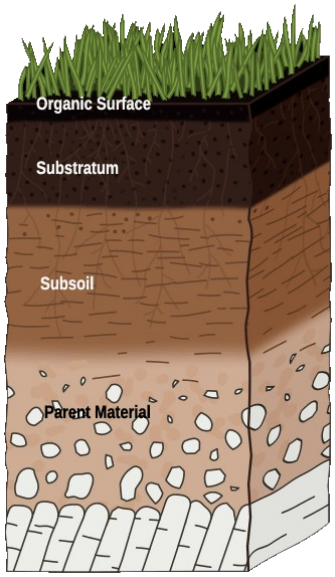
Soil Additives

When it comes to soil, it's very important to know if you want to grow flowers or vegetables. Flowers – especially perennials – are available for nearly all soil types, locations, and conditions. Good perennial shops usually ask what conditions the buyer has and then create a suitable offer. The right flowers in the right place will thrive. This is especially true for native plants and wildflowers.

Vegetables are different. As cultivated plants that have been bred for centuries, they are standardized to thrive in "rich, deep, loose" soil. However, this type of soil is not available everywhere. Therefore, various additives are introduced to help create such soil.



Schematic structure of a garden soil

according to Wikipedia,
Author: Thomáš Kebert & umimeto.org

The key point is the formation of humus. This process involves earthworms, snails, woodlice, various small organisms, fungi, and soil bacteria. All efforts in developing a fertile vegetable soil should focus on promoting this "soil fauna." Only when in balance healthy vegetable-growing soil can develop. The most important addition for this purpose is, of course, compost, whether homemade or sourced from a certified compost plant (be sure to pay attention to this quality label!).

It's also simple if you have a lawn that hasn't been treated with herbicides: Both the moss from scarifying and the grass clippings used as mulch promote humus formation. Grass mulch also has the advantage of being a favorite habitat for earwigs, where they raise their young: They eat everything smaller than themselves, especially aphids, and are often fed to birds.

The goal should be to have healthy soil that is rich in humus and life, where healthy vegetables can grow.

Here I present some additional additives with which I have my own experience – in unsorted order:

- ## Sand

  It is often suggested to mix sand into heavy (clay) soils. However, the oldest mortar used for building houses was made from clay and sand, which became rock-hard when dried.
  Here's a recommendation how you can still use sand:

  To improve heavy soil, one uses what is called manufactured sand.

  > Manufactured sand is also known as artificial sand and is generated through the crushing and screening of rock products. It provides a sustainable solution to the scarcity of river sand. It can range in size but typically passes through 7mm or 5mm screens.
  >
  > https://www.mekaglobal.com/en/blog/what-is-manufactured-sand

  The manufacturing process not only preserves natural sand deposits, but also creates grains with edges and grooves where soil organisms can settle. The edges provide better support for fibrous roots compared to round sand grains (like river sand or aquarium sand).

  Application: Mix sand in a ratio of 1:5 evenly with finely sifted dry compost and spread the mixture a few centimeters high on the bed that needs improvement. Use a long-toothed rake (or a similar tool) to work it into the top layers of soil.
  Then, either sow seeds or plant in the bed right away and cover with mulch to prevent UV damage.

Cocos

In the past, gardeners used large amounts of peat, both in the soil and as a moisture-retaining layer. Besides the destruction of peat bogs that contributes to climate change, peat has some downsides as well. Here are the benefits of coconut fibre:

Coconut palms were used in the past for three main purposes:

- The fatty flesh of coconuts was turned into coconut oil;
- The shells of coconuts were used as fuel;
- The soft fibers from immature coconuts were made into nets and mats.

The woody fibers from mature coconuts were considered waste, which was either dumped into the sea, disposed of, or burned.

A few decades ago, people started grinding this material and using it as a peat substitute. It has different names: Wikipedia refers to it as "coco peat," while in stores it is also called "coco soil" or "coco block," since it is usually sold as a dry block.

Benefits of coconut soil (100% coconut):

- Rapidly renewable resource,
- Retains moisture well,
- Does not acidify the soil (for use in moor beds, coffee grounds can be mixed in),
- Draws less moisture from the surroundings when well-watered before processing.

Drawbacks:

- Long transport distances (using heavy oil-burning ships),
- Requires additional nitrogen as it is a wood material (e.g., horn shavings).

Since coconut palms often grow near the coast and ripe coconuts fall into the sea, cheaper coco peat may contain salt that can harm plants. Therefore, always check for labels stating "salt-free," "washed," or "suitable for hydroponics!"

For several years, there is sold a mix with neem cake, which is another byproduct, available as soaking pots or pressed soaking discs. They are made up of 90% coco peat and 10% neem shells. Due to neem's effectiveness as a plant protection agent, they are especially useful for growing young plants indoors, as they prevent fungus gnat infestations. I do not use them in the garden because of neem's insecticidal characteristics.

Wood in the form of chips or shavings, bark mulch, garden fiber, biogel

Such additions can be beneficial for humus formation if a few things are considered.
Here are the detailed explanations:

A few years ago, I read the following story: A young scientist was researching with crickets. For collaborative work, he moved in with a Canadian colleague for a while and brought his animals along. However, after three weeks, all the crickets he had brought from Europe suddenly died.

The reason found after a difficult search: He used paper rolls for the cricket habitats just like at home. However, the Canadian paper contains a toxic substance that comes from Canadian coniferous trees and kills European crickets.

This episode highlights the importance of knowing the source of wood and wood products. Both Canadian and tropical woods can contain substances that are toxic to Central European animals and plants. The bark and wood of some native European trees also have compounds to repel pests (e.g., tannic acid). In a gardening group on Mastodon, a woman shared that she had to dispose of all her tomato plants with fruit: she had mulched with clippings from the (toxic) cherry laurel and became ill after eating the tomatoes.

On the other hand, in some exceptional cases, the toxic effects can be beneficial: using privet clippings around fruit trees can prevent some pests from climbing.

Wood consumption during decomposition requires a lot of nitrogen, which can reduce overall soil fertility without additional inputs like horn shavings. Therefore, wood is generally only suitable as a soil amendment to a limited extent. If you have wood chips from non-toxic native trees (like maple or hornbeam), you can use them in the vegetable garden to cover the paths between the beds.

For several years, there has been a product called "**garden fiber**", which is a wood product used for soil improvement and mulching. It supposedly does not consume nitrogen. However, the bags should not be left outside during winter: if moisture gets in, by spring, you will have no fibers left, only high-quality humus. This shows how this material behaves. It is particularly suitable for flower beds, where mulch made from cuttings is simply not attractive. (One market variety is even called "rose mulch")

Another soil additive developped in Austria and derived from wood is "**Agrobiogel**," a pudding-like substance made from lignin. It is purchased as a dry granule and mixed with water. It enhances the soil's water retention but decomposes into humus over a few years (unlike synthetic gels based on plastics).

In my experience, due to its cost, it is only suitable for specific uses. I use it for pot and container plants that require constant moisture, such as camellias and myrtles. Additionally, I mix it as a rooting aid in planting holes for berry bushes; after the initial watering, they manage on their own and develop deep roots quickly, which is not the case with continued surface watering.

Lava granules, expanded clay

What bonsai growers have known for decades about the benefits of fine lava granules should also be utilized by hobby gardeners. Expanded clay is often used for hydroponics.
Here are a few remarks:

Lava granulate is ground stone made from volcanic lava. In Germany, it mainly comes from the Eifel region. It is a natural material that is simply ground and possibly washed. No additional energy-intensive treatments are required. Lava has a porosity of over 50%, making it lightweight and usually reddish-brown in color. Its porosity gives it the unique ability to retain moisture within the granules. Therefore, fine lava granulate (grain size up to 3mm) is particularly suitable as an additive to potting soil. In the bonsai field, it has been successfully used for over 30 years. It is also effective for emaciate purchased (often over-fertilized) potting soil. Additionally, its sharp edges help inhibit the development of fungus gnat larvae in flower pots. Coarse lava granulate (grain size 2-8 mm) is ideal as a mulch material on the surface, for example, on tree discs.

Both are similar in that they undergo slow weathering, making them a source of minerals for the soil. Their porous, open structure promotes the colonization of suitable soil bacteria.

For hydroponics, a substrate made of lightweight stones with a smooth surface is required. **Expanded clay** has proven effective for this purpose. It does not store nutrients and is otherwise neutral in behavior. However, it is less suitable for gardens and not recommended due to the high energy consumption during its production.

What about the **stones** that are naturally found in the soil? They mainly interfere with the cultivation of carrots, radishes, and other root vegetables. However, they also play a valuable role in keeping the soil loose. Additionally, they undergo natural weathering, which continuously releases trace elements. A wise gardener once said, "Stones are the bones of the earth." Where no tools with sharp edges like plows are used, they do not cause harm. My suggestion: Remove them from the beds and collect them in the paths in between. There, they can have their positive effect without causing disruption.