

10 Ways to Massively Improve Your Soil

What to Consider for Making Fertile Soil for your Garden, and Why

Growing in poor soil is no fun. Char Bro Ltd helps you improve your soil so you can enjoy big, juicy harvests and share them with your friends.

The Soil Supermarket

Where do you find big, juicy fruits? For most people, it's at the supermarket. But did you know that your plants need their own supermarket in the soil?

With care, practice and this Soil Improver Guide, you can discover how you can make your soil into a Soil Supermarket that feeds your plants, so your plants can feed you 😊

In this Guide we will go over the main parts of the Soil Supermarket, and you will find tips to can make your soil into your very own Soil Supermarket!



1. Improve soil structure - The floors, walls and roof of the Soil Supermarket

Like a building starts with the frame, plants need their solid materials for their roots to grow into before they can enjoy their soil supermarket.

For soil, these materials are a mix of very small pieces of rocks, or dead plants and other organic materials.

Soils rich in organic materials like humus will have a rich, dark, chocolate cake colour.

Soil maker tip:

Use a mix of sand, silt, clay, biochar and compost in your growing mix to provide structure for your Soil

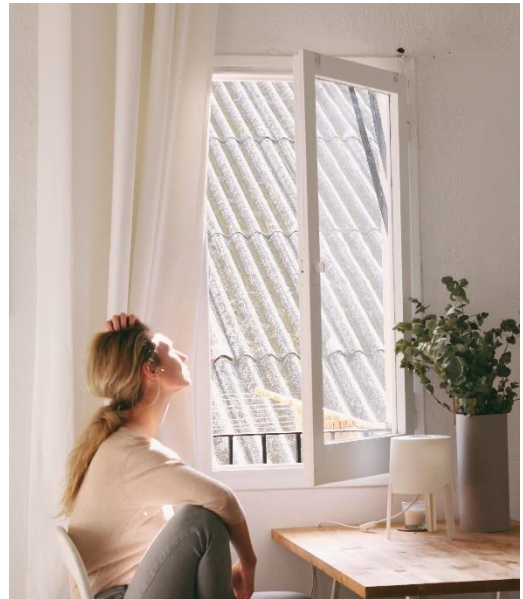
2. Improve ventilation for the Soil Supermarket

When your house is stuffy, you air it out. Just like you, your plants and soil need plenty of fresh air to survive and thrive.

Most plants for home gardens have adapted to soils that have a mix of solid materials, air and also water. Like us, plants need some water, but not too much.

Over time, standing on or watering soils which aren't covered with mulch will compact your soil. This stops the healthy flow of fresh air, so everything inside the Soil Supermarket stops breathing. Not good. Some soils can become so compacted that even plant roots can't get through these layers to get the nutrients and anchoring they need.

Your soil supermarket needs water, but also drainage and ventilation to have the right balance between water and air in the spaces between the soil crumbs. Good drainage means there's connected spaces for air and water to move around in the soil to keep things fresh. A good soil will be over 50% open space inside and between the solid soil materials. A fluffy, ideal soil can have over 70%!



Soil maker tips to keep the soil ventilation open:

1. Open up the soil with a garden fork before planting
2. Try to avoid standing on areas that you want to grow plants, and maintain a layer of mulch over your garden beds in to help prevent compaction
3. Apply thin top-ups of compost at least annually to keep your living soil aerators like worms happy and well fed

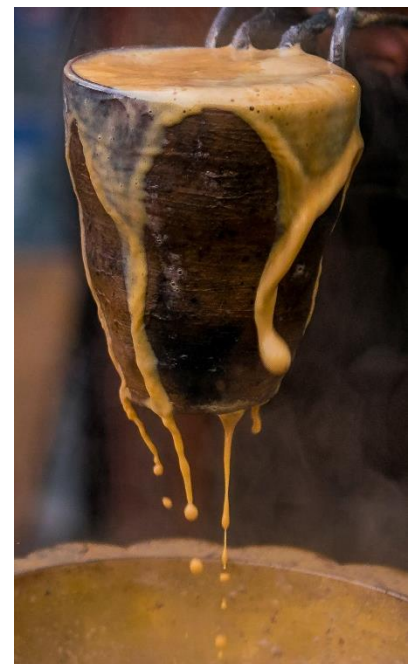
3. Improve the water tank for the Soil Supermarket

A healthy Soil Supermarket is a lot like a big spongy tank - able to hold lots of water for plants to access when they want, but doesn't stay waterlogged for more than 2 to 3 days after each mini flood from heavy rains.

After air, water is the most important ingredient for growing plants. Water dissolves nutrients in the Soil Supermarket which can then be used by the plants to help them grow well. Your plants will need much more water than nutrients because plants use water as an ingredient to help them grow, and also to help lift the nutrients up to the growing parts at the tops and sides of the plants.

Soil Supermarkets with lots of clay can struggle when rains come, because the waterlogged soil stops the air needed to keep soil life and plant roots happy. Air provides access to materials that plants need to thrive. When parts of the soil become waterlogged, plant growth can slow down or stop in that area.

Many common plants prefer free draining soil, so it's really important to get this right.



You can check drainage yourself by digging a spade sized hole in your yard and half filling it with water. If the water doesn't drain much over 2 days, you will need to think seriously about improving your soil so you have good drainage around your plant roots.

Many sandy or rocky Soil Supermarkets struggle to keep the water that falls onto it. This is because the water quickly drains through the gaps between the soil particles like a sieve, and there's not much in the soil that the water can stick to.

Soil maker tip:
aim to create a Soil Supermarket that is free draining, yet still retains plenty of plant-available water

4. Be aware of pH's influence on your Soil Supermarket

The pH value of a substance measures how acid or alkaline it is. The pH varies from 0 to 14, with very strong acids having low pH of 0 (zero) to very strong alkaline substances with pH of 14. A pH of 7.0 is neutral. Inexpensive pH test kits can be useful when you're just starting out

Most plants prefer a slightly acid soil, around pH 6.0 to 6.5, but can survive in other conditions with the help of soil microbes. pH is most important when starting and growing seedlings, many of which prefer a pH of 5.5 to 6.5.

To start off, the pH of your soil will be determined by the existing minerals in the soil. Then as time goes on and you look after the beneficial microbes and insects in the soil, they will help to keep your soil around at a good pH, so you won't have to worry about this so much then.



Soil maker tip:
Be careful to no overdo the use of liming materials or fertilisers, especially when making seed raising mix

5. Improve soil fertility - the food shelves in the Soil Supermarket

If nutrients are the food for plants, then soil fertility is the shelves where you stock the food.

A very fertile soil can hold on to lots of nutrients without them being washed away and lost when it rains. This means that more nutrients are available on the shelves for the plant when it needs them, leading to happier, healthier plants with more complete nutrition.

This is where is can get technical. Fertility is measured using CEC¹ and ASC². You can compare the different CEC values for different soils using the following table. Higher CEC and ASC means more shelves to stock nutrients in your Soil Supermarket. Who loves free food? Your plants certainly do.

¹ Cation Exchange Capacity (CEC) can be used to estimate the amount of positively charged nutrient ions that can be held by the soil for a given mass of material

² Anion Storage Capacity (ASC) is very similar to CEC, but for negatively charged nutrient ions. A high ASC will help make P (phosphorous) more available to plants. With high CEC of up to 200+, biochar has been shown to increase P availability in soil by a factor of 4.6

Table 1: CEC values for different soil ingredients and amendments

Material	CEC
Biochar + loam + compost	Up to 200+
Biochar	30-100+, increasing as it ages
Pure compost	6 - 110
Clay	30 - 50
Loam: sand + silt + clay)	15-25
Coconut coir	6
Sand	2-4

6. Consider going organic – introduce an Organically Grown section in the Soil Supermarket

Many home gardeners prefer soil ingredients that come from organic sources, and people commonly talk about how tasty and satisfying organic food is. With care, you can get good yields that are comparable or better than other growing systems.

Organically grown food, fibre and ingredients are grown using naturally occurring materials without a lot of synthetic nasties. Many organic certification schemes also require suppliers to measure contaminants in the soil as well as plant and animal products to ensure they are at safe levels.

Note: there are such things as "organic" pesticides. There can be residues of these pesticides present in organically certified composts that have not yet been broken down by soil microbes. It's best to ask about residues, and test small amounts before buying in bulk from new suppliers.

7. Work with your Soil food web – the workers stocking the shelves of your Soil Supermarket with plant food

Did you know that your Soil Supermarket even has workers stacking the shelves with plant food?

Your Soil Supermarket is home to a tiny ecosystem of many different kinds of beneficial microbes and insects.



The soil life works helps by:

- mining nutrients from rocks,
- breaking down organic materials,
- recycling the nutrients into plant-available forms,
- gluing soil particles together so they don't wash away and
- increasing stores of organic material and CEC of the Soil Supermarket, whilst boosting water holding capacity

Beneficial microbes also help increase the resilience of plants by doing cool things like increasing germination and growth rates and some can even increase resistance to frost! Cool huh?

8. Aim for replete nutrition – feed your plants from the shelves of your Soil Supermarket

Plants are picky customers in your Soil Supermarket. They only use certain types of dissolved, plant-available nutrients. Once you can read the different types of plant stress, you can then spot deficiencies and make sure that you are feeding your soil. Your soil can then feed your plants, and your plants can then feed you!

Some plants need more or less of each nutrient, but all plants need the following nutrients to thrive:

Main nutrients	Mainly Absorbed As	Trace Minerals	Mainly Absorbed As
O - Oxygen	H ₂ O (water)	Cu - Copper	Cu ²⁺
C - Carbon	CO ₂ (from air)	Cl - Chlorine	Cl ⁻
H - Hydrogen	H ₂ O (water)	Fe - Iron	Fe ²⁺ , Fe ³⁺
N - Nitrogen	NO ₃ ⁻ or NH ₄ ⁺	Zn - Zinc	Zn ²⁺
P - Phosphorous	HPO ₄ ²⁻ or H ₂ PO ₄ ⁻	Mn - Manganese	Mn ²⁺
K - Potassium	K ⁺	Ni - Nickel	Ni ²⁺
S - Sulfur	SO ₄ ²⁻	Mo - Molybdenum	MoO ₄ ²⁻
B - Boron	H ₂ BO ₃ (not an ion)		

With practice you can learn to spot the visual signs of nutrient deficiencies by looking at your stressed plants, comparing them with photos of nutrient deficient plants in online guides and getting people to help you check to be sure. Gardening groups are great for this.

The workers in your Soil Supermarket will naturally provide sufficient amounts of many of the necessary nutrients, but you may need to supplement that with extra plant nutrients as composts, manures, seaweeds, fertilisers and other preparations.

A word of warning – like people, plants only need a small amount of nutrients at a time, and will suffer if over-fertilised. Think of fertilisers like salt: it is better to feed a little and often than to over feed.

9. How Biochar Helps Your Soil Supermarket Thrive

Biochar can be used as a replacement for many soil ingredients and amendments.

Biochar helps to:

- open up clay soils and increase moisture holding capacity of all soil types
- increase nutrient retention. Like a good cheese, the biochar helps your soil becomes more and more fertile over time
- provide moist, aerated refuges in the soil for roots and beneficial soil life to thrive
- keep soil temperature within the optimum growing range for longer through helping to warm the soil surface, and also cooling when required through evapotranspiration
- Keep pH balanced by helping to neutralise very acid soils
- Encourage production of humus

10. Applying your learnings from this guide to make your own Soil Supermarkets

You now know the fundamentals about making and improving soil so your Soil Supermarket can feed you with big, juicy fruits.

The next step is to set a date for when you will be planting into your Soil Supermarket, and start getting everything ready.

Check out our handy checklist below for what you will need to improve your soil
Equipment and supplies required

For planting into containers

Supplies

- Plants
- Containers
- Planter pot or indoor plant mix
- Biochar
- Mulch
- Duff from a local old growth forest (optional)

Equipment

- A scoop, trowel or shovel for shovelling soil
- Gardening gloves (optional)
- Dust mask
- Container or hose for watering in

For planting into open soil

Supplies

- Plants
- Garden bed edges (optional)
- Compost
- Clay (optional, if your soil is very sandy)
- Biochar
- Mulch
- Duff from a local old growth forest (optional)

Equipment

- tape measure to measure how much material you need
- spade
- sturdy garden fork or broad fork
- Gardening gloves (optional)
- Dust mask
- Container or hose for watering in

Now you know about soil making, do you want to take your soil to the next level? Looking for specific recipes for your situation?

Contact Char Bro Ltd using the details below to order your biochar and get **free advice** to improve your soil today, so you can enjoy big juicy fruit from your Soil Supermarket:

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