



## SOIL HEALTH

Gardening is not the art of growing good plants, but of growing good soil. To ensure your vegetables and fruit thrive, take good care of your soil. When growing in containers or raised beds, there is a limited amount of soil available to the plants so it is particularly important to keep that soil healthy and fertile.

Soil is a complex ecosystem, made up of air, water, mineral particles and organic matter, plus living organisms.

Like our own health, plants need a good supply of nutrients and water in order to live, and they obtain this from soil. Keeping soil healthy will give your plants the best chance to thrive and supply you with a good crop. There are a number of factors that influence soil health, including nutrient content, water, aeration, pH, structure.





**Organic matter** – this is any material that was once living. Organic matter can help correct a lot of the issues in soil. It is important to add organic matter but also to prevent it being lost.

**Nutrients** – the availability of nutrients in the soil is as important as the amount. The three main nutrients plants need are nitrogen, potassium and phosphorus, though there are many more within soil that keep plants healthy. The next page gives more detail on nutrients in soil.

**Water** – it is not just the amount of water in the soil but its capacity to hold it that is important. The soil structure and amount of organic matter will influence this.

**Structure** – a good structure will enhance the availability of nutrients and water, as well as supporting soil life. A good structure is one that has continuous pores of air between the soil particles.

**pH** – this is the measure of acidity/alkalinity of soil. Different plants prefer different pH levels. Most vegetables prefer soil that is slightly acidic, meaning it has a pH below 7.0, ideally 6.5. If it's too high the soil will be too alkaline and if it's too low it will be too acidic.

**Depth** – in shallow soil, or in raised beds, there is a limited amount of nutrients and water which will affect the fertility.

**Aeration** – soil has pores between the mineral particles that allow air to circulate. Aeration is crucial as soil life needs to breathe as they play a vital part in the health of the soil.

**Soil life** – earthworms and various microbes are essential to the health of soil. The majority will live in the top soil at the surface.

**Soil type** – soil can have different size mineral particles, which determine the soil type, classed as clay, silt, sand or a mix known as loam. Each type has advantages and disadvantages for growing food and other plants but if you know how to take care of your soil, it is possible to grow healthy plants in all types of soil.

**Temperature** – the temperature of soil influences certain processes that are crucial for plant growth.



## NUTRIENTS

The key minerals needed for plant growth are Nitrogen, Phosphorus and Potassium although micro-organisms are just as important.

Medium	Nutrients	Other comments
Organic Manure	Good levels of nitrogen, Phosphorus, Potassium	Acidic, Brassicas – cabbage, broccoli, brussel sprouts don't like it but tomatoes, peppers & pumpkins love it
Organic Chicken Pellets	High levels of Nitrogen. Also contains Phosphorus and Potassium	Will take a few weeks to break down
Seaweed	Nitrogen, Potassium and natural growth hormones which stimulate root growth and thus healthy plants	Low in phosphorus
Rock Phosphate	Phosphorus	Lasts for up to 3 years in the compost
Worm casts	Very high levels Nitrogen, Phosphorus, Potassium	Expensive but a great all rounder, gardener's call it 'black gold'
Leafmold	Nitrogen, Phosphorus, Potassium	Dig in for healthy root vegetables or leave as surface mulch
Potash	Potassium	Do not use at seed stage, use on plants only
Mycorrhizal Fungi	A fungus that has a symbiotic relationship with the plant roots	It feeds off the roots and in return adds nutrients which make the roots stronger, thus the plant. Highly recommended

## PLANT NUTRIENTS

Plant Nutrient	Plants most in need	Signs of deficiency	How to avoid deficiency
Nitrogen	Vegetables grown for their leaves Grass	Stunted growth, pale green leaves, weak stems	Add an all rounder like manure, worm casts or chicken pellets, or plant a nitrogen fixer such as a plant in the legume family
Phosphorus	Young plants Root Vegetables	Stunted roots and stems, small leaves with a purplish tinge, low fruit yield	Add rock phosphates or an all rounder like manure, worm casts or chicken pellets
Potassium	Fruit Flowers Potatoes	Edges of leaves turn yellow/brown, low fruit yield, low disease resistance	Add potash to your plants or a liquid feed made from comfrey



## TOP TIPS FOR KEEPING SOIL HEALTHY

Whatever the type or condition of your soil, there are a number of ways you can keep it healthy.

- Get to know your soil – the type, how well it holds water, whether it's prone to water-logging. By knowing your soil, you can use the right methods to keep it healthy.
- Keep the soil covered. This will prevent it from losing heat, nutrients and water. You can keep it covered using plants or a mulch, which is explained in more detail later on.
- Add organic matter to the soil, particularly to soil in raised beds or containers. This will add nutrients and provide food for the micro-organisms.
- Avoid digging or turning the soil. Digging disrupts the structure and topsoil – this is where most of the micro-organisms live.
- Use organic gardening methods and avoid chemicals. Chemical fertilisers, herbicides and pesticides are harsh on the soil and micro-organisms. There are natural alternatives that are more effective and won't disrupt the eco-system.
- Minimise stepping on soil by creating bed systems and clear paths. Treading on soil will lead to compaction which prevents air from circulating and causes drainage problems.
- Avoid gardening when the soil is wet as it will damage the structure.
- Make your own compost. This is an effective way to create your own organic matter and a good way to use kitchen scraps and garden waste.
- Check there is enough drainage so that your soil doesn't get waterlogged and make sure you have an effective watering routine.

The following pages have more in-depth information on supporting and improving soil health.



## COMPOST

Compost is organic material such as vegetable peelings, grass cuttings and hedge trimmings that has decomposed until it resembles a dark brown soil-like substance. Compost is rich in the nutrients that plants need for healthy growth and is an essential part of gardening. Either add it to your garden soil to increase fertility or mix it with sharp sand to create a potting mix.

Composting provides a way of reducing the amount of waste that we send to landfill and of converting our food scraps and green waste into rich healthy soil that plants need to grow strong and healthy.

To make compost, simply put all your suitable organic waste into a heap or special bin and try to ensure a good mix of different material, not just one thing. Ensure you stir it regularly to let the air in, and continue to add to it until it is full. When it is full, cover it with plastic or a lid and let nature do the rest! It should take 6 to 9 months to be ready to use on the garden and resemble dark, crumbly soil with no bad smell.





**What to compost:** Anything that rots will compost. Ideally you will have a good mix of 'greens' which are newer plants and food waste, and 'browns' which are older more woody plants. In a community composting system, it's wise to leave some things out to deter pests and vermin. Here is a basic guide to what to put in your compost bin. It's worth putting a sign on the bin to let people know what they can and can't put it. At the back of this pack is a laminated sign for you to use.

Do Compost	Don't Compost
<ul style="list-style-type: none"> <li>• vegetable peelings</li> <li>• tea bags</li> <li>• coffee grounds</li> <li>• old plants</li> <li>• shredded paper</li> <li>• dead leaves</li> <li>• grass cuttings</li> <li>• hedge trimmings</li> <li>• hair clippings</li> </ul>	<ul style="list-style-type: none"> <li>• synthetic fabrics</li> <li>• eggs and eggshells</li> <li>• cooked food</li> <li>• meat or bones</li> <li>• any kind of oil</li> <li>• dairy products</li> <li>• cat and dog litter</li> <li>• nappies</li> </ul>

### Wormery

A wormery is a contained composting system that can be used to compost cooked foods, meat and dairy as well as vegetable scraps. Wormeries are suitable for small spaces and enable you to reduce waste further by composting food that is not suitable for a community compost bin. The liquid produced by the worms is an excellent natural plant food, containing nitrogen fixing bacteria. The compost made by worms is rich in nutrients and can be added to your soil. Wormeries are sometimes available at a subsidised cost, check with your local council.





## NATURAL FERTILISERS

Nature has a way of creating what it needs through process cycles. The nutrient cycle ensures that plants get the nutrients they need by means of a natural cycle. In a garden created using beds and planters, it may be necessary to give soil a bit of a boost. Chemical fertilisers may provide a short-term solution but they can contribute to the degradation of soil and the nutrients are often washed out. By mimicking the natural nutrient cycle, it is easy to create conditions and fertilisers that support soil health.

### Plant fertilisers

You can create your own plant fertiliser for free using plants commonly found in gardens and it will be much more effective. Useful plants to try are nettle and comfrey. Comfrey is a great fertiliser for fruit trees and shrubs as it is high in potassium, needed for flower and fruit growth. Nettle makes a well balanced fertiliser, it is rich in nitrogen which is needed for leaf growth.

Simply soak a suitable plant in water for a few weeks. Young leaves are best. Once ready, mix one part liquid feed to 10 parts water. Store in a plastic bottle.

You can also cut and lay the plants directly onto soil. For example, cut comfrey leaves and lay at the base of fruiting plant in spring. The leaves will decompose to provide nutrients as the flowers and fruits are growing.

### Green manures

Green manures are plants that are grown to replenish and cover the soil whilst it is not being used for a food crop. Plant green manures if there is a gap between crops, during the winter, or leave in a bed for a whole growing season. Common green manures include alfalfa, clover, buckwheat, field beans. Green manures often have other benefits such as attracting wildlife.

### Nitrogen fixers

Certain plants 'fix' nitrogen – they make nitrogen available to plants that can't access it otherwise. You can plant nitrogen fixers in with other crops to make the nitrogen more accessible. All members of the legume family are nitrogen fixers so you could plant some beans or peas in the same bed as other edible crops.



## MULCH

Mulch is a low-cost way to care for soil, maintain water levels, prevent weeds and clear ground ready for planting. Mulch is a material that is placed on the surface of the ground, like a blanket, and protects soil from erosion and weeds. Natural mulches will also provide decomposing organic matter which will add nutrients to the soil.

There are different types of mulch you can use, and each is appropriate to different situations:

Cardboard – this is free as it's often a waste product. It will last for a growing season and it's biodegradable.

Newspaper – again a waste material which will biodegrade. You will need to use quite a few layers to prevent weeds growing, and keep it weighed down.

Woodchip – you may be able to access free woodchip from your local authority or from a tree surgeon. It works well for paths and can be used in combination with cardboard or newspaper to be more effective.

