

## Soils: an introduction

Most horticultural and agricultural production is based on soil. Soil and climate limit what crops you can grow and how well you can grow them. There is a lot you can do to improve or spoil the soil though it is usually easier to damage soil than to fix it up again.

### What is soil?

A typical soil is about half solids and half holes. The holes can be filled by water or air. The solid part is made up of rock minerals (clay, silt and sand) and organic matter. The organic matter is a very small part (usually less than 5% of the solids) and only a small amount is alive.

### Soil properties

Soil fertility is the ability of the soil to grow crops well. When thinking about soil we consider its chemical, physical and biological properties.

The chemical properties of a soil include the amount and type of nutrients present and whether they are in a form that plants can use. We also consider the acidity of the soil because this can affect the availability of nutrients. If the right nutrients are not naturally in the soil, we can apply chemical or organic fertilisers. But this needs to be done carefully because some nutrients are poisonous in high amounts.

The physical properties of a soil affect its ability to hold water and air, how well it drains and how easily roots can grow through it. Physical properties include the texture, structure and porosity of the soil. Texture is the proportions of sand, silt and clay in the soil. Structure is how these are clumped together to form aggregates or "peds". Porosity is how well air, water and roots can move through the soil.

The biological properties of a soil include both living and non-living organic components. Most of the organic matter is from living and dead roots and composting stalks and leaves. Other

biological components are earthworms, insects, fungi and bacteria. Earthworms are important in helping to mix and aggregate the soil and allow air and water through. The number of earthworms in your soil can be a good indicator of its health.

When we manage soil, we are managing its chemical, physical and biological properties to make it suitable for our crops.

### Recommended books to read

The following books may contain some helpful hints for understanding soils. The book by Molloy is a very in-depth description of New Zealand soils. The book by McLaren is more about soil chemistry and includes information about what may be needed based on soil and crop type. Other books may not be about the crop you want to grow but may still have answers to your questions.

- Molloy, L., *Soils in the New Zealand landscape; The living mantle*. 1988, Wellington, New Zealand: Mallinson Rendel
- McLaren, R.G. and K.C. Cameron, *Soil Science*. 1990, Auckland: Oxford University Press.
- Reid, J.B., A.J. Pearson, and J.M. English, *Land management for process tomatoes; Recommended best management practices for New Zealand*. 2000, <http://www.crop.cri.nz/psp/rbmp/tomato/index.htm>
- Reid, J.B., A.J. Pearson and P.J. Stone, *Land management for sweetcorn; Recommended best management practices for New Zealand*. 2001, <http://www.crop.cri.nz/psp/rbmp/corn/>

'Te Pānui Tips' are simple fact sheets that cover topics designing organic crop production systems on the East Coast.

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