

SOIL

Why do we need it for plants?

- A** TO GIVE SUPPORT
- B** TO FEED THE MICROBES AND TO SUPPLY NUTRIENT TO PLANTS

A: Support - roots travel through it to allow plant to keep upright, prostrate or other: needs to have some specific qualities

B: Nutrient supply is far more involved.

A Water holding : inert lumps - eg scoria, perlite, bark, pebbles as in hydroponics and orchid growing - these are not for us today.

: sandy soils - will hold moisture fairly well: the surface will dry quickly but will often wet easily too

: clayey soils - will stay wet too long and often set like rock when dry; it may crack wide apart and be slow to rewet. Compacted soils are difficult for the roots, water and air to penetrate.

We need an in-between condition!!

How???

We need to add material which will hold moisture in the sandy soils and, for the clayey soils, to keep the fine clay particles separated, not as impervious lumps. We need to add organic materials like composts and manures. Compost is mostly plant materials which have been modified by bacteria to a safe mass of fibres, nutrients, water, bacteria, fungi and other microscopic organisms plus, probably, living animals eg worms, insects, grubs, spiders, mites, etc. In fact anything that once was alive can be used to make compost but meat tends to attract vermin and if not, to stink. Good compost smells of earth and nature - lovely. Details for making good compost are on a separate note, see below,

The compost in soil acts as a holder of moisture, and as a wick to help water penetrate into the ground. It feeds the worms, bacteria, fungi and all the rest of the livestock in the soil. The bacteria particularly convert the fertilisers, the animal manures, the minerals in the soil - nitrates, phosphates etc - into a form that can enter the root system of the plants we are trying to grow (and the weeds too, unfortunately!). The worms and other biota (a fancy word for living things) aerate and enrich the soil and also supply tunnels for the water to penetrate. Both aeration and moisture are essential to keep the roots in good condition just as much as the nutrients - so Compost, Compost, Compost. Worms will drag down into the ground fine particles of mulch too; another benefit, so soil teeming with worms and living organisms is what we need to achieve.

Acidity

pH is a measure of the acidity or alkalinity of the soil. The ideal range for the vast majority of plants is slightly acidic ie less than 7. Different elements have different availability to the plants depending on the pH; some elements will be virtually unavailable at one pH but perfect at another; others will become toxic at some pH levels but essential at others. The best band is between 6 and 6.5 except for the minority of plants which have evolved in alkaline soils.

As minerals are used up by plants or rain and excess irrigation leaches them away, soil becomes more acid. Nature supplies material in the form of mulch, compost, manures, etc. to counteract this change. This occurs in rainforest and deciduous-tree forests, especially. One problem due to the Fire regimes of the aborigines over thousands of years is that for large areas of the country the oily-leaved eucalypts, etc, became dominant; the other trees being killed by the fires except in gullies and wetter patches. Eucalypt leaves are slow to rot down and, as leaf litter, burn easily and in doing so damage the upper zones in the soil destroying its life. This has resulted in our soils continually tending to acidity - at my place 4.5 to 5.5. Plants which prefer acid soils like azaleas, rhododendrons, camellias, tomatoes, but even then not much less than 5.5. NB Worms dislike acid soil; ants enjoy it. If you get little mounds of soil come up in your lawn, the cause is ants and acid soil.

I can 'sweeten' the soil ie make it less acid, by adding mulch/compost etc and also by spreading an alkali. The composts, manures and mulches will reduce the acidity very slowly; alkalis act more quickly. The easiest and cheapest alkali to get is Lime. Two types (at least) are available - slaked lime and ground limestone, both supplying calcium. Slaked lime (Builders' lime) gives a rapid belt of alkalinity which I think is too strong for general use. I prefer ground limestone (Agricultural lime) which changes the acidity more slowly and the pH change is easier to control. The suggested amount of ground limestone is 200 to 300 gm (low end for sandy soils) per sq m to change the pH by about 0.5 when well mixed into the surface. If the pH in your garden is 6 or lower, I suggest that one dosing at half that rate is done. After two or three months, retest the pH and continue dosing if still too acid. Note - it is more difficult and expensive to bring an alkaline soil back to slightly acid. pH testing annually is probably a good thing but tends to be forgotten! The only time I use slaked lime is when preparing a new garden bed. My procedure is: after forking over the ground I spread Blood and Bone, slaked lime, compost, Multigro or similar (a long-term, prilled fertiliser), gypsum, perhaps chicken manure pellets too. After a light turning-over to incorporate it all, I water the bed and leave it to 'mature' for a couple of months. NB some of the common artificial fertilisers acidify the soil - Ammonium nitrate for example; I suggest you use it sparingly.

Dolomite is often called Dolomite lime and is suggested as an alternative to Limestone. Dolomite has magnesium present as well as calcium. An excess of magnesium is toxic. In this area the level of magnesium naturally in the soil is adequate so using Dolomite may cause problems.

Compaction and Pores

Water and air penetration into the soil can have its problems. Mulch on the surface reduces the loss by evaporation. It also protects the soil from the

force of falling raindrops compacting the surface and closing up the small cracks and dips in it. The old practice of hoeing weeds is very good as it loosens the surface and allows the rain and air to penetrate more easily (as well as lifting the weeds so they dehydrate and die). Mulch keeps the water available for a longer time. If the soil has become compacted air cannot enter the soil sufficiently. Except for a few aquatic plants, air around the roots is essential to plant growth. Waterlogged ground will kill roots; hard-packed soil will too. Clays have problems due to the particle size. The particles stick together and make the plants work hard to penetrate them. There are ample nutrients in clay but they are difficult to get at. Gypsum has the property, without changing the pH, of making the clay particles form smaller and less dense clusters. These crumbs allow the roots to penetrate and to let in the water and air so necessary for good root growth. Too much rain or irrigation can be a problem. Soils which have been 'worked' when wet or walked on say when picking flowers or collecting vegetables can become too hard a) for the roots to breathe and b) too hard for the roots to penetrate. The solution is gentle forking, placing stepping stones in the bed, waiting for the ground to dry, adding gypsum to the surface and incorporating it OR making the soil ideal for the myriad of creatures which will live in it if the conditions are right and which will loosen it up again with time.

B Feeding the Soil life and Plants.

Dug-in compost feeds the microbes and worms; there are few other ways of achieving the same objective. Worms in particular give huge benefits to the productivity of the ground. Increases of 200% of vegetables have been noted merely because worm population had been increased. Worms digest the soil, make the minerals available, loosen the ground and provide tunnels which allow air and water to penetrate, mix the compost and minerals, and finally die and feed the plants with their bodies. At one time farmers believed worms ate the roots of their plants and should be eliminated. We know better now, they only eat dead roots. Worms should be pampered - they will work hard for us if we look after them.

Worm wee is the liquid which runs out of worm farms and in a diluted form is poured onto the surface using say a watering can; it acts as a wonderful feed. Worm farms are simple to run. The equipment can be bought from our Council (still?) but any large container - garbage bin, bath, plastic drum - can be converted. It must have drainage holes, be up off the ground (to allow collection of the worm wee), out of the sun. Buy or beg some worms, add kitchen scraps, shredded paper, animal manure, also anything usable in a compost heap but in smaller particles (by use of an old blender?); keep it moist not wet. The worms convert it to a dark mass of bacteria and nutrients. The solids are great added in small quantities to the fill material when planting shrubs etc.

Liquid fertilisers are also poured onto the surface. They are easy to produce and again are used in a diluted form. A large lidded container, say a plastic drum eg garbage bin, etc, is nearly filled with water. Into it is hung a hessian or shade cloth bag filled with manure. Cow manure is ideal - go for a drive and ask a farmer if you can collect a few buckets full from his paddocks; many will be amused and say yes, or try a cattle market - Taree, Kempsey, etc. Dynamic Lifter pellets can be used in the same way but not so much fun.

Over a few weeks the brew will be dark brown and teeming with life. This adds microbes, feeds the microbes already in the ground and so in turn, the plants.

Seasol is a proprietary liquid made from seaweed. It is used diluted in the same manner as worm wee. In my experience it improves the soil presumably by feeding the microbes or by adding more of them.

Green Manure.

One way to get fibre and nutrients into the soil is to grow a crop of plants and dig them when small. Suitable blends of seeds are available from some nurseries. Being a cheap-skate, I buy Own Brand birdseed from a supermarket. It contains wheat, grasses, maize, sunflower, millet etc seeds. I spread it over the bare patch and roughly scratch it into the surface then water it. The seeds germinate readily. When the leaves are a foot or so high (300 - 400mm) I cut the tops off with garden shears then dig them and the plants into the soil, trying to get it all under the surface. This rots down fairly quickly improving the soil condition and increases the nutrient levels including adding nitrogen from the atmosphere. If you do this, do NOT plant anything in the bed for at least three weeks - the decaying causes short-term toxicity of the soil probably leading to poor germination, slow growth or stunting in most cases or even death. This same effect is caused by putting un-composted sawdust, bark and green waste straight into the ground. Note sawdust from a few species of trees does not have this effect, but it is best to treat them all the same way.

Compost.

Compost is made by the action of bacteria, fungi and partly by worms. For full details on Composting see separate notes on what to do.

I have said little about the use of Blood and Bone, soluble fertilisers like Aquasol and Thrive, Dynamic Lifter or Neutrog type pellets - they are fine to use around your plants to boost them along but the most important job is to first get your soil **alive** and that is what I have tried to help you to do.

John Carter

July 2012

All care taken but no responsibility accepted for your use or misuse of the above information.