



# SOIL TESTING AND NUTRIENT MANAGEMENT FOR TOMATO PRODUCTION



## Introduction



*Tomato variety Bingwa FI.*

## Introduction

Soil test results reveal the nutrient levels, how acidic or alkaline it is (soil pH) and organic matter content, informing if lime is needed for balance. Essential nutrients like nitrogen (N), phosphorus (P), and potassium (K), are assessed along with others such as calcium (Ca), magnesium (Mg), iron (Fe), manganese (Mn), and zinc (Zn). Specific concerns like copper (Cu), boron (B), chlorine (Cl) and molybdenum (Mo). Additionally, it evaluates soil texture (whether it's sandy, loamy, or clayey) and how well soil holds moisture, aiding in watering decisions. It is a comprehensive report card to help make informed decisions about how to care for plants and improve the soil for better yields. In this way, this test enables efficient soil fertility management practices to maximize profits. In essence, a soil test serves as the initial step in identifying soil-related constraints and implementing strategies for optimal soil health and productivity, whether in soilless media or traditional soil environments.

## SOIL TESTING

### **When should soils be tested?**

Result of soil test is the first step in determining what needs to be done or not done and is often used as a planning tool. If the soil is used continuously, samples can be taken at any time after two years. To enhance soil fertility, one should give yourself enough time to evaluate the results of the soil test before acting upon them. Any suggested changes, such as applying fertilizer, should be done at

the right time of year or season

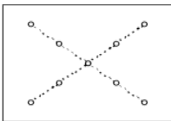
## The Importance of Soil Testing

Soil tests can be used for four purposes:

- Maintaining proper soil fertility
- Guiding plant selection
- Performing plant problem diagnostics
- Conforming to some requirement

## Soil sampling

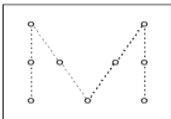
Soil sampling involves the systematic collection of soil samples on a farm for analysis. When conducting soil sampling, it is crucial to ensure that the samples accurately represent the farm or area's situation. Additionally, it is essential to take separate soil samples in areas where farm features vary, as these differences can affect soil fertility.



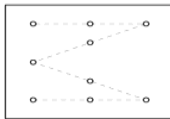
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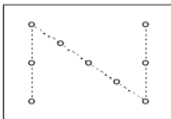
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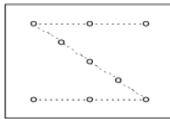
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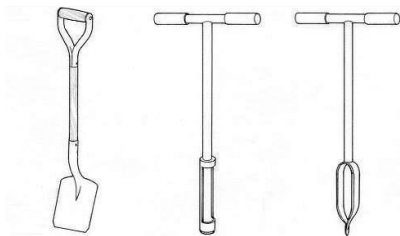


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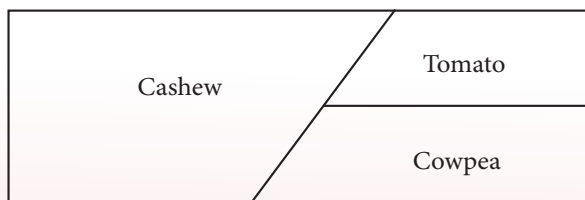
*Soil sampling in the field.*

1. Tools for drilling soil for sampling.



*Blade, tube, and auger (left to right).*

2. Divide farm according to variability. Sketch and label each field.



*Map of Farm showing sampling areas*

3. Mark soil auger (0-15 cm, 15-30 cm, 30-60cm, e.t.c) as desired.
4. Mark buckets corresponding to the different soil depths.
5. Sample to depth 0-15 cm for shallow and >15cm for deep rooted crops.
6. Take soil from at least 10 places in each field.



*Sampling in the field using auger – left and tube – right.*

7. Mix thoroughly to form a composite sample.
8. Take at least 500g of the composite and pack in a bag.
9. Label the outside of the pack and insert another label into the pack.

10. Send the samples to the laboratory or store in a clean dry place for later submission to the laboratory.

### Soil samples should be sent to:

Kenya Agricultural & Livestock Research Organization (KALRO)

National Agricultural Research Laboratories

P.O. Box 14733, 00800 NAIROBI

Email : [soil.labs@kalro.org](mailto:soil.labs@kalro.org) / [soilabs@yahoo.co.uk](mailto:soilabs@yahoo.co.uk)

Tel: 020-2464435

Physical Address; Along Waiyaki Way Opposite ABC Place

### Guidelines to interpretation of soil analysis results (Use of Critical levels)

Soil pH levels		
Range	Ratings	Interpretations
> 8.5	Very high	Alkaline soils
7.0-8.5	High	Alkaline to neutral
5.5-7.0	Medium	Acid to neutral
<5.5	Low	Acid soils

### Guidelines on interpretation of soil N and C

Nutrient	Value	Rating
Organic C%	>3.0	High
	1.5-3.0	Moderate
	0.5-1.5	Low
	<0.5	Very low
Total N %	>0.25	High Moderate
	0.12-0.25	
	0.05-0.12	Low
	<0.05	Very low

## Interpreting of exchangeable cation levels in soils

Rating	K(mg/kg)	Mg (mg/kg)	Ca (mg/kg)
Very high	>300	>180	>2400
High	175-300	80-180	1600-2400
Medium	50-175	40-80	1000-1600
Low	50-100	20-40	500-1000
Very low	<50	<20	<500

Source: Okalebo *et al.* (2002)

## SOIL NUTRIENTS FOR TOMATO

### Important tomato nutrients, their uses and deficiency symptoms

#### I. Nitrogen

##### Uses

- It is a crucial part of chlorophyll.
- A protein constituent.
- Facilitates vegetative growth of plants.

##### Deficiency symptoms

- Decreased growth of vegetation.
- Older leaves have chlorotic tips that move in a V-shape toward the midrib.
- The veins and petioles have a little red tint.



Source: [www.haifa-group.com](http://www.haifa-group.com)

## 2. Phosphorus

### Uses

- Helps in root formation
- Supports flower and seed formation
- Useful in energy transfer

### Deficiency symptoms

- Turning purple leaves
- Stopped development
- Stems that are thin and spiny
- If plants have an extreme lack of phosphorus, they are unable to flower
- Usually observed at the beginning of the season



Source: [www.haifa-group.com](http://www.haifa-group.com)

## 3. Calcium

### Uses

- Promotes elongation of cells.
- Helps in absorbing nutrients.
- Enhances the structure of the cell wall

### Deficiency symptoms

- Lesions soaking in water on fully grown fruits.
- Folds upward and leaves curl.
- Leaf margins do not enlarge.
- Flower abortion is caused by a severe deficit.
- Growth point death



Source: [www.haifa-group.com](http://www.haifa-group.com)

## 4. Potassium

### Uses

- Helps in movement of sugars.
- Imparts disease tolerance.
- Play a role in water movement (drought tolerant).

### Deficiency symptoms

- Yellowing of leaves starting with leaf margins
- Uneven ripening of fruits
- Severe deficiency results in dead leaf veins
- Leaves curl up and crinkle
- Cracking/ splitting of mature fruits



Source: [ww.asiafarming.com](http://ww.asiafarming.com)



## 5. Magnesium

### Uses

- Component of chlorophyll.
- Used in protein synthesis.
- Influence oil formation in seeds.

### Deficiency symptoms

- Prevalent in older leaves.
- Yellowing of leaf veins.
- Leaf edges and tips turn red and turn downwards.

Severe deficiency results in dead spots in the veins.



Source: [www.asiafarming.com](http://www.asiafarming.com)

## 6. Boron

### Uses

- Helps in formation of conductive tissue.
- Helps in formation of pollen tubes.
- Translocate nitrogen and sugars from leaves to fruits.

### Deficiency symptoms

- Leaves become brittle, thick and dwarfed.
- Bumpy appearance on fruits.
- Swollen and misshaped fruits.
- Rosetting of flowers.
- Leaves exhibit a light yellow color.



Source: [www.asiafarming.com](http://www.asiafarming.com)

### Further Reading

JICA, HCD and MoAL&F, 2019. Smallholder Horticulture Empowerment and Promotion Project for Local and Up-Scaling (SHEP PLUS). Smallholder Horticulture Empowerment & Promotion Project for Local and Up-Scaling (SHEP PLUS)

KALRO, 2018. Tomato Production Manual 2016. ISSN:987-9966-30-026-3



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