

# Soil Testing For Sustainable Farming

*In order to achieve genuine sustainability and manage your soil for optimum productivity, a properly organised soil testing program is essential. This E-book will show you how to do this easily and economically.*

## Contents

<b><i>Collecting a Good Soil Sample.....</i></b>	<b><i>3</i></b>
<b><i>Collecting the Sample.....</i></b>	<b><i>5</i></b>
<b><i>Wet Samples.....</i></b>	<b><i>6</i></b>
<b><i>Pasture Soils.....</i></b>	<b><i>6</i></b>
<b><i>Soil Under Trees and Vines.....</i></b>	<b><i>7</i></b>
<b><i>Truffière Soils.....</i></b>	<b><i>7</i></b>
<b><i>Sending Your Samples.....</i></b>	<b><i>8</i></b>

For More Information on Sustainable Soil Management:

[www.the-living-soil.com](http://www.the-living-soil.com)

# Soil Testing For Sustainable Farming

The biggest problem with the majority of soil tests is that they are based on a flawed assumption: That soil fertility is based on a 'Balance of Nutrients'. In other words, for any given crop or land use, all you need to do is adjust the nutrient levels in the soil to match to some ideal 'balance' - and sometimes a different one for each stage of growth. This sounds reasonable, but the trouble is that it hardly ever works!

A related and somewhat less flawed concept is Liebig's Law of Minimums<sup>1</sup>. It states that plant growth will occur up to the level of the most limiting nutrient. This is based on good science, but unfortunately it has come to be overused. Firstly, the limitations to plant growth include more than just nutrients - rainfall, climate, soil and so on. But more importantly, it is not necessarily true that further increasing nutrient levels (albeit in 'the right balance' so as to avoid any limiting minimums) will also further increase growth. And even when this does happen, produce quality almost always suffers.



*Liebig's Law of Minimum works like a barrel with one short stave - it cannot be filled above this level.*

For more information on this subject, we also have a detailed E-book on [understanding soil tests](#) that looks at other pitfalls to avoid and how to get through all the technical 'mumbo jumbo' and make your own decisions about fertilizers and soil management. For now though, let's just look at the most important and generally overlooked part of the whole soil testing process...

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<sup>1</sup> The Law of Minimum was actually developed by Carl Sprengel (1828) and then popularised by Liebig who used the barrel analogy to explain it.

## ***What is a Good Soil Sample***

Proper soil sampling is crucial in order to get the best results from a soil test, so it is important for you to follow the method for collecting samples described here. Don't be tempted to take any shortcuts or skip any steps. Soil is inherently variable and without a good sample, the results you get will be - at best - misleading, but could easily be quite meaningless!

"So," I hear you ask, "If soil varies so much and good results are so hard to get, why bother soil testing at all?" Well, let's look at it this way: Suppose you were travelling through the mountains and came to a junction in the road. You could see your destination directly ahead at the bottom of the mountain, but the signpost seemed to be pointing you away in a different direction - which way would you go, following the signs or straight off a 1,000 ft cliff (the direct route)? If you thought to bring a parachute or hang-glider, the direct route may be OK, but we are not all into such advanced options. So following the signposts may be the best option - safer, more reliable, but longer.



*The direct route is not necessarily for everyone!*

Soil testing is the same. The sampling method here is based on detailed statistical analysis of what will give the most reliable result. Then, by using repeat tests to track your progress, you will end up with a series of signposts that will get you to your destination safely and reliably.

Above all else, the most important thing in soil sampling is consistency! Soil is highly variable, so much so that if you took separate samples from different parts of your garden, they would probably each give you a completely different result. Instead, the aim

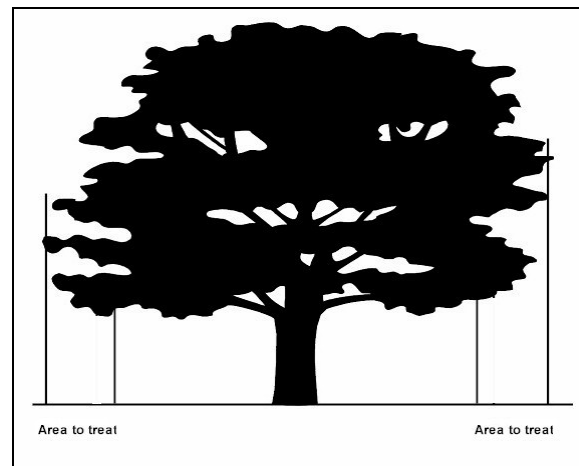
is to get a "Representative Average" for the whole area by taking soil from a number of places and mixing it together.

But before you begin, make sure you have everything you need as it will be important to send the sample to the laboratory as quickly as possible. A suitable implement for soil sampling (see below) is very important. You will also need a zip-lock plastic bag and a notebook.

Next, you should think about the area you want to have tested and make sure it is one that has had a fairly consistent history. For instance, an area used for pasture will give a rather different result from a vineyard, so you should avoid mixing soil from two such different areas – choose one or the other. (Of course if you want to work on both areas, you should get two samples tested, but make sure each is clearly labelled so they don't get mixed up).

If you are testing soil an orchard, nut grove or vineyard, do your soil sampling from the area of the "Drip-line" near the edge of the canopy, rather than close to the trunk. In other words – take the sample from the area beneath the outermost branches.

In general, the best time for soil sampling is at least 8 weeks before you need to be applying any fertilizer. This will allow plenty of time to deal with any questions you may have about the results before applying fertilizer. However, more time may be needed if you have soil preparation work or planting to organise as well, but we will deal with those situations in more detail a bit later.



*Most of the tree's active feeder roots are beneath the drip line.*

## ***Collecting the Sample***

When actually collecting the soil it is important to use the right implement and sample to the right depth. Remember, you are looking for results that give a reasonable picture of the soil within the root zone of the plants.

For most Land uses the proper depth to sample is from the surface down to 15cm, but for pasture, 0-10cm is enough. Truffles, Citrus and Wine grapes are special cases for which a 0-20cm sample is required.

The best soil sampling tool to use is a stainless steel core sampler - a simple apple corer that you can get from your local Supermarket can suffice for one-time use (although it can be a bit tricky to use on hard, dry soils). Other metals should be avoided as they can produce distorted results for Trace Elements like Iron, Copper or Zinc, etc.

You need to collect soil from 20 to 30 spots selected randomly from the area you are interested in, mix the collected soil very thoroughly in a clean plastic bucket and take the sample out of this. The sample is best packed in a zip-lock plastic bag, labelled with a descriptive name for the area it represents (eg. "Back Paddock" or "Block 5").

By far the best way to do this is by following a zigzag path across the area to be sampled, collecting cores as you go. As you proceed, be sure to avoid areas where extreme nutrient levels may distort your results. These include manure and urine patches, tracks and ditches or other places where soil disturbance has occurred, fences, troughs and stock camps, or anywhere that fertilizer or compost has been applied recently.

***Important:*** *To complete all the required tests, the laboratory needs at least 500g of soil - please make sure you send enough soil and avoid delays caused by needing to repeat this process.*

Once you have collected the sample, it is important to send it off as quickly as possible since some important nutrient levels (especially Nitrogen and Sulfur) can change when soil is kept in a sealed container.

## ***Wet Samples***

It is no good to collect a sample if the soil is saturated, (that is, if water is dripping out when you squeeze it in your hand). In these circumstances, either wait for the area to dry out a bit, or leave the soil you collect in the bucket in a cool, safe place (where it cannot be contaminated by anything) for a few days, until it is dry enough. Then do the mixing and take out the 500g you need.

## ***Pasture Soils***

Pasture is not simply grass, but an entire community of plants. The members of this community have their own strategies for competing with the others for space and nutrients in the soil. This means that pasture management is more like applied ecology than simple crop production. Sustainable soil management is of vital importance, but so is grazing management.

In terms of soil sampling, however, it is important to be aware that some pastures can develop thick organic mats. When these become deep enough that they occupy most of the root zone (about 8 - 10cm) pasture growth will be seriously restricted and fertilizer will do little to help. In these cases, the first objective will always be to reduce the thickness of this mat so that roots can have good access to the soil beneath. At this point growth will improve and the species that generate such mats will lose their competitive advantage.

The important points to remember in these situations is not to discard the mat and send only the soil beneath - you still need to work with the conditions within the root zone (0-10cm). It is also important in such cases to repeat you soil tests annually, as requirements can change quickly as you move forward.

## ***Vineyards, Orchards, Nut & Olive Groves***

Unlike pasture, trees and vines do not have roots evenly distributed across the whole area. Most of the active feeder roots will be in the so-called 'Drip zone' a few inches either side of an imaginary line on the ground that traces the outermost extent of the foliage canopy above. Whenever sampling soil for trees or vines - while the general guidelines described above will still apply, you should aim to collect soil from the area between the rows, rather than directly under the plants. One of the biggest mistakes people make here is to collect soil (and apply fertilizer) only along the mulch or herbicide strip directly beneath the plants. In newly planted orchards, nut groves and vineyards, this may not make much difference, but once the plants are properly established this practice will simply miss the target - wasting both time and money!

And don't forget that the correct sampling depth here will be 0-15cm, except for Citrus and Vines which will be 0-20cm.

## ***Tropical Tree Crops***

Many of these tree crops are highly specialized, some are best grown (or can only be grown) under a forest canopy, making the whole subject of organic soil improvement especially tricky. Here, standard approaches may actually do more harm than good.

## ***Agro-forestry***

In general, the same principles for Orchards and Vineyards will also apply here, although tree produced for paper or timber may be planted at higher densities and this can make access more difficult. However, farm-based agro-forestry for specialized purposes such as production of logs for Shitake Mushroom growing pose special problems. In such cases, nutrient inputs must be carefully controlled and biological activity optimized so that roots and stumps of a previous crop can be decomposed before the next is harvested - while also minimizing the risk of disease from these decomposing roots.

## ***Truffière Soils***

If you are testing an area in preparation for planting a Truffière then the main considerations are to allow plenty of time and make sure you take your sample from 0 to 20cm. Your first objective will be to change the soil environment and ensure the soil pH is around 7.5 before planting. Lime is slow acting so (depending on rainfall) allow 6 to 12 months between soil sampling and planting.

If you have an existing Truffière, then remember that there will be a significant difference in the soil between the inside and outside of the Brûlé ('burn' area around the trees within which Truffles form). Since it is the Brûlé area you are most interested in, collect your samples from the outer few inches of the Brûlé, but avoiding spots where Truffles have previously been removed and organic matter added to the back-fill soil. Don't worry, we will cover this in more detail in our [Truffle Cultivation E-book](#), however, for the moment just try to time your soil testing for as long after the Truffle hunting season as possible, but still before the new Truffles begin to form - in general this means as early in Spring as possible.

## ***Sending Your Samples***

In all cases, send your samples as soon as possible to:

Country Dirtdoctor  
7 Coull Close  
Boronia VIC 3155

Either enclose payment with your samples or use the PayPal buttons on the website: [www.the-living-soil.com](http://www.the-living-soil.com) (NB. You don not need to have a PayPal account, you can still use these buttons to make secure payments with a Credit Card if you prefer. If you have any questions, or experience any problems, [please contact us](#)).