Soil Health Toolkit

FUTUREPROOF YOUR LAND

MAIN TOPICS:

Understanding the soil beneath your feet

Almost all of the world's food is grown on land utilising the top 20cm beneath your feet. Topsoil is perhaps our richest resource and the fact we rely heavily on it to feed ourselves is often overlooked. Good farmers will understand high value products are derived from well cared for soils. We want to help you better understand and care for this important resource.

Help is at hand

This toolkit is for anyone who owns a farm, orchard or land surrounding Tauranga Harbour. We hope you will find the information useful for understanding and caring for your land. Please contact a Tauranga Land Management Officer for free advice.

Soil types

In the Tauranga Harbour, ignimbrite and rhyolite form the main basement rocks, changing to andesite in the larger Katikati area. Generally these rocks are mantled by deep layers of volcanic ash and it is this which forms the parent material for our soils. In the Bay of Plenty there are nine soil orders from which all our soil names are derived. The main ones for Tauranga Harbour are listed in the table below:

Photo: Regional Council staff conduct a visual soil assessment.

SOIL ORDERS IN THE BOP	DESCRIPTION
Allophanic	The main soil order in Tauranga Harbour. Strongly influenced by clay minerals. Weak soil strength. Topsoil 18cm or more with weakly developed structure and black to dark brown colours. Moderately to strongly leached with low levels of exchangeable calcium, potassium, magnesium and sodium. Available phosphate for plants is low with high phosphate retention in the soil. Friable, no rooting barriers, crop with care to protect soil structure.
Anthropic	Man-made soils, mainly around Mount Maunganui and other areas that have been disturbed or recontoured.
Gley	Poorly drained or very poorly drained in their natural state, low oxygen. Made from older wet mineral soils, they occur in valley floors, upper coastal terraces, and back swamps. Greyish colour.
Organic	High peat content; occurs in low lying depressions or former back swamps and valley floors. Poorly drained with fluctuating water tables.
Podzols	Strongly leached acid soils. Occur under high rainfall at mostly higher elevations, associated with acid litter from forest species such as rimu or beech.
Pumice	Dominated by pumice or pumice sand high in volcanic glass. Clay content less than 10% and soil strength very weak. Low fertility, highly erodible, summer droughts.
Raw	Lack distinctive topsoil development due to rocks, active erosion, deposition or thermal actively. Frequent flooding, excessive drainage or extreme salinity.
Recent Soils	Young soils that have weak soil development, high base saturation, gravel or rock not strongly altered, high rooting depth, good drainage, low phosphate retention, high fertility, but erosion prone. Fluvial recent soils occur on slightly elevated river terraces and are some of the most versatile soils for dairying, dry stock and cropping.

Soil management

For best plant growth, soil physical properties ideally include 50% solids, 25% water and 25% air by volume. Managing the physical properties of the soil for crop or animal production and environmental protection is more challenging than managing the chemical properties e.g. nitrogen deficiency, high phosphate retention, acidity.

Soil water

The retention and availability of water in the soil for plant use depends on soil texture, which determines the distribution and size of soil pores (or space) that hold water. This is called readily-available water and can be extracted by plants with little effort. Available water-holding capacity is important for two reasons. First, it's a measure of the soil's ability to sustain good plant growth with high yields and second, it's a measure of the soil's capacity to store water via rainfall and irrigation.

Organic matter affects water-holding capacity by stabilising soil structure and increasing the volume and size of soil pores resulting in increasing water infiltration and water retention. Given the sandy nature of our soils, the importance of adding and retaining organic matter should be part of a sound soil management programme.

Soil aeration and drainage

Soil aeration allows the soil to exchange air between the atmosphere and plant roots. It represents the coarser pores in the soil that provide space for plant roots to grow into, and from where water drains under gravity. Roots of most dry land plant species obtain oxygen for respiration and nutrients from this space.

Soil drainage refers to how much, and how quickly, water is removed from the soil. Drainage depends on three main factors:

- Input into the soil from rainfall, irrigation, seepage and runoff;
- the flow of the water through the soil, or permeability;
- the outlet from the soil, drains, streams to the sea.

Drainage is important because it affects the oxygen supply and temperature of the soil. Non-aquatic plants will not normally survive waterlogged soils due to lack of oxygen.

Plant growth on partially drained soils is slow because wet soils take longer to warm up.

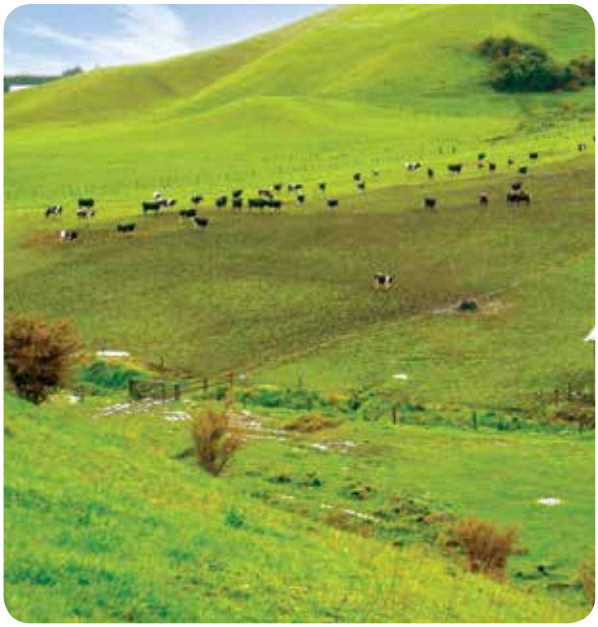

Photo: Heavy stock grazing near a waterway can affect water quality and damage soil structure.

Most soils in Tauranga Harbour have few problems as they are naturally well-drained. Exceptions include poorly-drained gley and organic soils, generally located in coastal areas.

Compaction

A reduction in the soil's porosity is referred to as compaction. Packing soil particles closer together reduces the volume of air in the soil. Compaction can be caused by cultivation when the soil is wet, animal treading and vehicle traffic. Excessive soil compaction restricts aeration, reduces plant growth and productivity, impedes drainage, reduces infiltration and increases run-off during intense rain, leading to greater soil erosion issues.

PLAN FOR THESE

- Identify and map the different soil types on your property.
- Use this information to manage your soil within its physical limits to sustain long term production.
- Find out the water holding capacity of your soil in order to determine the correct amount and frequency of irrigation. This will save water, time, money and labour. It will also allow the water resource to be more efficiently managed and reduce the impacts on the environment, such as nutrient leaching and run-off.
- Allow soil to dry below field capacity before grazing.
- Limit the number of hours animals are on wet paddocks.
- Manage vehicle traffic to avoid soil compaction.
- Establish a nutrient budget to gain efficiencies and protect water resources.

MAKE USE OF THESE

- Use these online maps to find your soil type: www.boprc.govt.nz/environment/land/soil-information.
- A Land Management Officer can help explain the soil types on your property.
- Feed pads, stand-off pads and animal shelters, so as to protect your soil and pasture from treading and pugging damage.
- Light stocking rates on heavily pugged or compacted paddocks, at least until the paddocks become fully productive again.
- Regular soil monitoring and soil tests. Land Management Officers can show you how to conduct a visual soil assessment test which is quick and very effective.
- Protect soil structure by adopting minimum or no tillage systems and cultivate at correct soil moisture levels.

AVOID THESE

- Harvesting crops under wet conditions. The long term cost of any soil damage may outweigh the income lost from a delayed harvest.
- Mole drainage on Bay of Plenty sandy / loam sub-soils.
- Over-irrigation.
- Inappropriate amounts, methods or timing for fertiliser application.

RESOURCES

Soils of the Bay of Plenty Volume 1: *www.boprc.govt.nz/media/32401/EnvReport-201011-SoilsBayofPlentyV1WesternBay.pdf*

Soil Information: *www.boprc.govt.nz/environment/land/soil-information*

Photo: A healthy maize crop near Te Puke.

The natural resources you benefit from as a landowner through soil, plants and water, is worth defending. Doing nothing could threaten the quality of future production affecting soil, crops, livestock and your lifestyle. It could decrease your land value. Our series of toolkits will help you future proof your land to ensure it remains productive and profitable.

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Bay of Plenty REGIONAL COUNCIL