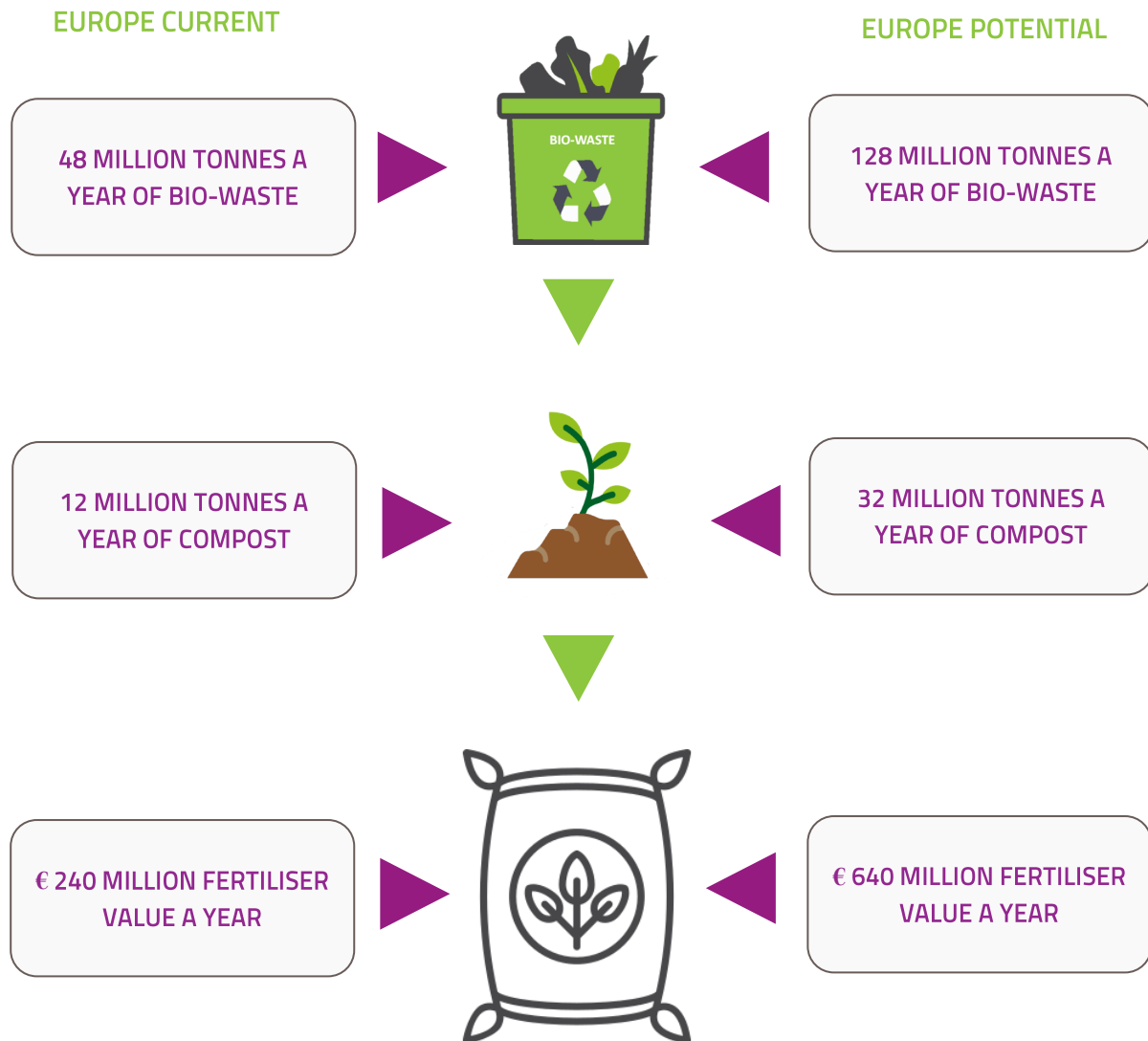
**SOIL FERTILITY VALUE
= € 20 / TONNE (FRESH MASS)**

³ Data from 21 samples of bio-waste-derived compost quoted by Bhogal A, Taylor M, Nicholson F, Rollett A, Williams J, Newell Price P, Chambers B, Litterick, A and Whittingham, M. (2016) Work Package 1 Final report (2010-2015) DC-Agri; field experiments for quality digestate and compost in agriculture. Waste and Resources Action Programme.
Nutrient levels shown are total concentrations (not plant available) and will vary depending upon feedstock and compost type. Calculations based on: Gilbert, J., Ricci-Jürgensen, M. and Ramola, A. (2020) Quantifying the Benefits to Soil of Applying Quality Compost, ISWA, Rotterdam.
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EUROPEAN POTENTIAL FROM BIO-WASTE

Bio-waste is made up of discarded plant and animal residues, and includes garden/park and food waste. Between 118 and 138 million tonnes of bio-waste is generated across the EU every year, but less than 40% of this is currently recycled into useable products.

About 12 million tonnes of compost is produced annually across the EU, but this could be increased to just over 32 million tonnes a year if all collectable bio-waste was treated⁴.



⁴In 2018 approximately 48 million tonnes of bio-waste was treated, resulting in an estimated 12 million tonnes of compost (74% of the total) and 4 million tonnes of anaerobic digestate (26% of the total). This assumes a 33% conversion of bio-waste into compost and digestate. Scaling up, the median value of 118-138 million tonnes of bio-waste was taken, and it was assumed that there would be a pro-rata increase in compost and digestate production (i.e. 74% of the total would be compost and 26% digestate).

About ECN

The European Compost Network (ECN) is the leading European membership organisation promoting sustainable recycling practices by composting and anaerobic digestion of organic resources and guarding over the quality and safe use of the recovered organic fertilisers/soil improvers.

The European Compost Network is a membership organisation with 65 members from 27 European Countries. Members include all European bio-waste organisations and their operating plants, research, policy making, consultants and authorities. ECN represents more than 4500 experts and plant operators with more than 45 million tonnes of biological waste treatment capacity.