

Non-Bearing Coffee Soil Analysis

Farmer’s Manual Guide

*Fertilizer Recommendations Without Laboratory Soil Analysis
Based on Visual Soil Assessment, Soil Texture, and Coffee Growth Stage*

Introduction

Not all farmers have access to laboratory soil testing facilities. In the absence of soil and tissue analysis, general fertilizer recommendations can be made based on two key factors: (1) the growth stage of the coffee tree (non-bearing vs. fruit-bearing), and (2) the soil texture type (clayey, sandy-loam, or loam). This guide provides a practical, field-ready approach for smallholder coffee farmers.

This document is adapted from the KAPE (Kape Asenso sa Pilipino Enterprise) program recommendations provided by university instructors, enhanced with supporting references from Philippine and international coffee research.

Section 1: General Recommendation (No Lab Results)

When no laboratory soil analysis is available and the soil type is unknown, the following general recommendations apply. These are based on average nutrient requirements for coffee at different growth stages.

Coffee Status	Synthetic N-P-K (g/hill)	Organic (per hill)	Schedule	Notes
Non-bearing coffee	120-120-60	1 kg compost per tree	Every 3 months (4x/year)	Higher N and P to promote vegetative growth and root development
Fruit-bearing coffee	120-60-120	1 kg compost per tree	Every 4 months (3x/year)	Higher K to support fruit development, ripening, and bean quality

Source: KAPE APP program, university-based recommendation. Consistent with general Philippine coffee recommendations where, in the absence of soil analysis, balanced NPK ranging from 200–450 g/tree/year is applied for non-bearing trees.

Section 2: Recommendations by Soil Type

When the farmer can identify the soil texture (through the simple feel method or visual assessment), fertilizer rates should be adjusted. Different soil types retain and release nutrients differently, which affects the amount of fertilizer needed.

2.1 Clayey Soil

Clayey soils are heavy, sticky when wet, and hard when dry. They have high nutrient-holding capacity (high CEC) but poor drainage and aeration. Nutrients are retained well but may become less available due to fixation.

Coffee Status	Synthetic N-P-K (g/hill)	Organic (per hill)	Rationale
Non-bearing	150-50-150	1 kg compost per tree	Higher N and K; lower P because clay soils fix P. More K to counteract slow nutrient release. Compost improves drainage and aeration.
Fruit-bearing	200-80-250	1 kg compost per tree	High K for fruit/bean development. Higher total rates because clay binds nutrients. Split application recommended.

Schedule: Same as general – every 3 months for non-bearing, every 4 months for bearing.

Additional tips for clayey soil:

- Incorporate compost or rice hull to improve soil structure and drainage
- Apply fertilizer in shallow furrows around the drip line, not deep holes (compaction risk)
- Mulch with organic materials to prevent surface cracking during dry season
- Avoid waterlogging – ensure proper drainage channels between rows

2.2 Sandy-Loam Soil

Sandy-loam soils are lighter, well-drained, and easy to work. However, they have low nutrient retention (low CEC) and nutrients leach easily with rain or irrigation.

Coffee Status	Synthetic N-P-K (g/hill)	Organic (per hill)	Rationale
Non-bearing	70-35-80	1 kg compost per tree	Lower total rates because nutrients leach easily. Frequent, smaller applications are more efficient than large single doses.

Coffee Status	Synthetic N-P-K (g/hill)	Organic (per hill)	Rationale
Fruit-bearing	220-80-300	1 kg compost per tree	Higher rates for bearing trees. Very high K demand for fruit. Split into more frequent, smaller applications. Compost critical for nutrient retention.

Schedule: Same as general, but consider splitting each application into 2 smaller doses (e.g., every 6 weeks instead of 3 months for non-bearing) to reduce leaching losses.

Additional tips for sandy-loam soil:

- Add extra organic matter (2–3 kg compost/tree) to improve water and nutrient holding capacity
- Mulch heavily to conserve soil moisture
- Use slow-release fertilizers if available
- Split fertilizer applications into more frequent, smaller doses
- Consider foliar feeding as a supplement during critical growth stages

2.3 Loam Soil

Loam soil is the ideal soil for coffee production. It has a balanced mix of sand, silt, and clay, providing good drainage, aeration, and nutrient retention. Most nutrients are readily available to plants.

Coffee Status	Synthetic N-P-K (g/hill)	Organic (per hill)	Rationale
Non-bearing	65-30-65	1 kg compost per tree	Lowest rates because loam retains and releases nutrients efficiently. Balanced NPK for steady vegetative growth.
Fruit-bearing	180-60-220	1 kg compost per tree	Higher K for fruiting. Efficient nutrient use means less fertilizer is wasted. Standard application schedule is effective.

Schedule: Same as general – every 3 months for non-bearing, every 4 months for bearing.

Additional tips for loam soil:

- Maintain organic matter through regular composting and residue retention
- Standard fertilizer application practices are effective
- Monitor pH annually (ideal: 5.5–6.5 for coffee)
- Practice crop rotation or intercropping with leguminous shade trees

Section 3: Summary Comparison Table

The following table provides a side-by-side comparison of all recommendations for easy reference.

Soil Type	Coffee Stage	N (g/hill)	P (g/hill)	K (g/hill)	Organic
General (unknown)	Non-bearing	120	120	60	1 kg compost
General (unknown)	Bearing	120	60	120	1 kg compost
Clayey	Non-bearing	150	50	150	1 kg compost
Clayey	Bearing	200	80	250	1 kg compost
Sandy-loam	Non-bearing	70	35	80	1 kg compost
Sandy-loam	Bearing	220	80	300	1 kg compost
Loam	Non-bearing	65	30	65	1 kg compost
Loam	Bearing	180	60	220	1 kg compost

Section 4: pH Assessment Without Laboratory Testing

Farmers can estimate soil pH using simple field indicators. While not as accurate as laboratory testing, these methods provide useful guidance:

4.1 Simple pH Indicator Methods

- pH test strips or litmus paper: Affordable and available at agricultural supply stores. Mix soil with distilled water, dip the strip, and compare the color to the chart.
- Vinegar and baking soda test: Add vinegar to a soil sample – if it fizzes, the soil is alkaline ($\text{pH} > 7$). Add baking soda mixed with water to another sample – if it fizzes, the soil is acidic ($\text{pH} < 7$). No reaction to either suggests near-neutral pH.
- Indicator plants: Presence of certain weeds can indicate pH. Mosses, ferns, and sorrel suggest acidic soil. Henbit and chickweed suggest neutral to slightly alkaline soil.
- BSWM Soil Test Kit (STK): The Philippine Bureau of Soils and Water Management distributes rapid soil test kits that can assess pH, N, P, and K in the field.

4.2 pH Recommendations for Coffee

Coffee grows best at pH 5.5–6.5 (slightly acidic to near neutral).

pH Range	Status	Effect on Coffee	Farmer Action
<4.5	Too acidic	Aluminum toxicity damages roots. Nutrients (P, Ca, Mg) become unavailable. Poor growth and yellowing leaves.	Apply agricultural lime (1–2 kg per hill). Mix with topsoil. Reapply every 6–12 months until pH improves.
4.5–5.5	Acidic	Reduced nutrient availability. Some root damage possible. Moderate growth limitation.	Apply lime (0.5–1 kg per hill). Add compost. Re-check pH after 6 months.
5.5–6.5	Ideal	Optimal nutrient availability. Healthy root development. Best growth and yield potential.	No pH correction needed. Maintain with regular organic matter additions.
6.5–7.5	Slightly alkaline	Iron, zinc, and manganese become less available. Some yellowing of young leaves (chlorosis).	Add organic matter (acidifying effect). Use ammonium sulfate instead of urea. Apply ferrous sulfate for iron chlorosis.
>7.5	Too alkaline	Severe micronutrient deficiency. Stunted growth. Poor fruit development.	Apply elemental sulfur (0.5–1 kg per hill). Heavy compost application. Use acid-forming fertilizers. Consider soil reclamation.

Section 5: How to Identify Soil Type in the Field

Farmers can identify soil texture using the simple feel (ribbon) method:

The Ribbon Test

- Take a handful of moist soil and squeeze it in your palm.
- Try to form a ribbon by pushing the soil between your thumb and forefinger.
- If no ribbon forms and the soil feels gritty: Sandy soil or sandy-loam.
- If a short ribbon forms (2–5 cm) and feels smooth but slightly gritty: Loam soil.
- If a long ribbon forms (>5 cm) and feels smooth, sticky, and plastic: Clayey soil.

Other Visual Indicators

Characteristic	Clayey Soil	Sandy-Loam Soil	Loam Soil
Color when wet	Gray to reddish brown	Light brown to yellowish	Dark brown
Feel when wet	Sticky, very plastic	Gritty, slightly sticky	Smooth, slightly gritty
Behavior when dry	Hard, cracks on surface	Loose, crumbles easily	Firm but friable
Water drainage	Very slow	Very fast	Moderate (good)
Nutrient retention	High (but may fix P)	Low (nutrients leach)	Moderate to good
Workability	Difficult to plow when wet/dry	Easy to plow anytime	Easy to plow when moist

Section 6: Best Practices for Non-Bearing Coffee Management

6.1 Fertilizer Application Method

- For 1–3 year old trees: Make a shallow furrow (5 cm deep) in a ring around the tree, about 15–30 cm from the trunk. Place fertilizer in the furrow and cover with soil.
- For trees approaching bearing age: Extend the furrow ring to the drip line (outer edge of the canopy). Apply fertilizer and cover.
- Always weed before applying fertilizer to reduce competition.
- Apply fertilizer when soil is moist (after rain or irrigation) for better absorption.

6.2 Organic Matter Management

- Apply 1 kg of well-decomposed compost or animal manure per tree per application.
- Compost can be made from coffee pulp, rice hull, animal manure, and kitchen waste.
- Mulch around the base of the tree (but not touching the trunk) with dried leaves, grass clippings, or rice straw.
- Plant leguminous cover crops (e.g., Calopogonium, Centrosema, or madre de cacao) as shade and nitrogen-fixing intercrops.

6.3 Monitoring and Adjustment

Even without laboratory testing, farmers should observe their trees regularly. Signs of nutrient deficiency include: yellowing of older leaves (N deficiency), purplish discoloration (P deficiency), browning of leaf edges (K deficiency), and interveinal yellowing of young leaves (Fe or Zn deficiency from high pH). Adjust fertilizer application based on these visual cues and seek advice from the nearest agricultural technician or BSWM regional office.

References

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Disclaimer: These recommendations are general guidelines for situations where laboratory soil analysis is not available. For optimal results, farmers are strongly encouraged to have their soil tested at the nearest BSWM regional soils laboratory or accredited soil testing facility. Site-specific recommendations based on actual soil analysis will always be more accurate and cost-effective than general guidelines.