

Improving Soil

Plants, like all living things, need adequate food, water, and air to grow. Feeding your plants the proper nutrients and supplements will greatly enhance growth, however, supplementing their water, oxygen and carbon dioxide supply is also important. Soil intervention may greatly improve your crops access to water, air, and nutrients and ultimately aid in grow and enhance production.

Know your soil

The first step when amending soil is to understand what type of soil you have, its advantages and what common issues are associated with that soil type. All soils are a combination of different particle sizes, but the proportion of those different sized particles can drastically alter the properties of your soil. This is referred to as the soil texture and is categorized by the proportion of sand, silt, and clay.

The terms sand, silt, and clay refer to the particle size of the soil – sand particles are the largest of the three and round, whereas clay is the smallest and is thinner and flatter. The differences between these particles will determine the characteristics of your soil.

Sand particles are large and round – creating large pores or cavities. These cavities fill with air, offering the plants an abundant supply of oxygen and carbon dioxide. However, since the cavities are so large, water cannot be retained in them, making sandy soil fast draining and predisposing plants to drought.

Clay particles are very small and flat, which allows them to pack together tightly. This means water is unable to travel very quickly and is retained in the soil - a clay soil will not need to be watered as frequently as other types. However, since the particles pack tightly together, clay soil may be compacted – the soil particles are so tightly clumped together that there are not many cavities. This can not only suffocate the plant as not enough air is reaching the roots, but can also hinder root growth and earthworm movement through the soil, which may have other devastating effects on the plants.

Most soils are a mixture of sand, silt and clay, and the overall properties will be dependent on which particle size makes up the majority of the bulk.

How do I know what type of soil I have?

An easy way to determine the texture of your soil is to feel it with your hands. Take a small handful of soil and drop water on it until it is wet enough to form a ball. If the soil is sandy, when you rub it between your fingers it will feel gritty. Conversely, silty soil will feel floury when dry, but greasy when wet. Also, if your soil has a majority of silt particles, the soil will form a ball when wet, but if you try to roll it into a thinner cylinder, it will crack. Finally, clay soil feels greasy even when dry, will form a ball when wet and does not break when you roll it out into a long ribbon.

Amending Soil

While the soil texture cannot be altered, the soil structure can be amended. The structure of the soil refers to the arrangement of the sand, silt, and clay particles and can overcome some of the downsides of the different soil textures. Good soil structure reflects a variety of pore spaces in a variety of sizes. Ideally, over half the soil volume would be empty spaces between soil particles, filled with air and water.

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Poor quality soil cracks and dries out during hot summer months, and standing water may be seen on the surface after a heavy rain. Additionally, digging holes in your soil should be easy when soil is both wet and dry; a poor soil will be compacted, making it difficult to dig.

How do I tell if I have good soil structure?

Desirable soil structure is granular or crumb-like soil with large aggregates. These soils will appear loose and fluffy when manipulated.

Soil **aggregates** are clumps of soil, held together by root hairs, bacteria exudate and fungi.

Aggregates, and in particular, water-stable aggregates are important for soil health as they allow the soil to resist severe weather conditions – for example, they keep the soil from compacting during heavy rains or cracking during drought.

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How can I improve my soil structure?

Organic inputs and biostimulants may improve soil structure. Additionally, reducing tillage may allow aggregates to form and be maintained, as repeated tillage can break down the aggregates and reduce soil tilth – the suitability of the soil for growing crops.

The addition of organic matter to soil can improve the water-holding capacity, enhance nutrient supply, and supports soil microorganisms. Organic matter encompasses a large variety of substances that may be added to soil, and includes plant and animal matter and microorganisms. These may be added in order to alter the physical properties of the soil to benefit plant growth.

Soils rich in organic matter are dark in colour and have a rich, earthy smell. Also soil should have no standing water – the water should be absorbed into the pore spaces between the soil particles. Finally, if you rub the soil between your fingers, it should appear to contain crumbs, or aggregates. If your soil ever smells sour, it may be a sign of poor air circulation or compaction and is a signal that your soil needs additional organic matter.

Both fresh and composted organic materials may be used to amend soil – each has its own set of advantages and disadvantages. Fresh material provides greater nutrients for soil microorganisms, however composted materials will persist in the soil for longer periods of time and is less likely to carry plant diseases. If sawdust or other woody materials are used as organic material, plants should be supplemented with nitrogen to prevent any deficiencies.

It is a misconception that adding sand to clay soil will enhance its water carrying capacity. Even though it is true that increasing the proportion of sand would offer enhanced soil texture, mixing sand directly into clay can be very detrimental. The clay can stick to the sand particles creating a cement-like substance. Instead, a sandy loam soil can be used in place of a portion of the existing clay.