📘 Chapter 1: Foundations of Soil Therapy – The Power of the Test

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🎬 Chapter Introduction – Unlocking the Hidden Language of Your Soil

Welcome to **Chapter 1: Foundations of Soil Therapy**, where we begin our journey into understanding the true power of soil testing. This chapter lays the groundwork for everything that follows, and if there's one key message, it's this:

> 🌱 **You can't manage what you don't measure.**
> And when it comes to soil, your test results are the most powerful decision-making tool you have.

In this session, Graeme Sait introduces you to a new way of thinking—**a root cause approach**. For decades, conventional agriculture has leaned heavily on input-based systems that treat symptoms rather than addressing the real problems. The result? Rising costs, increasing chemical dependency, and diminishing returns.

But there's a better way. Nutrition Farming® empowers growers to **understand their soil**, take back control, and make informed choices that are good for the crop, the planet, and the bottom line. And it all starts with a good soil test.

Graeme explains not just **how to read a soil test**, but why it's the cornerstone of farm resilience and profitability. You'll learn about key testing concepts like **CEC, pH, base saturation**, and **mineral ratios**—as well as how **imbalances can trigger a cascade of issues** that compromise plant health, reduce yields, and increase pest and disease pressure.

You'll also be introduced to two essential visual tools:

- **Mulder's Chart**, which illustrates how minerals interact (positively or antagonistically)
- A **cation antagonism pie chart**, showing how excesses in one mineral can restrict others

What makes this session particularly valuable is Graeme's ability to connect science to story, and numbers to outcomes. He'll show you how even small missteps—like applying the wrong kind of lime or blindly trusting fertiliser advice—can set you back. And more importantly, he'll teach you how to avoid them.

By the end of this chapter, you'll begin to see soil testing **not as a confusing lab report**, but as a **powerful, practical tool**—one that gives you the clarity and confidence to farm smarter.

🎥 Watch the Video

[Insert Chapter 1 Video Here]
Duration: ~20 minutes
Presenter: Graeme Sait, Nutri-Tech Solutions

📝 Detailed Summary

🌱 Soil Testing as the Gateway to Root Cause Farming

Graeme opens with the principle that underpins all of Nutrition Farming®: **solving problems at the source**. Instead of using synthetic chemicals to suppress symptoms like pests or diseases, he argues we must identify and address the **mineral or biological causes** behind them.

He cites concerning data showing chemical use has increased globally every year for decades, while pest and disease pressure has also risen—clear evidence that the current model is broken.

🔄 The Interplay: Minerals, Microbes, and Humus

At the core of Graeme's framework are three interconnected elements:

1. **Minerals** – the building blocks of soil fertility
2. **Microbes** – the life forms that cycle those minerals
3. **Humus** – the organic carbon sponge that retains nutrients and moisture

While all three are essential, this series focuses heavily on minerals and how to interpret their presence, absence, and balance using a soil test.

🧪 What Makes a Good Soil Test?

A useful soil test should include:

- **Base Saturation Percentages** – showing how calcium, magnesium, potassium, and sodium are held on the soil colloid
- **Cation Exchange Capacity (CEC)** – indicating the soil's storage capacity for nutrients
- **Key Ratios** like calcium to magnesium
- **Total Exchange Capacity (TEC)** – especially important for acidic soils

Labs like **AEL in Australia** (used by NTS) are referenced, but any test that offers comprehensive data and includes TEC is acceptable.

📉 Common Mistakes to Avoid

- **Overapplying calcium**: Can shut down seven other minerals, including phosphate and boron.
- **Using dolomite in high-magnesium soils**: Increases compaction and restricts oxygen.
- **Applying potassium when levels are already high**: Can reduce calcium uptake and cell strength, increasing disease pressure.
- **Trusting fertiliser advice blindly**: If you don't understand your soil test, you risk being misled by input suppliers.

📊 Visual Tools: Mulder's Chart & Cation Pie

Graeme introduces:

- **Mulder's Chart** – a web of arrows showing which minerals stimulate or antagonise others
    - *Example: Calcium stimulates phosphate, zinc, boron, etc.—but excess calcium antagonises them all*
- **Cation Antagonism Pie Chart** – shows how cations in excess (e.g. potassium, magnesium, sodium) can suppress others

👉 Tip: **Print and laminate these charts** to keep them in your office or grower shed as ongoing references.

⚖️ Balance Over Quantity

It's not about how much of a mineral you have—it's how well they work together:

- Calcium is essential, but more isn't always better.
- Phosphate might be present, but if pH or other minerals are off, it may not be available.
- pH is a master variable—it controls the availability of all nutrients.

🌡️ The Role of pH in Nutrient Uptake

Graeme explains the pH-nutrient availability chart:

- **Ideal soil pH = 6.4**
- **Low pH (5.0)** limits nitrogen, phosphorus, calcium, etc.
- **High pH (8.5+)** locks out iron, zinc, manganese, boron

✅ **Foliar feeding** can bypass high or low pH and deliver trace minerals directly to the leaf—up to 12 times more efficiently than soil application.

⚡ Cations vs Anions: The Chemistry of Soil

- **Cations**: Positively charged (Ca^{2+}, Mg^{2+}, K^{+}, Na^{+})
- **Anions**: Negatively charged (NO_3^{-}, PO_4^{3-}, SO_4^{2-})

This distinction helps explain:

- Why anions like nitrate leach more easily
- Why cations are held on the soil colloid

- Why humus (which holds anions) is such a valuable storage bank

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📌 Key Takeaways

- Soil testing is the most empowering tool in your agronomic toolbox.
- Understanding mineral **ratios and interactions** is more important than chasing raw numbers.
- **pH and base saturation** are crucial concepts for managing nutrient availability.
- Use **Mulder's Chart** and **Cation Pie Charts** to visualise interactions.
- Foliar nutrition is a strategic way to correct imbalances quickly and cost-effectively.

⏭️ Up Next: Chapter 2 – Cracking the Code of Your Soil Test

In the next chapter, we move from theory into application. You'll learn exactly **what each line item on your soil test means**, how to interpret values like CEC, TEC, conductivity, and pH—and what those numbers actually tell you about your soil's health and productivity potential.

📘 Chapter 2: Cracking the Code – How to Read and Interpret Your Soil Test

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🎬 Chapter Introduction – Turning Numbers into Knowledge

Now that you understand the philosophy and purpose behind soil testing, it's time to roll up your sleeves and start interpreting the numbers.

In **Chapter 2**, Graeme Sait takes us deeper into the soil test itself—line by line—and demystifies the key terms that appear on most commercial soil reports. If Chapter 1 was about **why** we test soil, this chapter is all about **how** to use those results to guide better decisions on the farm.

You'll learn to identify the critical parameters like:

- **Cation Exchange Capacity (CEC)** – the "bucket size" of your soil
- **Total Exchange Capacity (TEC)** – reveals the presence of acidity-driving hydrogen
- **Organic Matter** – the single greatest predictor of soil productivity
- **pH** – the gateway to mineral uptake
- **Conductivity** – your mineral "oomph" level

This chapter is rich in practical insights, including **how to measure your own pH and conductivity at home**, how to understand hydrogen's impact on nutrient availability, and why **paramagnetism** might be a hidden fertility factor in volcanic soils.

By the end, you'll not only understand the terms on your test—you'll begin to recognize how they influence one another and what actions they suggest.

🎥 Watch the Video

[Insert Chapter 2 Video Here]
Duration: ~20 minutes
Presenter: Graeme Sait, Nutri-Tech Solutions

📝 Detailed Summary

🧮 1. Cation Exchange Capacity (CEC) – The Soil's Storage Tank

- **CEC** measures the soil's ability to store nutrients—specifically cations like calcium, magnesium, potassium, and sodium.
- **Heavy clay soils** = high CEC (e.g., 40+)
- **Light sandy soils** = low CEC (e.g., 3–5)

💡 *Tip*: In low-CEC soils, don't broadcast large inputs—it's better to spoon-feed through fertigation or foliar application.

⚡ 2. Cation Exchange Process – The Hydrogen Effect

When a plant absorbs a cation (like calcium), it must release another cation to maintain electrical balance. It doesn't give up potassium or magnesium—instead, it **exchanges hydrogen**.

- Hydrogen is not a nutrient—it's an acidifier.
- More hydrogen = lower pH = fewer beneficial cations left on the colloid.

🌡️ *Key Insight*: High hydrogen content means your soil is acidic **and** depleted of base cations. This is why you must measure hydrogen on your test (via **TEC**).

🧪 3. TEC vs CEC – The Hidden Acid in the System

- **TEC (Total Exchange Capacity)** = CEC **+ hydrogen**
- If your test doesn't include TEC, you're flying blind in acidic soils.

📉 Example: You might think you have "perfect balance" with 68% calcium, 12% magnesium… but you actually have 30% hydrogen and a pH of 5.5. That 68% calcium is really only ~48% in a full picture.

📌 Always choose a test that measures **both** CEC and TEC.

🧲 4. Paramagnetism – Energy in the Earth

Paramagnetism refers to a soil's ability to attract and convert atmospheric energy (long-wave radio frequencies) into light energy (biophotons).

- Volcanic soils are naturally high in paramagnetism.
- You can **boost fertility** by adding **basalt crusher dust**, which is inexpensive and high in paramagnetic charge.

🧠 Graeme references the work of **Professor Phil Callahan**, who discovered that these "antenna-like" soils improve biological activity and crop performance.

🌡️ 5. pH – The Mineral Gatekeeper

- Ideal pH: **6.4** (same target for plant sap pH and even human/cow urine)
- Nutrient availability peaks at this level
- Acidic soils (pH < 5.5): Poor phosphorus, calcium, nitrogen availability
- Alkaline soils (pH > 8): Iron, manganese, zinc, boron are locked out

✅ Use **DIY pH testing**:

1. Mix equal parts soil and deionized water
2. Shake and wait 5 minutes
3. Test with a pH strip or probe
4. Do this in **multiple paddock zones**—pH often varies across a field

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🧬 6. Organic Matter – The #1 Fertility Indicator

- Ideal range: **4–7%**
- Australian average: ~1.7%

Organic matter:

- Buffers nutrients
- Stores water
- Improves structure
- Holds negatively charged minerals (anions) like nitrate, phosphate, sulfate

📊 *Case Study*: A National Bank study of 700 Australian farms found that **organic matter was the single strongest predictor of farm profitability.** Even a 0.15% increase raised land value substantially.

🎯 Key Insight: Improving humus = improving profits. And soon, growers may get paid for doing so through **carbon credits.**

⚡ 7. Conductivity – Do You Have Enough "Oomph"?

- Measured with a conductivity (EC) meter and deionized water
- Starting point: **0.2 EC** for most crops
- Flowering/fruiting stage: **0.6–0.8 EC**
- Avoid >1.0–1.2 EC (can lead to salt stress)

Potassium is the **biggest driver** of conductivity. If EC is low, potassium is the first place to look.

📌 Graeme recommends checking EC and potassium together to diagnose plant “stagnation.”

📌 Key Takeaways

- **CEC** tells you how much your soil can hold—use it to guide your input strategy.
- Always test for **hydrogen (TEC)**, or you risk misinterpreting base saturation.
- **Organic matter** is the #1 predictor of productivity—track it and build it.
- **pH affects everything**—know your paddock zones and adjust accordingly.
- Use **conductivity** to monitor nutrient sufficiency and vigor.
- Don’t overlook the **energetic side** of soil—paramagnetism may be the hidden force in high-performing volcanic soils.

⏭️ Coming Up: Chapter 3 – Working with Real Tests and Real Numbers

In Chapter 3, we’ll go even deeper by analyzing actual soil test data. You’ll see how to:

- Interpret mineral levels (ppm and base saturation)

- Diagnose imbalances
- Plan corrective strategies (e.g., foliar sprays, root zone management)
- Work with macro and trace elements

This is where knowledge meets application—don't miss it.

📘 Chapter 3: From Data to Decisions – Interpreting Real Soil Tests

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🎬 Chapter Introduction – Where Knowledge Meets the Paddock

Welcome to **Chapter 3**, where things get real.

In the first two chapters, you were introduced to the principles of Nutrition Farming® and the core parameters of soil testing. Now, in this pivotal session, Graeme Sait takes you into the practical reality of soil interpretation—**using actual soil test examples** to guide decision-making.

This chapter is all about application. You'll learn how to look at a real test result and not just read it, but **understand what it means** for your farm and how to act on it. Graeme walks you through:

- Base saturation levels and ratios
- Macronutrient and micronutrient deficiencies
- Antagonisms that block uptake
- Strategic foliar corrections
- The role of compost and humus in nutrient retention

You'll explore case studies of problematic soils—high in magnesium, low in potassium, or overloaded with iron—and how those problems manifest in plant symptoms like small fruit, poor flavour, or pest pressure.

More than anything, this chapter reinforces that interpreting a soil test is **not just about numbers**—it's about understanding **how minerals behave**, how they interact, and how you can adjust them to support crop health, soil structure, and farm profitability.

🎥 Watch the Video

[Insert Chapter 3 Video Here]
Duration: ~20 minutes
Presenter: Graeme Sait, Nutri-Tech Solutions

📝 Detailed Summary

🧲 1. Calcium & Magnesium – The Breathers and the Binders

- **Calcium**: Large ion with two charges, promotes **soil flocculation** (opens the soil)
- **Magnesium**: Small ion with two charges, causes **compaction** (tightens the soil)

💡 High magnesium soils are hard to work, reduce oxygen flow, and require **more nitrogen** due to poor microbial activity.

📌 If **Mg is too high**, it's antagonistic to nitrogen, potassium, calcium, and overall nutrient mobility.

📊 2. Base Saturation – The Balancing Act

- Introduced by **Dr. William Albrecht**, base saturation describes what % of the soil colloid is occupied by:
  - Calcium (Ca)
  - Magnesium (Mg)
  - Potassium (K)
  - Sodium (Na)
  - Hydrogen (H)

🎯 **Ideal base saturation for medium soils**:

- Calcium: 68–70%
- Magnesium: 10–12%
- Potassium: 3–5%
- Sodium: <2%
- Hydrogen: whatever is left (ideally low)

🔁 Calcium + Magnesium should not exceed 80% of the base saturation pie.

📌 This balance affects everything from soil structure to nutrient availability.

⚠️ 3. High Magnesium Case Study – Locked Soil & Tiny Fruit

- Example: Grower has 1247 ppm Mg (ideal ~400), only 114 ppm K (ideal ~400)
- Result: A **12:1 Mg:K ratio** – a major imbalance
- Symptoms: Small, sour grapes; poor sweetness and yield

📉 Solution:

- **Foliar spray potassium sulfate** with fulvic acid
- Spoon-feed the crop through fertigation
- Possibly apply soft rock phosphate to slowly lift K and P together

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💡 4. Potassium – The Money Mineral

- Drives fruit **size**, **sugar transport**, and **flavour**
- Should be around **3–6% base saturation** or 400+ ppm for fruiting crops

- Often suppressed by high Mg or high Na

👉 Low potassium = poor fruit set, bland taste, lower market value

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🌿 5. Humus – The Great Nutrient Keeper

- Negatively charged, humus holds **anions** like:
  - Nitrate (NO_3^-)
  - Sulfate (SO_4^{2-})
  - Phosphate (PO_4^{3-})
  - Boron (B)

📊 Case Study:

- Grower with 6.5% organic matter shows:
  - High nitrate (29.7 ppm) without ever applying nitrate fertilisers
  - High sulfate (43 ppm)
  - Moderate boron (0.7 ppm) despite no boron applications

✅ Proof that **humus holds onto leachable nutrients**, reducing waste and increasing nutrient efficiency.

🔗 6. Interactions: Antagonisms & Synergies

- **Magnesium antagonises potassium**
- **Potassium suppresses calcium and magnesium**
- **Iron suppresses manganese, zinc, and phosphate**
- **Zinc affects phosphate, and vice versa**

- **Copper can affect boron and silica**

📌 Even if a nutrient is present, it may not be available due to excesses elsewhere. This is why tissue testing or sap analysis is critical in high-iron or high-calcium soils.

📉 7. Micronutrient Interpretation

- **Boron**: Most leachable trace element; aim for ≥1 ppm
- **Zinc**: Minimum 5 ppm for healthy cell division and flowering
- **Manganese**: Affected by iron excess and high pH
- **Copper**: Often elevated due to fungicide use; ideal 2–3 ppm
- **Iron**: High iron = red soils, but may lock up other minerals
- **Molybdenum**: Critical for nitrogen fixation; aim for ≥0.5 ppm

🧪 Molybdenum is required by all nitrogen-fixing organisms (both free-living and nodular). If it's missing, you can't effectively harness the free nitrogen hovering above your crops.

🔧 Corrective Strategies

- Use **foliar nutrition** to bypass antagonisms and pH problems
- Add **compost** to build humus and hold nutrients longer
- Choose **micronised minerals** for root zone application in broadacre
- Balance **base saturation** using lime or gypsum based on needs
- Use **ratios** to guide both macro and micro mineral decisions

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📌 Key Takeaways

- Soil test interpretation is about **patterns**, not just numbers
- Imbalances often explain crop health issues better than simple deficiencies
- Potassium is central to productivity—address it aggressively when low
- Organic matter buffers and enhances nutrient availability—build it!
- **Think in ratios**: K:Mg, Ca:Mg, Zn:P, Fe:Mn—and always correct accordingly
- Your goal is not just to fix the test—but to unlock plant performance

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⏭️ Next Up: Chapter 4 – Mastering Mineral Ratios and Making Smart Corrections

In the final chapter, we'll uncover the six most important mineral ratios and learn how to use them to guide fertiliser decisions, avoid waste, and correct deficiencies with precision.

Graeme will also show you how to **calculate application rates** from your test results and how to combine science with cost-effective practice.

This is where everything clicks—don't miss it.

📘 Chapter 4: Mastering Mineral Ratios – Your Soil's Secret Formula

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🎬 Chapter Introduction – From Theory to Precision Strategy

Welcome to the final chapter of the course: **Mastering Mineral Ratios**.

At this point, you've learned how to read a soil test, interpret its values, understand the importance of balance, and avoid common pitfalls. Now it's time to connect all the dots and develop the skill of building a **correction strategy** based on mineral ratios—**the language of balance and efficiency in the soil.**

In this powerful session, Graeme Sait reveals six critical ratios that act as **guiding markers** for nutrient uptake, soil structure, resilience, and productivity. You'll learn:

- How to **calculate the ideal ratio** for your soil type
- Which ratios most impact soil **breathability**, **photosynthesis**, and **nutrient synergy**
- How to **convert ppm values to kg/ha** to create precise fertiliser plans
- When to use **lime vs gypsum**, **micronised inputs**, and **foliar applications**

This chapter isn't just academic—it's immediately practical. By the end, you'll be able to **analyze your own soil report**, spot the key ratios that need correction, and plan your inputs with confidence and cost-effectiveness.

🎥 Watch the Video

[Insert Chapter 4 Video Here]
Duration: ~20 minutes
Presenter: Graeme Sait, Nutri-Tech Solutions

📝 Detailed Summary

📐 1. How to Calculate Inputs from PPM

Example: You have 2 ppm of zinc, but need 5 ppm.

- That's a gap of 3 ppm, or **3 kg/acre of elemental zinc**
- Zinc sulfate (monohydrate) is ~33% zinc, so:
  - 3 kg elemental = 9 kg zinc sulfate per acre
  - Multiply by 2.5 → **22.5 kg/ha of zinc sulfate**

Same logic applies to copper sulfate (~25% copper), lime (~40% calcium), etc.

💡 Use this simple ppm-to-kilogram method to calculate **precise input rates**.

⚖️ 2. The Six Most Important Soil Ratios

a) Calcium : Magnesium Ratio

- Controls **soil structure** and **gas exchange**
- Calcium flocculates (opens), magnesium compacts (tightens)
- Ideal ratio varies by soil type:
    - **Light (sandy)**: 3:1
    - **Medium**: 5–6:1
    - **Heavy clay**: 7:1 or more

📌 Look at **base saturation**, not ppm, for this ratio.

To fix:

- Add **lime** to increase Ca and displace Mg
- Use **gypsum ($CaSO_4$)** to remove Mg via leaching ($MgSO_4$)

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b) Magnesium : Potassium Ratio

- Controls **potassium uptake** and **phosphate flow**
- Ideal: **1:1 in parts per million**

High Mg blocks K and phosphate. High K blocks Mg and Ca.

📉 Fix: Foliar spray potassium sulfate + fulvic acid, apply Mg only if deficient

✅ Balanced Mg:K triggers a **surge in phosphorus** uptake (due to synergy)

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c) Potassium : Sodium Ratio

- Ideal: K should be **5–10x higher** than Na in ppm

- High sodium affects potassium uptake and soil structure

📌 Monitor salinity closely; if Na is too high relative to K, potassium will struggle

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d) Phosphorus : Sulfur Ratio

- Two major **anions** with strong antagonism
- Ideal: **1:1 in ppm**

Too much sulfur → phosphate lockout
Too much phosphate → sulfur lockout

📉 Fix: Adjust one side of the ratio depending on excess/deficiency

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e) Phosphorus : Zinc Ratio

- Crucial for **enzyme function, energy transfer, Brix levels**
- Ideal: **10:1 P:Zn in ppm**

Example: 23 ppm P → need 2.3 ppm Zn

📌 Too much phosphate suppresses zinc, and vice versa

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f) Phosphorus : Boron Ratio (Implied)

- Boron affects calcium uptake, flowering, and sugar transport
- Needs to be **balanced with phosphate** for full reproductive performance

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📈 3. Ratios Predict Crop Outcomes

- Poor Ca:Mg → tight, anaerobic soil = low oxygen, poor structure

- High Mg:K → weak sugar transport, small fruit
- Low P:Zn → poor photosynthesis, stunted growth
- Poor P:S → locked-out nutrients, weak stress response

🧠 Knowing these ratios helps you:

- Save money (avoid waste)
- Improve response to foliar programs
- Prevent long-term structural issues

🧪 4. Application Strategy Based on Ratios

- **Gypsum** = best for displacing Mg or Na in high clay soils (forms $MgSO_4$ or $NaSO_4$ → leaches out)
- **Lime** = best for boosting Ca and displacing Mg in low-pH soils
- **Micronised minerals** = use in seed rows or banding for direct root zone delivery
- **Foliar sprays** = bypass soil limitations, correct trace deficiencies, boost Brix quickly

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📌 Key Takeaways

- Mineral **ratios matter more than raw numbers**
- A balanced soil is **more productive, more resilient, and more profitable**
- Learn to think in **parts per million, base saturation, and ratios**
- Foliar and micronised solutions are your most **precise correction tools**
- Lime and gypsum are **not interchangeable**—use based on soil need

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🧠 Bonus: What Happens When You Get It Right

- Improved root structure and soil breathability
- Higher nutrient density and Brix levels
- Reduced chemical inputs and pest pressure
- Stronger resilience to drought, salinity, and temperature extremes

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🎓 Course Wrap-Up – You Are Now Soil Fluent

Congratulations! You've completed the four core chapters of the Soil Testing Mastery course. You now have a full understanding of:

- How to read and interpret your soil test
- How to identify and correct imbalances
- How to calculate input rates
- How to build long-term strategies for a fertile, resilient soil

🎯 Remember: soil testing isn't just data. It's the **starting point of smarter, more sustainable farming.**

✅ Next: Test Your Knowledge

Ready to see what you've retained?
The final step is our **20-question multiple choice quiz**, designed to reinforce your learning and help you lock in the most critical concepts.

🧪 Soil Testing Mastery Quiz

Choose the best answer for each question.

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1. What does a high TEC value on an acidic soil primarily indicate?

A) High organic matter
B) High mineral content
C) High hydrogen saturation
D) High salinity

✅ **Correct Answer:** C

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2. If your soil test shows 68% calcium, 12% magnesium, and a pH of 5.2, what is likely missing from the test?

A) Conductivity reading
B) Sodium levels
C) Hydrogen measurement
D) Paramagnetism rating

✅ **Correct Answer:** C

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3. In a sandy soil with a CEC of 5, which calcium to magnesium ratio is most appropriate?

A) 2:1
B) 3:1
C) 6:1
D) 7:1

✅ **Correct Answer:** B

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4. Which mineral interaction is most responsible for phosphate suppression in a high-potassium soil?

A) Magnesium
B) Calcium

C) Sodium
D) Potassium

✅ **Correct Answer:** D

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5. Which of the following nutrients is *not* held on the cation exchange sites of the soil colloid?

A) Calcium
B) Nitrate
C) Magnesium
D) Potassium

✅ **Correct Answer:** B

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6. What is the ideal phosphorus-to-zinc ratio in parts per million?

A) 2:1
B) 5:1
C) 10:1
D) 1:1

✅ **Correct Answer:** C

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7. Which form of calcium application is most appropriate when you need to reduce high magnesium levels *and* avoid pH increase?

A) Dolomite
B) Lime
C) Gypsum
D) Soft rock phosphate

✅ **Correct Answer:** C

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8. A conductivity reading of 0.1 EC in vegetative crops indicates:

A) Ideal mineral levels
B) Excess sodium
C) Deficient nutrient availability
D) High salinity risk

✅ **Correct Answer:** C

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9. A grower has 2 ppm of copper and needs to raise it to 4 ppm. Copper sulfate is 25% Cu. How much is needed per hectare?

A) 10 kg
B) 20 kg
C) 40 kg
D) 4 kg

✅ **Correct Answer:** B

> *Explanation: 2 ppm = 2 kg/acre actual Cu → requires 8 kg Cu sulfate/acre → 20 kg/ha.*

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10. Which of the following statements is false regarding organic matter?

A) It stores cations like calcium and magnesium
B) It buffers pH
C) It holds anions like nitrate and sulfate
D) It increases with synthetic fertiliser use

✅ **Correct Answer:** D

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11. What is the ideal soil pH for optimal nutrient uptake and microbial activity?

A) 7.0
B) 5.5
C) 6.4
D) 6.8

✅ **Correct Answer:** C

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12. Which mineral is most antagonistic to boron when in excess?

A) Copper
B) Zinc
C) Calcium
D) Iron

✅ **Correct Answer:** C

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13. Paramagnetic materials enhance fertility by:

A) Lowering pH
B) Stimulating microbial nitrogen fixation
C) Attracting atmospheric radio waves and converting them to biophotons
D) Feeding beneficial fungi

✅ **Correct Answer:** C

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14. A ratio of 1200 ppm magnesium to 100 ppm potassium suggests which is most urgent?

A) Add calcium
B) Apply manganese
C) Foliar spray potassium
D) Apply magnesium sulfate

✅ **Correct Answer:** C

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15. What is the ideal base saturation percentage for potassium in a fruit crop?

A) 1–2%
B) 3–5%
C) 6–8%
D) 10–12%

✅ **Correct Answer:** B

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16. If zinc is deficient and phosphorus is excessive, what effect may occur?

A) Improved sugar transport
B) Increased calcium availability
C) Suppressed zinc uptake
D) Reduced potassium mobility

✅ **Correct Answer:** C

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17. What is the effect of magnesium on soil nitrogen efficiency in high Mg soils?

A) Improves nitrogen cycling
B) Inhibits nitrogen fixation and availability
C) Binds with nitrogen and holds it longer
D) Converts nitrate to ammonium

✅ **Correct Answer:** B

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18. Why might high sulfur suppress phosphorus availability?

A) Both are anions and compete for uptake
B) Sulfur forms insoluble salts with phosphorus
C) Sulfur lowers soil pH
D) Sulfur kills phosphate-solubilising microbes

✅ **Correct Answer:** A

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19. If TEC is not measured, what mistake are farmers likely to make?

A) Underestimating potassium needs
B) Overestimating sodium saturation
C) Assuming ideal base saturation in acidic soils
D) Applying too much phosphorus

✅ **Correct Answer:** C

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20. Which of the following strategies would *not* increase humus levels in the soil?

A) Compost application
B) Cover cropping
C) Synthetic nitrogen fertiliser
D) Biological stimulants

✅ **Correct Answer:** C

🧠 Scoring Guide

- **18–20 correct**: 🏆 *Soil Savant* – You truly understand the soil's story and can guide others.
- **15–17 correct**: 🌾 *Field-Ready Expert* – Strong grasp of soil dynamics; ready to apply this knowledge on-farm.
- **12–14 correct**: 🌱 *Emerging Agronomist* – You're on track, just revisit key ratios and calculations.
- **<12 correct**: 🔍 *Review Recommended* – Go back over Chapters 2–4 and revisit mineral interactions and balance logic.

🌱 Course Overview – Soil Testing Mastery: Foundations of Nutrition Farming®

The **Soil Testing Mastery** course, created by Graeme Sait of Nutri-Tech Solutions, is a comprehensive training program designed to unlock the secrets hidden in your soil test. With four immersive chapters, this course empowers growers, agronomists, and consultants to decode soil reports, make smarter input decisions, and build a more resilient, profitable, and sustainable farming system.

This is more than just a course on soil chemistry—it's a practical roadmap to Nutrition Farming®, where you tackle issues at the root cause, not just the symptoms.

🎯 What You Will Learn

- How to accurately read and interpret a soil test
- How to work with key metrics like CEC, TEC, pH, conductivity, and base saturation
- How to understand nutrient interactions using visual tools like Mulder's Chart
- How to diagnose imbalances and nutrient antagonisms that limit plant health
- How to build precise correction strategies using mineral ratios
- How to calculate input rates and make smart, cost-effective decisions

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🎬 Course Introduction – Unlocking the Hidden Language of Your Soil

Welcome to *Soil Testing Mastery*—a course that will change the way you see your soil. This course begins by reframing your mindset: *you can't manage what you don't measure*. Your soil test is not just a lab report—it's the most powerful decision-making tool on the farm.

Instead of relying on guesswork or input-driven advice, you'll learn a root cause approach to farming. This is the path to lowering chemical use, improving crop quality, enhancing profitability, and building resilience in your soils.

Graeme Sait will walk you through each concept with practical examples, case studies, and proven strategies—transforming soil science into a user-friendly tool for everyday farming success.

📘 Chapter Summaries

Chapter 1: Foundations of Soil Therapy – The Power of the Test

This chapter introduces the core principles of Nutrition Farming® and explains why soil testing is the foundation of everything. You'll explore key soil test parameters like base saturation, CEC, pH, and mineral ratios. You'll also learn how to use **Mulder's Chart** and the **Cation Antagonism Pie** to visualize nutrient interactions. The focus is on seeing your soil test as a strategic roadmap to long-term soil and crop health.

Chapter 2: Cracking the Code – How to Read and Interpret Your Soil Test

Here, we move into practical interpretation. Graeme breaks down the major components of a soil test—CEC, TEC, organic matter, conductivity, and more. You'll discover how to assess hydrogen levels in acidic soils, why pH controls nutrient availability, and how organic matter drives productivity. You'll also learn how to test pH and EC at home.

Chapter 3: From Data to Decisions – Interpreting Real Soil Tests

This chapter takes everything you've learned and applies it to real-world examples. You'll see how to identify deficiencies, toxicities, and imbalances using actual soil test data. Graeme shows how magnesium excess, potassium deficiency, or iron antagonism can impact crop performance—and what to do about it using foliar nutrition, compost, micronised minerals, or balanced inputs.

Chapter 4: Mastering Mineral Ratios – Your Soil's Secret Formula

In the final chapter, you'll master the six most important mineral ratios that determine soil performance. Learn how to calculate input requirements from ppm, when to use lime vs. gypsum, and how to build correction strategies using calcium:magnesium, magnesium:potassium, phosphorus:zinc, and other key ratios. This is where knowledge turns into action—giving you the tools to create balance, build fertility, and farm with confidence.