



Healthy Soil Happy Harvest

Nutrients and Plant Needs

There are 3 nutrients that are especially important in the garden:

- *Nitrogen*: for healthy leaves - our atmosphere is mostly composed of nitrogen, but most plants cannot access this, apart from nitrogen fixers (e.g. pea family)
- *Potassium*: for strength, immunity, and general physiological functioning
- *Phosphorus*; for cell division and growth in roots and shoots, especially in seedlings. Also for flower and fruit formation.

However, a broad range of nutrients is always best, and if a soil also contains plenty of trace elements (e.g. boron, magnesium) then veg will be healthier and tastier.

Fertiliser:

In a very basic sense, then, we can address these needs by applying a feed that is high in the 3 key elements of potassium, phosphorus and nitrogen, plus some trace elements. For example, a nettle or comfrey tea, or manure or compost. With these fertilisers, the nutrients that were in the nettles, comfrey, or ingredients that broke down into compost, are made available to our plants.

Fertiliser Tea Recipe:

1. Cut and chop some nutrient-dense leaves (e.g. comfrey, nettles, or pernicious weeds) into a hessian sack or an old pair of tights and tie shut.
2. Place this into a bucket and cover with water (the ideal ratio is 20:1 Water:plant)
3. Place a weight on top of the plant matter to keep it under the surface
4. Put a lid on the bucket and leave for 6 weeks to decompose.
5. The resulting liquid can be used directly on plants.

An Ecosystem Perspective:

Plants absorb nutrients through their roots, and are massively aided in this by bacteria and fungi in the soil, which are decomposers and recyclers of nutrients. Through photosynthesis, trees produce sugars, which they exude through their roots. Fungi soak these sugars up, swapping them for nutrients like nitrogen, phosphorus, trace minerals and even water. Similarly, without bacteria continually eating nutrients (and one another) and excreting them, minerals would simply wash out of the soil. So having a bacteria-rich soil ensures nutrients stay in the soil so that plants can access them. This is one reason why pesticides are so damaging: when we kill the life in the soil, we damage the soil's ability to hold on to nutrients.



So, when thinking about plant health, we really need to think about ecosystem health first and foremost. Fruit trees, and other woody plants, evolved in forest-edge ecosystems. Every year in such systems, carbon-rich woody branches and tree leaves fall to the forest floor, feeding soil life dominated by fungi. These fungi decompose the wood and leaves that fall, and transport nutrients between plants and trees, ensuring the ecosystem is healthy and balanced. Grazing herbivores and birds also fertilise these systems with manure.

Leafy vegetables, salads and herbs mostly evolved as meadow and/or forest clearing plants. Every year in these ecosystems, nitrogen-rich leaves die back and fall to the ground, or are eaten by herbivores who then fertilise these ecosystems with their manure, feeding a soil food-web dominated by bacteria.

Mulches

A mulch is any material we place on top of the soil. Its functions are to:

- Suppress weeds - if a thick (2-3") layer of mulch is applied, weeds will struggle to grow through this, and those that do will be more easily plucked out.
- Aid in water retention - the mulch forms a lid on the soil, water is able to trickle through the mulch to the soil beneath, and when it is sunny the mulch and not the soil it covers will dry out.
- Feed the soil and enhance soil life - the nutrients in the mulch will be broken down by fungi and/or bacteria, allowing plants to access them.

Note that not all mulches will do all three of these. Plastic weed membrane, for example, will suppress weeds but will not feed the soil or encourage soil life, as it will not degrade.

For woody plants used to a forest-edge ecosystem, we would add woodchip, tree leaf mold and/or manure as our mulches, as these are an echo of the branches, leaves, and manure that would have fallen at the base of trees for millenia, and will encourage a fungi-rich soil to develop.

For softer herb and vegetable plants we would mulch with 'green' materials e.g. grass cuttings, manure, compost, or the leaves of fertilising plants like comfrey.



These mirror the meadow ecosystem, and will encourage a bacteria-rich soil to develop, and give the plants the nitrogen they need.

Other Allies

For plants to be able to send roots through the soil, the soil needs to be as free as possible from compaction. Again, soil life is key in this - especially earthworms. Mulching can encourage earthworm activity by providing food for them. The soil life is delicate - digging over the soil will kill it.

Lastly, there are plant allies that will help other plants. In particular, the legume family (e.g. peas, beans, clover) are able to fix nitrogen from the atmosphere into the soil, making it available to other plants. These can be grown as a 'green manure' - i.e. a living mulch - around other plants, or as a cover crop (a plant grown on its own during a fallow year of a crop rotation). By cutting them back each year we can prompt their roots to release the nitrogen they have captured before they re-grow.

Similarly, there are tap-rooted plants capable of digging deep into the soil to bring up trace minerals to the surface (e.g. comfrey). Similarly, the leaves and stems of comfrey can be cut back, prompting its roots to release nutrients for other plants - we can also use the cut leaves to mulch with.

In addition, just having roots in the soil encourages soil life, as many bacteria and fungi live around plant roots. All plants are also engaged in capturing carbon dioxide from the atmosphere, and pumping carbon into the soils, building organic matter. Lastly, when soil has no roots in it, it can be washed away very easily, especially over winter.

The best ways to enhance and protect soil life are:

1. Don't dig, plough, or turn your soil - this kills soil life
2. Try not to step on your soil, as this will compact it and kill soil life
3. Try not to leave much bare soil - use living plant allies
4. Use a mulch!

Compost

Adding your own compost to your garden is a fantastic way of injecting nutrients and soil life into your soil. There are thousands of resources on compost making out there - do some Googling and get started!



Pest Control

Healthy ecosystems feature a diversity of plants, animals, bacteria, fungi and insects. This web of living beings are helping and hindering one another, and overall we see things balancing out. A pest might move in, but soon enough a predator will arrive to eat the pest.

This is useful to hold in mind when gardening: diversity is our friend. Planting a wide range of crops and of beneficial, insect attracting flowers is a good way to go. If we plant a monocrop, there is a risk we've planted one big food source for a pest! We can spread the risk out by planting numerous crops. We can then try to mitigate the dangers pests present by planting flowers that attract insects that predate on those pests. Here are some super useful, predator attracting flowers to have in the garden:

Carrot-family (e.g. yarrow, wild carrot, hogweed, lovage, dill, fennel, ground elder, coriander): Great for attracting red soldier beetles (aka the Hogweed Bonking Beetle!), which eat aphids, and whose larvae eat slugs and snails. Also attract lacewings and hoverflies, which eat aphids. Lastly, great for attracting parasitic wasps, which feed on larvae of numerous pests. Yarrow especially attracts a vast range of insects.

Scotch Marigolds: Attract hoverflies, parasitic wasps and lacewings

Lemon Balm: Hoverflies, Parasitic wasps and tachinid flies, which eat caterpillars

Tansy: Lacewings, tachinid flies and parasitic wasps

Poached Egg Plant: great for attracting hoverflies

Nasturtiums: These attract aphids, which may not seem a great idea but they can distract the aphids from your prize veggies!

Wild-flower Mixes: I'd recommend Scotia Seeds wildflower mixes. You want native flowers, preferably perennial if you don't want to have to re-sow every year. Just remember to mow once/year (usually in early spring before the new growth begins) and rake away the mowings. You could also just leave a patch to grow wild and let dormant seeds in your soil come up. Many 'weeds' are really beneficial for wildlife. You could then add some wildflower plug plants into this patch if you want specific species in there.

Dig a Pond: this attracts frogs (which eat slugs) and many other beneficial insects.