SOIL NUTRIENT SAMPLING FOR VEGETABLE CROPS

User Guidance

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1 Introduction

Soil nutrient sampling is integral to outdoor vegetable cropping. First and foremost, soil sampling is fundamental to nutrient management planning – understanding the soil's nutrient profile guides decision making around fertiliser planning and applications over a crop cycle. Soil sampling can also be used to mitigate the environmental impact of vegetable cropping. For example, having a good understanding of nitrogen levels within a growing system can support the implementation of strategies to reduce nitrogen fertiliser use and increase nitrogen uptake, reducing the risk of nitrogen loss to the environment.

Growers should always follow best practice when soil sampling because soil test results guide many on-farm decisions that can have significant implications for crop performance and profitability. Guidance on best practice sampling is a core part of this resource. Figure 1 illustrates how the final analysed sample is a tiny fraction of the paddock or field being sampled. Therefore, collecting and processing soil samples must represent the area to which the results will be applied.

This guideline is a resource for growers, agronomists, and crop advisors on best practice soil nutrient sampling for outdoor vegetable cropping. It supports implementing practices within the Horticulture NZ Code of Practice for Nutrient Management.

This guide covers:

1. Sampling protocol: Purpose, timing, equipment and tools, method, depth, specific crop requirements, and handling/transport
2. A deeper dive into nitrogen testing
3. Links to further information and other resources.

The information included in this resource should be used as guidance, rather than a set of prescriptive requirements. At times, specialist soil advisors and/or scientists will be better placed to provide direction on this subject matter.

To gain more background understanding on soil sampling and nutrient management, check out this 9-min webinar by LandWISE.

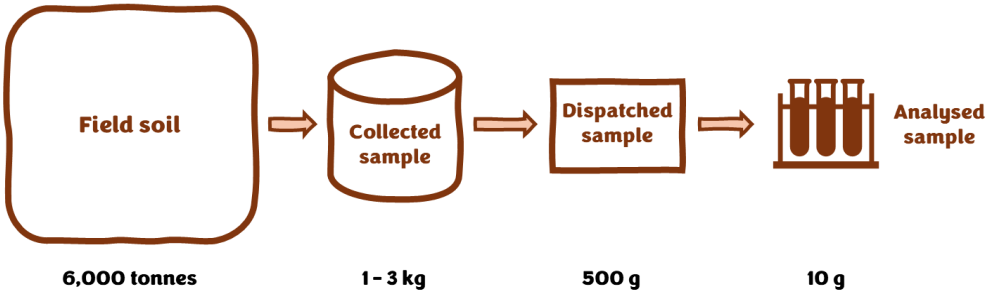


Figure 1. The different soil quantities at each step of soil sampling, illustrating the importance of representative sampling. Graphic retrieved and redesigned from *A guide for fit for purpose soil sampling*[1].

1. Cameron J. P. Gourley and David M. Weaver. *A guide for fit for purpose soil sampling* (Fertilizer Australia, 2019), 4.

2 Soil sampling considerations

This section provides guidance on each step of the soil sampling process, including sampling purpose, lab selection, sampling timing, collection pattern, number of cores, and field layout considerations.

A quick reference guide that provides a 1-page summary of this information is available on VR&I's website.

Purpose: Why test your soil?

The first step is to define your purpose: why are you collecting this soil sample? What will you use the results for? Soil nutrient sampling can fulfil a wide range of functions on farm, so be specific about the question you want to answer. Testing for different purposes will impact your sampling methodology, laboratory tests requested, and results obtained. Table 1 provides a summary of the key functions soil nutrient sampling supports within a vegetable production operation.

Selecting a testing lab

New Zealand has three major soil testing labs: ARL, Eurofins, and Hill Labs. These labs offer a range of soil testing services. After determining your testing purpose, check with your preferred lab to ensure they offer the tests you require, especially if undertaking any specialty testing. Labs will also offer testing kits, so get these ordered beforehand so you have sample bags and forms handy.

Table 1. Key functions soil nutrient sampling can support in a vegetable production operation.

Function	Description
Predictive / planning	Sampling to check soil nutrient levels for the purpose of planning crop requirements for the upcoming season. This sampling is normally carried out across the block or paddock the planned crop will be planted into, to inform the development of a nutrient budget and/or fertiliser recommendation.
Monitoring / trend analysis	The regular testing of soils over time to track trends in nutrient status. This testing should be carried out using the same methodology, sampling location/s, and laboratory each time. Trend analysis can help growers understand the longer-term impacts of their management practices on their soil.
Diagnostic testing	Often utilised in combination with plant tissue analysis, soil testing can be used to help diagnose any observations or symptoms in a crop, for example, if areas of particularly good, or poor growth, are observed.
Trials	Soil testing often accompanies on-farm trials that may relate to new nutrient inputs, cover crops, or soil amendments.
Compliance	Soil sampling for compliance involves testing and submitting samples to test for elements or compounds that may impact environmental or human health. This could involve testing for contaminants such as cadmium, or testing for phosphorus or nitrate, to provide evidence for nutrient management decisions.

Sampling timing

Sampling timing can have a big impact on your soil testing results, particularly if the timing of fertiliser applications on your sampling site is unaccounted for. The day sampling is carried out is also important – couriering samples collected at the end of the week may risk soil warming up in a depot over the weekend.

Key considerations

- If collecting annual samples for monitoring, sample at the same time every year
- All soil samples should be collected before fertiliser is applied
- Annual monitoring of soil nutrient status should not occur within 3 months of a P, K, or S fertiliser or lime application
- Sample at the beginning of the week (Monday to Wednesday) to ensure samples reach the lab as soon as possible
- Avoid sampling when soils are saturated i.e. after heavy or sustained rainfall, or irrigation
- When testing for mineral nitrogen, sample just prior to a N fertiliser application, with enough time to get the results back for decision making. Do not sample sooner than 10 days, ideally longer, after an N application.

Materials and equipment

Ensure you have all the required materials and equipment for sampling on hand. In general, equipment needed includes:

- Soil corer or Dutch auger
- Clean plastic buckets
- Trowel (to mix soil)
- Sample bags
- Permanent marker for labelling
- Phone or GPS unit for GPS tracking
- Chilly bin & ice packs (for storage in vehicle when testing for mineral N)
- Postage materials: Lab form/s, ice packs, and courier box/labels

You may require different corers if sampling at different depths, or tags/flags to mark a transect/location. The resources section of this guide contains links to equipment suppliers.

Maintain good hygiene practices between sampling locations. Clean equipment between farms to avoid spreading any soil-borne diseases.

Collecting the sample

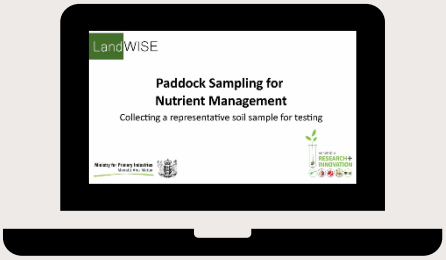
Soil sample collection involves many decisions that can significantly affect your soil test results. This section covers:

1. In-field considerations
2. Sample pattern
3. Sample depth
4. Number of cores
5. Crop and fertiliser placement considerations

In-field considerations

Areas to avoid

Avoid sampling from headlands, end of rows, humps, hollows, fence and tree lines, irrigation and vehicle wheel tracks, old shed-sites, dump sites, and animal camp areas. These sites may have concentrated areas of nutrients, which will affect your results.



This 2-min video from LandWISE summarises all key considerations to collect a representative soil sample. The video was developed as part of the LandWISE online nutrient management module. Find more information in the Resource section.
https://www.youtube.com/watch?v=lie4t-FUVrA

Physical features

Physical paddock features, such as terrain, soil type, or flow paths, may affect soil test results and crop performance. Sample each area separately or ensure your sampling technique fairly represents both areas if the same nutrient programme will be applied across the area.

Key points for sampling accuracy:

1. Same time of year
2. Same depth
3. Same pattern

Sample pattern

Choose a sample pattern that best suits the purpose of your testing. Using a transect, zigzag, or 'W' pattern is recommended to collect a representative sample for a paddock.

Grid sampling could be utilised to build a picture of nutrient variability across a paddock.

Transect

This involves taking cores (~10 m apart) in a diagonal across the paddock (avoiding unrepresentative areas). The sampling points or ends of the transect should be marked (GPS or coloured post), so you can return to the same transect each year. Transects are useful for repeatability and monitoring changes over time.

Zigzag/W

As the name suggests, walk in a zigzag or W-shaped pattern across the paddock, taking cores every ~10 m. This pattern takes longer than a transect but the sample collected will be more representative of the sampling area[2]. For year-on-year monitoring, GPS each core location (Figure 2).

Figure 2. Example of GPS-marked zig zag transects across a set of paddocks. Provided by Dan Bloomer.

2. Gourley, *Fit for purpose sampling*, 15.

Grid

Use grid soil sampling when conducting an in-depth analysis of fertility across a paddock. Grid sampling involves dividing up your paddock into grid cells. Cores (10-12) can either be collected randomly from each cell (**F** in Figure 3) or collected near a georeferenced point (**E** in Figure 3). Samples from each grid cell or point are tested in as individual samples to build a map of soil fertility. Grid sampling is useful if the results can be used to apply nutrients variably across a paddock.

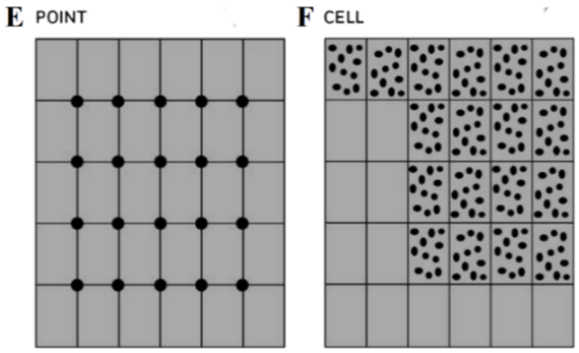


Figure 3. Different grid sampling methodologies[3].

Sample depth

Sample depth is a key consideration when soil sampling. As nutrients can be stratified down the soil profile, inconsistent sampling depths will impact accuracy, representation, and the ability to compare results.

Different agricultural sectors have standardised sampling depths in New Zealand[4]:

- Pastoral sector: 0–7.5 cm
- Horticultural/cropping sector: 0–15 cm

For nitrogen testing in horticulture, deeper cores of 0–30 cm are often used to better understand crop nitrogen availability, as most crops can access nitrogen down to 30 cm[5]. More detail is provided in the section on testing for nitrogen.

Number of cores

Given the normal variability in soil, a reasonable number of cores need to be collected for each sample to be representative. More cores should be collected when sampling areas you know are highly variable, or if using a small soil corer[6].

In general, 15-20 cores are recommended per sample. Mix cores collected to create a composite sample. Most labs require approximately 500 g of soil for a sample[7].

Crop and fertiliser placement considerations

If taking samples in a paddock that is already ridged or bedded up, ensure samples collected are still representative of the paddock.

Bed crops

- Estimate the area occupied by wheel tracks. This may involve measuring the width of the wheel tracks and beds.
- Take a proportionate number of samples from the wheel tracks and beds, based on the area estimation[8]. For example, if the paddock is 20% tracks, take 2 cores out of 10 from the wheel tracks (but skip compacted spray tracks).

Ridged crops

- For ridged crops (e.g. potatoes), collect 4 cores across 2 ridge shoulders (Figure 4) at a time.

3. Oliver Knowles and Aimee Dawson, "Current soil sampling methods – A review", *Farm environmental planning – Science, policy and practice,* Occasional Report 31 (2018): 3.
4. "Soil and pasture sampling instructions", Hill Labs, accessed 16 November 2025, https://www.hill-labs.co.nz/media/f0afm0ve/54605v2_soil-and-pasture-sampling-instructions.pdf.
5. Mike Beare, *Guidelines for Soil Nitrogen Testing and Predicting Soil Nitrogen Supply* (FAR, 2022), accessed November 16, 2025, https://assets.far.org.nz/factsheet-2022-guidelines-for-soil-nitrogen-testing_and-predicting-soil-nitrogen-supply.pdf
6. Gourley, *Fit for purpose sampling*, 14.
7. Hill Labs, "Sampling instructions."
8. Sustainable Vegetable Systems project soil sampling protocol. Available on request: andrew@agrilink.co.nz

- The top of the shoulder is the starting point for the core depth.
- These 4 cores equate to 1 sample point.
- Repeat across the paddock until enough cores are collected.

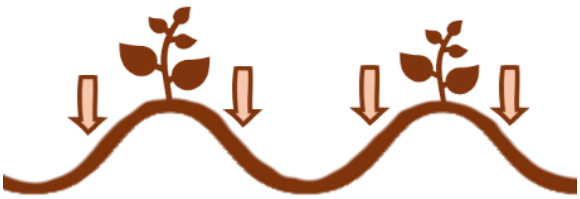


Figure 4. Sampling directions for ridged crops e.g. potatoes[9].

Fertiliser bands

Extra care is required when sampling crops with banded fertiliser as banding results in concentrated strips of nutrients. Avoid sampling within at least 10 days of a fertiliser application. After this banded fertiliser should be less of an issue, nevertheless you should be aware of them particularly if there has not been rain or irrigation since the fertiliser was applied. Soil cores are taken in line with or alongside the crop and offset from fertiliser banding lines. Avoid sampling through knifed in fertiliser.

Handling and transport

After collecting your cores, mix well to create a properly blended sample. Place a ~500 g subsample into a clean and labelled sample bag. Following this, samples should have minimal handling to reduce microbial activity i.e. so the soil tested in the lab reflects the original sample collected as close as possible. This is particularly important for nitrogen testing.

- Store samples out of the sun and ideally in a chilly bin (especially on hot days), to keep samples cool.
- Refrigerate samples overnight if you don't have time to drop them off that day.
- If sampling for mineral nitrogen (see later section on nitrogen), pack samples with ice packs in a chilly box before sending. Labs have cold kits available on request.
- Ensure your samples are labelled and the appropriate documentation is included.
- Send samples via overnight courier for next-day delivery.
- If you have sampled at the end of the week, store samples in the fridge and send on Monday.

3 Focus on nitrogen

Nitrogen is essential for growing vegetables. When limited, it can significantly affect the success of a crop. However, nitrogen is also a major environmental concern. Therefore, it needs to be carefully managed in soil to achieve both a successful crop and limit negative environmental impacts.

The very large majority (approximately 98%) of nitrogen in soils is part of organic matter (including humus and soil organisms)[9]. Organic nitrogen is unavailable to plants. Soluble, plant available nitrogen (referred to as mineral nitrogen) is present in soil solution as nitrate (NO_3^-) and ammonium (NH_4^+). Figure 5 illustrates the cycling of nitrogen in soil systems.

Soil nitrogen testing is complex and it can be difficult to know what test to select. There are multiple lab testing options available and growers can also undertake the Nitrate Quick Test themselves.

This section explains the options available for nitrogen testing, considerations when testing, and how to interpret the results, including use of the SVS Tool.

For a deeper dive into nitrogen testing, please refer to the Norris et al. article, *Soil testing for informing nitrogen management in New Zealand cropping systems*[10].

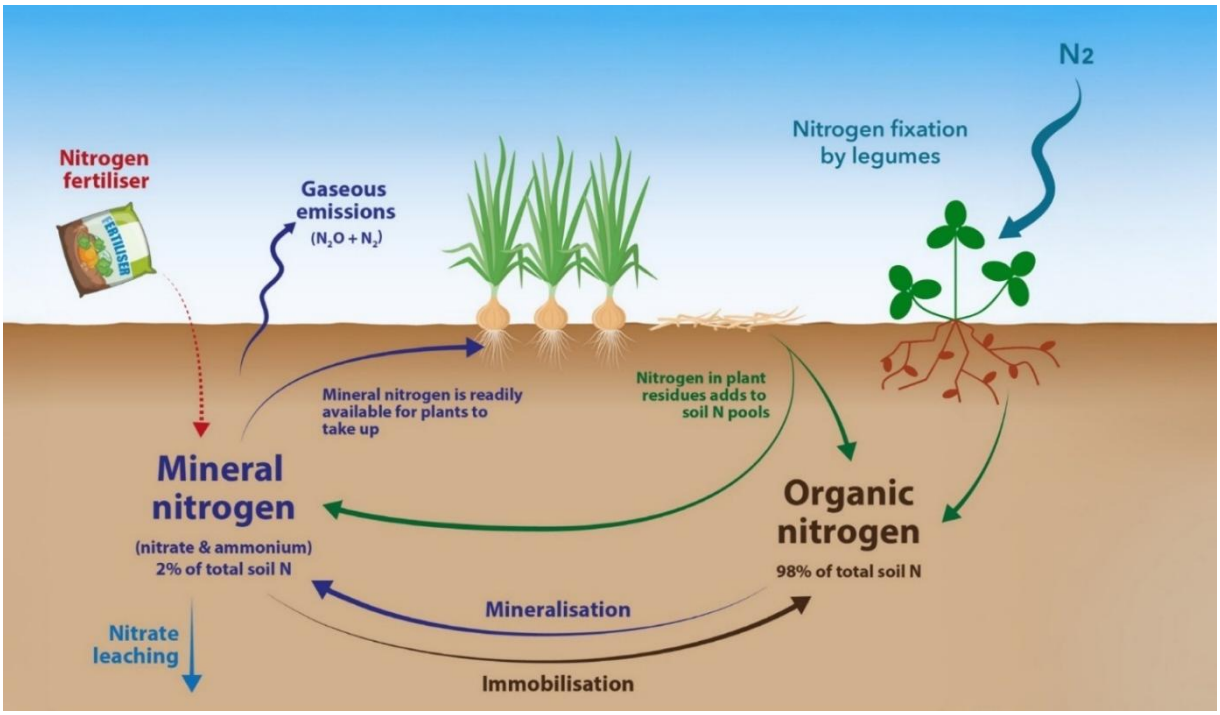


Figure 5. The nitrogen cycle (sourced from the HortNZ Nutrient Management Code of Practice).

9. "Technical note: Understanding soil nitrogen tests", Hill Labs, accessed 16 November 2025, https://www.hill-labs.co.nz/media/hgndk3iy/22221v7_technical-note-understanding-soil-nitrogen-tests.pdf.
10. M. Norris, M. Beare, D. Curtin, S. Trolove, and S. Dellow, "Soil Testing for Informing Nitrogen Management in New Zealand Cropping Systems," in *Opportunities for Improved Farm and Catchment Outcomes*, Occasional Report No. 36, ed. C. L. Christensen, D. J. Horne, and R. Singh (Palmerston North, NZ: Farmed Landscapes Research Centre, Massey University, 2024), https://flrc.massey.ac.nz/workshops/24/paperlist24.html.

What nitrogen test do I use?

Most labs offer several different nitrogen tests for soil. It is important to understand what each test measures. Table 2 on the next page summarises four nitrogen tests offered by most soil testing labs in New Zealand, as well as the Nitrate Quick Test (QT), as a self-test option for growers.

Tests generally measure two main types of nitrogen:

Mineral nitrogen (N currently available for uptake by the crop)

- Mineral N test
- Nitrate QT (grower test)

Potentially mineralisable nitrogen (N that may become available for uptake, based on ideal soil mineralisation rates)

- Hot Water Extractable Organic Nitrogen (HWEON) / Potentially Mineralisable Nitrogen (PMN) test
- Anaerobic Mineralisable N (AMN) test

Labs also offer a total N test, which measures total nitrogen present in the soil in all forms.

More information on each test is available from the soil testing labs or VR&I's website Nitrogen Soil Testing Factsheet[11]. Hill Labs has a detailed document on soil nitrogen testing[12].


Services Offered

Hill Labs

SOIL NITROGEN TESTS

Introduction

Management of Nitrogen (N) in farming systems is of importance in both achieving sustainable production and maintaining our environment. Whether fertiliser Nitrogen is applied or growers are attempting to use a "biological" approach without additions of synthetic N, soil testing may be useful in quantifying nitrogen potentially available for growing plants.

Hill Labs have invested significantly in NIRS instrumentation and the associated calibration to allow fast turnaround-time for several soil tests. The NIRS method will be the default method used, but a "codeswap" to the reference method will be driven by qualification criteria. The *Organic Soil Profile* measuring nitrogen and organic matter, with ratios, has been created to provide additional information on the biological activity in the soil.

Soil Nitrogen Tests Available

- **Potentially Available Nitrogen (AN) [also known as Anaerobic Mineralisable Nitrogen—AMN]**

  This test is a measure of Nitrogen mineralised under specific laboratory conditions (anaerobic incubation at 40°C for 7 days). The actual amounts of nitrogen that will be mineralised in the field will depend on factors such as soil temperature and moisture. *The results are reported as kg/ha assuming a 150mm sample depth for potentially available-N (AN), or ug/g for anaerobic mineralisable-N (AMN).*

  N.B. This test is measuring any free ammonium-N **and** the readily mineralisable N fraction. Some laboratories subtract the free ammonium-N from the mineralisable fraction but this step is omitted at Hill Labs, as the value is usually very low and would incur a higher test cost. Note this test name was previously reported as 'Available N' but the method remains unchanged.

Sample collection & handling considerations

Sample depth

The standard soil sampling depth for horticulture is 0–15 cm and is appropriate for shallow-rooting crops such as salad greens. However, many crops (e.g. broccoli, carrot, onion, and potato) can access mineral nitrogen up to 30 cm or more[13]. Therefore, when sampling these crops for nitrogen, sample to 30 cm or root zone depth to get a better understanding of the quantity of nitrogen available. For shallow-rooting crops (e.g. salad greens), 0–15 cm is appropriate.

Sample handling for Mineral N

The purpose of mineral N testing is to understand the amount of nitrogen in the freshly collected soil i.e. as close to in-situ in the paddock as possible.

To do this, samples should be chilled immediately after collection and stored in a chilly bin with ice packs. Cool in the fridge overnight, or pack with ice packs and send in a refrigerated box (Figure 6). Samples must arrive at the lab at < 4°C[11].

Figure 6. Chill-container to help keep soil samples cold during transport.

11. https://www.vri.org.nz/environmental-resources/
12. "Services offered: Soil nitrogen tests", Hill Labs, accessed 16 November 2025, https://www.hill-labs.co.nz/media/3zcji4lr/14666v9_services-offered-soil-nitrogen-tests.pdf
13. Beare, "Guidelines for soil nitrogen testing", https://assets.far.org.nz/factsheet-2022-guidelines-for-soil-nitrogen-testing_and-predicting-soil-nitrogen-supply.pdf

Table 2. Soil nitrogen tests, the form of nitrogen (N) measured, when to use each test, notes and considerations.

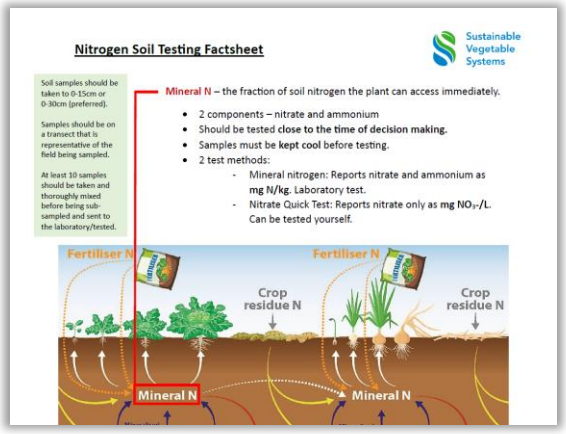
Test name	Form of nitrogen measured	When should I use this test?	Notes and considerations
Mineral N / Min N / Deep Mineral N	**Immediately plant available N** (at the time of sampling) in mg/kg The Mineral N test measures the soil's mineral N supply, which includes: • Nitrate-N (NO_3-N) • Ammonium-N (NH_4-N)	At the start of the growing season, just before planting/sowing to inform your fertiliser plan. After harvest, to understand the amount of surplus N in the soil (and then implement mitigation strategies if required.)	• Nitrate-N is the predominant form of plant available N in well-aerated soils. In saturated, anaerobic conditions, the fraction of ammonium-N will increase. • To ensure results reflect field conditions as best as possible, samples must be sent and received < 4˚C to prevent further organic matter mineralisation during transport.
Nitrate Quick Test (QT)	**Immediately plant available N** (in the form of **nitrate-N only**) • NO_3-N (mg/L) Conversion to mg/kg using soil specific correction factors	Monitoring nitrogen levels throughout the season, particularly before applications of nitrogen fertiliser, to guide decision-making.	• Cheaper test option compared to lab Mineral N testing. • Results are available the same day as sampling. • Assumes soil mineral N is predominantly comprised of nitrate-N (NO_3-N), which is not the case if soils are saturated or if urea or ammonium-based fertilisers were recently applied (then ammonium-N becomes a significant source of plant available N). • Recent research has investigated new methods to improve accuracy https://www.landwise.org.nz/home/tools/nitrachek-calculator/ [14].
Hot Water Extractable Organic Nitrogen (HWEON) / Potentially Mineralisable Nitrogen (PMN)	**Potential future supply of N** (from organic matter mineralisation) in mg/kg Results from this test are reported as: • Potentially Mineralisable Nitrogen (PMN) • Hot Water Extractable Organic Nitrogen	PMN tests can be conducted alongside an annual soil test. In general, sample annually for 3 years to be confident in the results. After this, testing only needs to be done again every 5 years or if something significant changes in the paddock e.g. coming out of pasture for a couple of years.	• The PMN fraction represents the amount of N that would be mineralised under ideal mineralisation conditions in the soil (25˚C, moisture at 90% of field capacity, for 14 weeks). • While the HWEON test is relatively new (developed in 2019), good reproducibility has been reported between testing labs. • Most soil sampling for this test's development was carried out at 0-15 cm depth. However, taking deeper cores (e.g. 0-30 cm) does not appear to impact relationship between HWEON and PMN. • Results are entered into the SVS Tool as mg N/kg. The lab will also report in kg N/ha, but use the mg N/kg value as this allows the tool to account for the location and the duration of the crop.
Anaerobic Mineralisable N (AMN) / Available Nitrogen (AN)	**Potential future supply of N** (from organic matter mineralisation) in kg/ha. Results from this test are reported as: • Ammonium-N produced (after incubation) • Mineral-N (as ammonium-N)	Was previously the main test to understand potential nitrogen levels available to the crop, due to in-field mineralisation. The newer, HWEON test is now a better test to estimate this.	• Usually sampled at 0-15 cm.
Total N (tN)	**All N** in soil (mineral and organic forms)	Useful to know the soil C:N ratio and subsequent effect on mineralisation rates.	

14. Olivia Webster and Dan Bloomer, *Farmer Friendly Nitrate Testing: Nitrachek Project Report* (LandWISE Inc., 2025).

Ordering lab tests for nitrogen

The types of nitrogen tests offered by labs, as well as the terminology used, has changed over the years. Furthermore, some tests need to be specifically requested on the lab forms, instead of ticking a box for a normal fertility test.

A guide on ordering nitrogen tests through the three main soil labs in New Zealand (Hill Labs, ARL, and Eurofins) was developed for the Sustainable Vegetable Systems project. This guide is linked below and available on VR&I's website[15].



Key points to note include:

- Mineral N tests normally need to be separately requested on the order form.
- PMN is the amount of N potentially available i.e. mineralisable in the soil. This can be ordered using a HWEON test.

Contact a client services manager at your preferred lab for any lab specific queries.

Nitrate Quick Tests

A Nitrate QT can be a useful tool to quickly understand soil available nitrogen (nitrate-N only), without needing to wait on a lab analysis. This testing method involves collecting a representative soil sample and undertaking your own analysis by extracting nitrate into solution and using a test strip or digital sampler to measure nitrate levels.

The resources below (user guide and video) will step you through the key aspects of conducting a Quick Test. The resources section of this guide contains links on where to order the required testing equipment and materials.

The Nitrate Quick Test Mass Balance Tool User Guide is a comprehensive document growers can use to understand how to take a Nitrate Quick Test and interpret the results. This was developed by Foundation for Arable Research (FAR). https://www.hortnz.co.nz/assets/Compliance/FAR-Quick-Test-Mass-Balance-Guide-2023.pdf

The Sustainable Vegetable Systems project developed a series of videos, including one on how to perform the Nitrate Quick Test. Check it out below. https://www.youtube.com/watch?v=UrY8yAvtVvY

15. Link to factsheet: https://www.vri.org.nz/dmsdocument/296-nitrogen-soil-testing-factsheet-v6

When conducting a Nitrate QT, additional information needs to be collected when sampling. This information is used when inputting the results into the SVS Tool (see the next section), to convert the result to estimated kg N/ha.

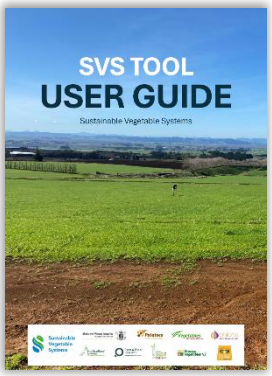
Additional information required:

- Sample depth (cm)
- Sample moisture (dry, moist, or wet)
- Soil texture (sand, loamy sand, sandy loam, sandy clay, sandy clay loam, loam, silt, silt loam, silty clay loam, clay loam, silty clay, or clay) – this information can be sourced from online soil maps (e.g. S-map) – see the resources section on online tools.

Results & analysis: Using the SVS Tool

The SVS Tool is a nitrogen budgeting tool developed for commercial vegetable growers, as part of the 4-year Sustainable Vegetable Systems project. The tool can be used to convert both mineral N test results (including Nitrate QT results) and PMN results in mg N/kg into kg N/ha. This makes it much easier to use the results as part of nutrient management planning.

The SVS Tool is free to use and available at https://svstool.co.nz/. For those unfamiliar with the SVS Tool, a comprehensive user guide is available on VR&I's website[16] (linked below).



Entering mineral N results

Mineral N tests results, including Nitrate QT and lab mineral N tests, can both be entered into the SVS Tool.

1. Set up a crop in the tool, if not already established.
2. Click **+Add** next to **Soil mineral N Test results**.
3. A pop-up will guide you to select either a Nitrate quick test, or a laboratory mineral N test.
4. Enter in the information when prompted. Take note of the units and ensure the correct depth and soil moisture is input (the latter for the quick test).
5. After clicking **Save**, the results should pop up underneath the Soil Mineral N Test Results section, in nitrogen kg N/ha to 30 cm[17].

Entering PMN results

The SVS Tool also provides an opportunity to input PMN results in mg/kg. The tool converts this to a soil organic N (kg N/ha) number, based on the soil, environmental factors and crop growing days. This figure will help you understand how much N may become available over the growing season.

Other resources

Other tools and resources that can be used to interpret Nitrate QT and PMN results include:

- FAR Quick Test Mass Balance Tool[18]
- Plant & Food Research factsheet on soil nitrogen testing[19] (includes calculation guidance on converting results to kg N/ha).

16. Link to guide: https://www.vri.org.nz/research/new-research-document-page-91/
17. The tool will automatically convert all results into a nitrogen availability from 0 to 30 cm, even if other depths are entered into the tool.
18. Link to tool: https://far-qttool.shinyapps.io/shinyapp/
19. Beare, "Guidelines for soil nitrogen testing".

4 Resources and further reading

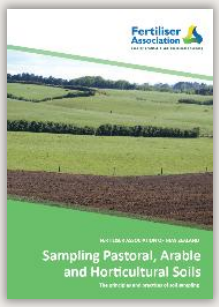
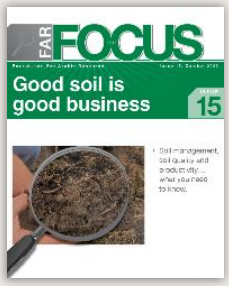
Equipment

Equipment	Details
Nitrate Quick Test kits 	Lab Supply provide Nitrate Quick Test testing kits, as well as the test strips (if you already have a test kit). https://www.labsupply.co.nz/General-Labware-and-Consumables/Testing-Strips/Test-Strips/Nitrate-Test-kit-CHENITRATE-N • This kit contains test tubes, strips, and $CaCl_2$ required to undertake a Nitrate QT. https://www.labsupply.co.nz/General-Labware-and-Consumables/Testing-Strips/Test-Strips/Nitrate-Test-100tests-MER1100200001 • This links you to the replacement Nitrate test strips included in the original kit.
Soil sampling kits	All major testing labs have methods for you to order soil testing kits, which generally include sampling bags, order forms, and courier labels. Labs also offer kits for Mineral N testing, which include ice packs and chill boxes. • Hill Labs: https://portal.hill-laboratories.com/sampling-supplies • ARL: https://resupply.co.nz/collections/tests • Eurofins: https://www.eurofins.co.nz/agricultural-testing/agricultural-testing-services/sampling/ (contact to request a kit)
Soil corers / augers	Soil corers are available through several channels, including soil testing labs. • Hill Labs: Through the customer portal (3 inch/7.5 cm + 6 inch/15cm available) • Resupply: https://resupply.co.nz/collections/tests/products/15cm-soil-testing-probe

Online tools

Tool	Details
SVS Tool	Nutrient budgeting tool for commercial vegetable growers. https://svstool.co.nz/
FAR Quick Test Mass Balance Calculator	Online calculator to convert Nitrate QT results to kg N/ha. https://far-qttool.shinyapps.io/shinyapp/
Nitrachek Calculator	Online calculator to convert Nitrate QT results to kg N/ha. https://www.landwise.org.nz/home/tools/nitrachek-calculator/
S-map Online	A digital soil map created and administered by the Manaaki Whenua Landcare Research Group. https://smap.landcareresearch.co.nz/
LRIS portal	An online information portal to download GIS information layers relevant to soil and environmental management. https://lris.scinfo.org.nz/

Further reading

Resource	Details
	**Fertiliser Association - Sampling pastoral, arable and horticultural soils booklet** The Fertiliser Association have a comprehensive booklet on soil sampling, including guidance for horticultural operations. https://www.fertiliser.org.nz/files/site/Sampling-Pastoral-Arable-and-Horticultural-Soils-Final.pdf
	**LandWISE online nutrient management course – Soil module** As part of their online nutrient management course, LandWISE developed a module on taking representative soil samples. The module includes two videos on best practice sampling, and considerations on sampling when crops have been previously fertilised. https://www.landwise.org.nz/courses/nutrient-management-for-vegetable-crops/lessons/dealing-with-variability/
	**FAR Focus: Good soil is good business – Guide on soil management and quality** Foundation of Arable Research (FAR) developed a FAR Focus issue in 2022, all about soil quality. It contains guidance on measuring different soil characteristics, including texture and organic matter, as well as nitrogen. It also contains guidance on methods to improve your farm's soil quality. https://assets.far.org.nz/blog/files/06c26daf-ed79-56f2-8dfe-3a62cd9e7a66.pdf
	**Fertcare – A guide for 'fit for purpose' soil sampling – Fertilizer Australia** A comprehensive document published by Fertilizer Australia on soil sampling timing, protocol, in-paddock considerations, equipment and handling. Useful for a deep dive into sampling procedures. https://fertilizer.org.au/Portals/0/Documents/Fertcare/Fertcare%20Soil%20Sampling%20Guide.pdf

5 Glossary

Most definitions sourced from the Soil Science Society of America[20].

Absorption, active Movement of ions and water into the plant root because of metabolic processes by the root, frequently against an electrochemical potential gradient.

Absorption, passive Movement of ions and water into the plant root from diffusion along a chemical potential gradient.

Adsorption The process by which atoms, molecules, or ions are taken up from the soil solution or soil atmosphere and retained on the surfaces of solids by chemical or physical binding.

ASC (Anion Storage Capacity) The sum of exchangeable anions that a soil can adsorb. Usually expressed as centimoles, or millimoles, of charge per kilogram of soil (or of other adsorbing material such as clay).

Bulk density The mass of dry soil per unit bulk volume. The value is expressed as kilograms per litre (kg/L).

Carbon/nitrogen ratio The ratio of the mass of organic carbon to the mass of organic nitrogen in soil, organic material, plants, or microbial cells.

CEC (Cation Exchange Capacity) A soil's ability to hold onto positively charged nutrient ions (cations like K^+, Ca^{2+}, Mg^{2+}) on its negatively charged surfaces, essentially measuring the soil's fertility and nutrient storage potential. Higher CEC means more nutrients are held, ensuring a steady supply for plants.

Immobilisation The conversion of an element from the inorganic (mineral) to the organic form in microbial or plant tissues.

Inorganic N (mineral N) Nitrogen in mineral forms, including nitrate-N (NO_3^--N) and ammonium-N (NH_4^+-N), immediately available for plant uptake.

Leaching The removal of soluble materials from one zone in soil to another via water movement in the profile.

Macronutrient A plant nutrient found at relatively high concentrations (>500 mg kg^{-1}) in plants. Usually refers to N, P, and K but may include Ca, Mg, and S.

Micronutrient A plant nutrient found in relatively small amounts (<100 mg kg^{-1}) in plants. These are usually B, Cl, Cu, Fe, Mn, Mo, Ni, Co, and Zn.

Mineral N (inorganic nitrogen) Nitrogen in inorganic forms, including nitrate-N (NO_3^--N) and ammonium-N (NH_4^+-N), immediately available for plant uptake.

Mineralisation The conversion of an element from an organic form to an inorganic (mineral) state as a result of microbial activity.

Nitrification Biological oxidation of ammonium to nitrite and nitrate, or a biologically induced increase in the oxidation state of nitrogen.

Nitrogen fixation Conversion of molecular nitrogen (N_2) to ammonia and subsequently to organic nitrogen utilizable in biological processes.

Organic N Nitrogen bound in organic compounds, such as plant residues and soil organic matter. It must be mineralised before plants can use it.

Oxidation The loss of one or more electrons by an ion or molecule.

PMN (Potentially Mineralisable Nitrogen) The amount of nitrogen that could become plant-available through microbial breakdown of organic matter under ideal conditions.

Soil organic matter The organic fraction of the soil exclusive of undecayed plant and animal residues.

20. Soil Science Society of America, *Glossary of Soil Science Terms*, 2025, accessed 16 November 2025, https://www.soils.org/publications/soils-glossary.

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