

# LOAM WASN'T BUILT IN A DAY

## SMALL LANDHOLDER INFORMATION SHEET



Soil is so much more than something to hold plants up while they grow.

It is a combination of organic matter, air, water, mineral particles such as sand, silt, and clay, as well as living organisms. It is alive, and this aliveness is critical. Microbes - living creatures too small to be seen with the naked eye, such as bacteria, fungi, protozoa, and nematodes - are essential to building soil structure, cycling nutrients, managing moisture, and breaking down toxins.

The composition of a healthy soil will depend on the type of plant being grown but will always have a 'sweet spot' of physical (structure and texture), chemical (nutrients and pH), and biological (microbial) attributes. A healthy soil will have good moisture management, allowing roots to penetrate easily and promoting nutrient cycling.

### Observe your soil

Simple observation techniques can give you a good indication of your soil's health. Grab a shovel and dig, or try to dig, a hole. How hard is it? Does the soil stick to the shovel or does it fill back into the hole as fast as you dig it out? What does this tell you about how plants might be able to grow here?

**Compaction:** when the ground (soil) is hard to dig. Compaction can be a result of soil type, lack of microbes, moisture content, chemical interactions (calcium/magnesium), or excessive applications of synthetic fertilisers and/or 'cides (herbicide, pesticide, fungicide, nematicide). Plant roots feed predominantly in the top 15cm of soil. If they can't get down that far, they must use extra energy to make their way through the hard stuff so they can access more water and nutrients. Pushing a shovel or screwdriver into the soil can give you an idea of how easy or difficult it is for roots to penetrate through this top layer of soil.

**Infiltration:** observing how fast water moves into the soil to get an indication of structure. Infiltration are the passageways for water to move effectively through soil and be held for plant roots to access. According to Nicole Masters, one inch (approx. 25 mm) of rain should infiltrate the soil within about 12 minutes. If the area is on a slope and water doesn't infiltrate, we risk erosion. If the area is flat and water doesn't infiltrate, we risk evaporation. You can also get an idea of soil structure by taking a teaspoon of moist soil and sitting it in a dish of water and observing how quickly it disperses or slakes. Ideally, the soil should stay contained and not fall apart (slake) or spread through the water (disperse).

**Test pH:** using a simple colour-based test kit. For pasture, the pH or measure of hydrogen ions in the soil (the acidity or alkalinity) is suggested to be 5.5 - 6.5. Different minerals become available to plants as the pH of the soil changes. By providing soil with a more neutral pH level, plants (with the help of microbes) are more easily able to do the work required to tweak the pH to access the minerals they need.

**Biology:** determining areas of high biological activity. By inserting a strip of washed unbleached calico or similar (you've likely heard of the underpants test) into a slit in the soil in various locations and digging it up about 6 weeks later, areas of high biological activity will have largely decomposed the calico.

**Species diversity:** how many different species can be seen. Mark out a small area of the paddock - perhaps a metre square, or an area you can easily reach while standing. Count the number of different plants you can see and estimate how much of the ground is covered. More species means different microbes are present, therefore a range of talents and skills are available to support plant growth. Plants will 'borrow' microbes associated with other plants to assist their wellbeing, for example, drought tolerance.

**Lab analysis:** a more advanced method that will provide mineral analysis, microbial population, and toxins levels.

## How can we support healthy soil?

Ideally, we want a diversity of living plants growing all year round. Plants help aerate the soil with their roots, retain moisture by shading, provide food for microbes with exudates, and attract insects, birds, and animals that can have many benefits. Aeration, moisture, food, friends. Plus, no matter where we start, every action can be a positive step towards healthy soil.

**Air is important** for roots and for microbes to breathe. These spaces can also hold water that dissolves nutrients. Not too much and not too little. If the soil is too compact – if you can't easily dig it or push a screw driver through the top 30cm – roots must use more energy to push through the soil.

**Moisture is important** – not too much and not too little. Plants need water to grow, plus essential microbes live in films of water in and around root systems. Roots and microbes provide structure to the soil, acting like a sponge to hold moisture and soluble nutrients for the plants to use, while also reducing run off and erosion.

**Food** is essential for healthy microbes and healthy plants, and comes from plant exudates, animal droppings, minerals in the soil particles, decaying matter, and what humans apply. Nutrients encourage healthy plants and microbial growth. Carbon is cycled from the air through the plant, with photosynthesis turning carbon into sugars. Some of this feeds the plant while the rest is released through exudates and the root system to feed microbes, creating healthy soil.

**Friends** are needed, in the form of a diversity of plants, soil flora and fauna, larger insects, birds, and animals. This diversity of interconnected beings provides access to skills and talents within the microbe population of soil and plants. They can help to gather nutrients, provide first aid, communication, and even help to reduce the impact of frosts.

## Where to from here?

Now that you have a bit of an idea of the character of your soil, what do you do now? When considering your next steps, ask yourself: "will doing this increase or decrease the microbial diversity in the soil?"

A first step might be to decrease the amount of bare soil. Next, increase the diversity of plants growing in your pasture. Work out a rough plan of which plants to add - for instance, replacing 'weeds' with species from the same family that are considered more useful. Depending on the size of your property, explore what you can do to improve the physical, chemical, and biological aspects of the soil in order to enhance plant growth.

If you've not already started, make a compost. About 200gm of good quality compost will be enough to spray out over one hectare. It doesn't take much.

**It doesn't matter too much where you start.** The key is making a start and the ripple effects of your actions will then positively impact other areas.

For further information:

- View the Small Landholders video resources on Perth NRM's website: [www.perthnrm.com/resource/videos](http://www.perthnrm.com/resource/videos)
- Dr Christine Jones: [www.amazingcarbon.com](http://www.amazingcarbon.com)
- Nicole Masters: [www.integritysoils.com](http://www.integritysoils.com)
- Walter Jehne: [www.regenerate-earth.org](http://www.regenerate-earth.org)
- Lower Blackwood Catchment: [www.lowerblackwood.com.au](http://www.lowerblackwood.com.au)
- Agpath Pty Ltd: [www.agpath.com.au](http://www.agpath.com.au)
- Department of Primary Industries and Regional Development: [www.agric.wa.gov.au/climate-land-water/soils](http://www.agric.wa.gov.au/climate-land-water/soils)
- Soils West: [www.soilswest.org.au](http://www.soilswest.org.au)
- EarthWhile Australia: [www.earthwhileaustralia.com](http://www.earthwhileaustralia.com)
- Contact your local NRM, catchment council, or grower group