



Healthy Soils –Healthy and productive groves



Dpird sampling guide

<https://www.agric.wa.gov.au/high-rainfall-pastures/soil-sampling-high-rainfall-pastures-western-australia>

- Good overall description and easy to follow.

Fertcare Soil Sampling Guide:

<https://fertilizer.org.au/Portals/0/Documents/Fertcare/Fertcare%20Soil%20Sampling%20Guide.pdf?ver=2019-06-17-095413-863>

- Very detailed (36 pages)
- Covers all aspects of representative sampling/variations.
- Page 30 gives a good one page checklist. (copy supplied)
- Page 18 calculation for calculating soil tests in the vine row and in the interrow. (otherwise stick with one for one principle.)

Infographic basic sampling guide:

<https://www.nutrientadvantage.com.au/latest-publications/Your%20guide%20to%20accurate%20soil%20sampling>

- One page graphic picture – useful if delegating the soil testing to a worker/training staff.

Soil Sampling equipment:

www.universal groundprobe.com 0419 171 962 (Electric drill option)

Albany Stainless Steel – 98 413 341 (Electric Drill option \$290 + GST)

CSBP Lab – pogo sticks – 9434 4600



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Why Sample

- Monitor soil levels year on year.
- monitor soil acidity and liming needs
- planning new plantations?
- Interrow management.
- High performing areas vs Low performing areas.
- budget and plan for farm nutrition.

How:

- have suitable and consistent sampling tools (handout provided)
- collect a representative sample from each paddock or area within a paddock
- **Be consistent** (same time of year, same sampling method, same sampling tool, same laboratory)

Paddocks smaller than 10ha

- One sample of 30–40 individual cores should be enough for paddocks smaller than about 10 hectares (ha) with reasonably uniform soil.

Paddocks larger than 10ha

- Collect 1 sample (of 30–40 individual cores) for every 10ha of larger paddocks, even if the soil type appears relatively uniform.

Different soil types

- Collect a sample from each management area of different soil types within a paddock, and have them analysed separately.
- Soil testing can be a waste of time and money if samples collected are not representative of the area. The top 10cm of soil over a hectare contains about 1300 tonnes of soil, so a 100 gram subsample from a 10ha paddock represents only 1 part in 130 million! Short cuts in sampling, such as taking only 1 or 2 cores, or only a handful or spadeful of soil, will give misleading and costly results.



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Do's	Donts
Avoid contamination (rust/zinc coating)	Kick the soil surface before sampling (depth)
Make sure your sampler depth is 100mm	Sample too deep
Representative sample	Collect too few cores
Consistent sampling pattern	Sample stock camps
Check the sampler for blockages	Sample near gates/waterways/headlands
Mix the sample prior to sending	Overfill the bag – split it down if needed
Avoid Urine patches	Sample within 4 weeks of fertigation applied.

Sampling pattern

There is no one 'correct' sampling pattern but, once you select a sampling pattern, stick to it. The same pattern should be used when collecting samples for plant tissue testing.

There are 3 options for sampling pattern:

- Fixed transect across a paddock: start in one corner of the paddock and walk in a straight line to the diagonally opposite corner, collecting 30–40 sample cores on the way. Ear tags or wooden stakes can be fixed to fences to mark a transect and it can be marked on your paddock map so that you sample along the same transect each year.
- Zig-zag across a paddock: start in one corner of a paddock and zig-zag across it to the diagonally opposite corner, collecting 30–40 sample cores on the way. It is difficult to sample along precisely the same zig-zag transect each year.
- Fixed points in a paddock: select reference points in the paddock or record GPS coordinates so you can locate them in future years and collect a number of samples within a set distance of that point, for example 5–10m. You need to have enough points to give you a total of 30–40 cores for the paddock. Sampling contractors should be able to supply GPS points on a map showing where the cores were taken.

Avoid:

- areas where livestock have been congregating – trees, water troughs and gates in particular
- areas where fertiliser, lime or hay have been dumped in the past 1–2 years
- dung and obvious urine patches; this is particularly important when using mechanical systems linked to GPS – do not just collect the sample where the machine says you should without taking a closer look
- sampling within 3 months of fertilising; if this is unavoidable, increase the number of cores to at least 60.

When to sample

Non-irrigated pastures should be sampled from late-December through to March. If you are sampling by hand, soils which set hard when dry should be sampled before they dry completely. Sampling at the same time each year will reduce some of the variation inherent in soil testing. Irrigated pastures should be sampled in early spring, generally when the soil has dried enough to make sampling possible, and at least 4 weeks after the last application of phosphorus or potassium fertiliser.



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Sampling tool	Image	Comment
Pogo stick or tube		<p>Suitable for taking surface samples from a wide range of soil conditions, to depths of up to 30 cm. The depth should be marked on the side of the tube or may be set by a fixed or adjustable foot to the required level. In dry sandy soils or cultivated land, the tube may need to be forced into a near-horizontal position while still in the ground before being lifted out. Need to be checked for wear to ensure desired sampling depth is maintained.</p>
Compressor driven auger		<p>Suitable for taking samples from a wide range of soil conditions, in 10 cm increments to depths of up to 20 cm. Surface and sub surface samples can be split automatically at each core location. Use of mirrors required to ensure dung or other hazards are avoided. Satisfies OHS requirements during hot weather. Useful for soils that are hard to penetrate. Auger can bind on wet clays or where there is tall biomass. Auger wear can reduce sample volume and integrity over time. Check depth is calibrated to desired sampling depth.</p>
Hydraulic driven tube		<p>Suitable for taking samples from a wide range of soil conditions to 10 cm, but mostly suited to moist soils and irrigated paddocks. Tube is extracted vertically. Beware that soil "cores" can be incomplete in dry sandy soils. Provides access to a wider range of terrain.</p>
Battery drill driven auger		<p>Suitable for taking samples from a wide range of soil conditions up to 20 cm. Useful for soils that are hard to penetrate. Auger can bind on wet clays or where there is tall biomass. Check depth is calibrated to desired sampling depth. Auger wear can reduce sample volume and integrity over time. Can make use of all-terrain vehicles to traverse sampling area.</p>
Hydraulic driven auger		<p>Suitable for taking samples from a wide range of soil conditions to depths of up to 20 cm. Useful for soils that are hard to penetrate. Auger can bind on wet clays or where there is tall biomass. Auger wear can reduce sample volume and integrity over time. Check depth is calibrated to desired sampling depth. Not preferred due to increasing OHS concerns of quad bikes.</p>
Multi-purpose soil mapping and depth sampling		<p>Undertakes zonal mapping of paddocks prior to identifying the most typical and suitable locations for the collection of deep soil cores. Maps electromagnetics, soil moisture, compaction etc. to identify best locations for samples.</p>



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Table 7. Sub-surface soil sampling depths (cm).

Crop	Qld	NSW	Vic/SA	Tas	WA
Pasture	10 - 30	10 - 30	10 - 30	7.5 - 30	
Cereal, Oilseed and Grain Legumes	10 - 30 30 - 60 60 - 90 Or combined 10 - 60	10 - 30 30 - 90 Or combined 10 - 60	10 - 30 30 - 60 60 - 90 Or combined 10 - 60	10 - 30 30 - 60 60 - 90 Or combined 15 - 60	10 - 30 30 - 60 60 - 90 Or combined 10 - 60
Cotton (sometimes extended to depth of estimated water extraction)	0 - 10 (rain) 0 - 15 (irr., flat) 0 - 30 (irr., bed)	10 - 30 30 - 60 or 90	Not Grown	Not Grown	Not Grown
Vegetables / Horticultural Row Crops	15 - 60	15 - 60	15 - 60	15 - 60	15 - 60
Horticultural Tree Crops (Establishing)	30 - 90	30 - 90	30 - 90	30 - 90	10 - 60 in 10cm increments
Horticultural Tree Crops (Bearing)	15 - 90	15 - 90	15 - 90	15 - 90	10 - 60 in 10cm increments
Vines	15 - 30 30 - 60	15 - 30 30 - 60	15 - 30 30 - 60	15 - 30 30 - 60	15 - 30 30 - 60

Table 6. Surface soil sampling depths (cm).

Crop	Qld	NSW	Vic/SA	Tas	WA
Pasture	0 - 10	0 - 10	0 - 10	0 - 7.5	0 - 10
Cereal, Oilseed and Grain Legumes	0 - 10	0 - 10 (North) 0 - 10 (South)	0 - 10	0 - 10	0 - 10
Cotton	0 - 10 (rain) 0 - 15 (irr., flat) 0 - 30 (irr., bed)	0 - 30	Not Grown	Not Grown	Not Grown
Vegetables / Horticultural Row Crops	0 - 15	0 - 15	0 - 15	0 - 15	0 - 15
Bananas	0 - 20	0 - 15	Not Grown	Not Grown	Not Grown
Sugar Cane	0 - 20	0 - 20	Not Grown	Not Grown	Not Grown
Tree Crops (Establishing)	0 - 30	0 - 30	0 - 30	0 - 30	0 - 10
Tree Crops (Bearing)	0 - 15	0 - 15	0 - 15	0 - 15	0 - 10
Vines	0 - 15	0 - 15	0 - 15	0 - 15	0 - 15



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Tissue test guidelines:

- Hygiene very important (gloves/wash hands/stainless steel scissors).
- Send samples to lab on early in the week or refrigerate.
- 200grams fresh plant material is required (2 handfuls)
- 4-5 leaves per tree from 25-30 trees
- Have a consistent sampling pattern. Select rees of the same variety along the same sampling path. Mark the trees you collected from so future samples can be collected from the same trees.
- Youngest fully mature leaf at mid portion of the current seasons non fruiting laterals at shoulder height.
- Exclude diseased, stressed, polinating trees.
- Do not test if tree has been sprayed/ foliar fertilised within 5 days or has environmental stress (frost/heatwave/insect infestation)
- Do not select dusted/earth contaminated leaves.

Element	Deficient	Sufficient	Toxic	Pasture legumes	Oats 4-6 leaf	Kikuyu
Nitrogen %	1.40	1.50-2.00		5.5	6	3.0 - 4.5
Phosphorus %		0.10-0.30		0.5	0.6	0.24 - 0.35
Potassium %	0.40	>0.80		4	6	2.3 - 3.8
Sulphur				0.4	0.45	>0.12
Calcium %		>1.0		2	0.6	0.4 - 0.7
Mg %		>0.10		0.5	0.5	0.3 - 0.58
Mn(ppm)		>20		<50	100	
Zinc (ppm)				30	40	
Copper (ppm)		>4		10	10	
Boron(ppm)	14	19-150	>185	25 - 100	10	10
Sodium %			>0.20	0.7	0.5	
Chlorine %			>0.50			

Source: <https://www.agric.wa.gov.au/high-rainfall-pastures/tissue-sampling-and-testing-high-rainfall-pastures-western-australia>,

:Australian olive growers association, Phosyn critical levels



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Critical Nutrient Guidelines (inter row/pastures)

<https://www.agric.wa.gov.au/soil-nutrients/nutrient-calculator-high-rainfall-pastures-western-australia-0>

Units of fertiliser applied by brand/chemical active:

<https://www.agric.wa.gov.au/fertiliser-calculator>

<https://www.asris.csiro.au/downloads/BFD/Making%20Better%20Fertiliser%20Decisions%20for%20Grazed%20Pastures%20in%20Australia.pdf>

Phosphorus removal rate: deficiencies in fruit orchards, including olive groves, are very rare. The ease with which woody crops reuse this element and the low level of extraction by the plant (0.7 g P/kg of olives)

Sample type options:

APAL:

<https://www.apal.com.au/>

EAL:

<https://www.scu.edu.au/environmental-analysis-laboratory---eal/analytical-services/agricultural-soil-testing/>

CSBP

<https://csbp-fertilisers.com.au/services/lab>

SUMMIT FERTILIZERS

<https://www.summitfertz.com.au/technical-services/soil-analysis>