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A Farmer's Practical Guide to Healthy Soil, Sustainable Crops and Better Farm Productivity

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INTRODUCTION

Understand Your Soil. Feed Your Soil. Grow Better Crops.

Soil is the foundation of agriculture. Healthy soil supports strong crop growth, supplies essential nutrients, stores water, supports beneficial organisms and sustains agricultural productivity.

Why should every farmer care about soil health?

- To maintain long-term soil productivity.
- To improve the availability of essential plant nutrients.
- To make efficient use of fertilizers and manures.
- To conserve soil moisture and prevent erosion.
- To maintain beneficial soil organisms.
- To reduce unnecessary cultivation expenses.

Remember: Soil is not just a medium for growing crops. It is a living resource that needs continuous care.



What is Soil Health?

Soil health refers to the continued ability of soil to function as a living ecosystem that supports plants, animals and humans.
Healthy soil should:

- Support healthy root growth.
- Allow proper movement of air and water.
- Store and supply nutrients to plants.
- Support beneficial microorganisms.
- Resist erosion and degradation.

What is Soil Fertility?

Soil fertility is the ability of soil to supply essential plant nutrients in sufficient and balanced amounts for crop growth.

In simple words:

- Soil health = Overall condition and functioning of soil.
- Soil fertility = Ability of soil to supply plant nutrients.

A fertile soil may still have problems such as poor drainage, compaction or low biological activity. Therefore, both soil health and fertility must be managed.

Three important components of healthy soil

1. Physical health

- Good soil structure.
- Adequate water-holding capacity.
- Proper aeration and drainage.
- Minimum soil compaction.

2. Chemical health

- Balanced availability of nutrients.
- Suitable soil pH.
- Appropriate salt levels.
- Adequate soil organic carbon.

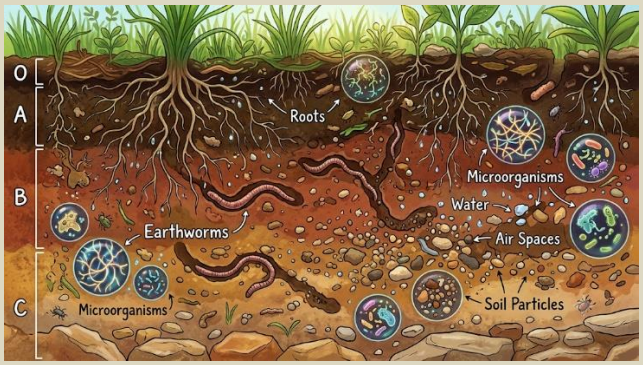
3. Biological health

- Beneficial bacteria and fungi.
- Earthworms and other soil organisms.
- Active decomposition of organic matter.
- Healthy soil biological processes.

Know the essential plant nutrients

Nutrient group	Important nutrients
Primary nutrients	Nitrogen (N), Phosphorus (P), Potassium (K)
Secondary nutrients	Calcium (Ca), Magnesium (Mg), Sulphur (S)
Micronutrients	Zinc (Zn), Iron (Fe), Boron (B), Manganese (Mn), Copper (Cu), Molybdenum (Mo), Chlorine (Cl), Nickel (Ni)

Farmer's message: Plants need all essential nutrients, but the required quantities differ. Applying more fertilizer does not necessarily mean better crop production.



KNOW YOUR SOIL – TEST BEFORE YOU APPLY

Why is Soil Testing Important?

Soil testing helps farmers understand the nutrient status and other important properties of their fields. It helps in:

- Identifying nutrient deficiencies.
- Avoiding unnecessary fertilizer application.
- Selecting suitable soil amendments.
- Planning balanced nutrient management.
- Improving fertilizer-use efficiency.

How to Collect a Soil Sample

Follow these simple steps:

Step 1: Select the field

Divide your land into separate sampling units based on differences in soil type, cropping history, slope and management.

Step 2: Collect samples

- Walk across the field in a zigzag pattern.
- Collect approximately 8–10 soil samples from representative spots in a uniform field.
- Remove surface litter before sampling.
- For most cultivated field crops, collect soil from the 0–15 cm depth, unless the laboratory recommends otherwise.

Step 3: Avoid unsuitable locations

Do not collect samples from:

- Field boundaries and bunds.
- Compost or manure heaps.
- Fertilizer storage areas.
- Irrigation channels.
- Recently fertilized spots.
- Waterlogged or unusual patches unless sampling them separately.

Step 4: Mix the samples

- Mix all representative samples thoroughly in a clean plastic bucket.
- Remove stones, roots and visible debris.
- Take approximately 500 grams of the mixed soil.

Step 5: Label and submit

Write the farmer's name, village, field identification, crop grown, proposed crop and sampling date on the sample bag. Submit it to a recognised soil-testing laboratory or through the local agriculture department/KVK.



Understand Your Soil Health Card

A Soil Health Card provides information on important soil parameters and crop-based nutrient recommendations.
It includes:

Parameter	What does it indicate?
pH	Whether soil is acidic, neutral or alkaline
Electrical Conductivity (EC)	Level of soluble salts
Organic Carbon	Soil organic matter status indicator
Nitrogen (N)	Nitrogen availability
Phosphorus (P)	Phosphorus availability
Potassium (K)	Potassium availability
Sulphur (S)	Sulphur status
Zinc, Iron, Copper, Manganese and Boron	Important micronutrient status

What should farmers do after receiving the card?

1. Read the nutrient status carefully.
2. Understand crop-specific fertilizer recommendations.
3. Consult an agricultural expert if results are unclear.
4. Apply recommended fertilizers and amendments in the correct quantity.
5. Keep the Soil Health Card for future reference.

Important: Do not apply lime, gypsum or micronutrient fertilizers without confirming the need through soil testing and expert recommendations.

Test your soil, save your money
improve your yield!

BUILD SOIL ORGANIC MATTER – FEED THE SOIL

Soil organic matter is an important component of healthy soil. It supports soil structure, nutrient cycling, water retention and biological activity.

Practical ways to improve soil organic matter

1. Apply well-decomposed Farmyard Manure (FYM)

- Use properly decomposed and mature manure.
- Incorporate it according to crop requirements and soil-test recommendations.
- Avoid applying fresh, undecomposed manure directly around sensitive seedlings.

2. Prepare and use compost

Simple farm composting method:
Materials:

- Crop residues.
- Dry leaves and weeds without mature seeds.
- Animal dung.
- Farm waste.
- Water.

Preparation:

1. Select a shaded, well-drained place.
2. Make alternate layers of dry plant residues and animal dung.
3. Sprinkle water to maintain adequate moisture.
4. Cover the heap with straw or another suitable cover.
5. Turn the material periodically to support decomposition.
6. Allow it to decompose until the material becomes dark, crumbly and earthy-smelling.

Use mature compost in the field.

3. Adopt Vermicomposting

Earthworms convert suitable biodegradable organic waste into nutrient-rich vermicompost.
Basic steps:

- Prepare a shaded vermicompost bed.
- Add partially decomposed organic material.
- Introduce suitable composting earthworms.
- Maintain adequate moisture without waterlogging.
- Protect the bed from direct sunlight, flooding and predators.
- Harvest when the compost is dark, granular and sufficiently mature.

4. Grow Green Manure Crops

Green manuring helps add organic biomass and improve nutrient cycling.
Examples: Dhaincha (Sesbania), Sunhemp. Other locally suitable green manure crops.
Grow the crop and incorporate it at the recommended stage, generally before flowering or as advised for the particular crop.

5. Recycle Crop Residues

- Retain suitable crop residues in the field.
- Use straw and leaves as mulch.
- Compost biodegradable farm waste.
- Avoid burning crop residues.

Remember: Organic manures also contain nutrients. Their nutrient content varies with the material, storage and decomposition. They should be considered while planning the total nutrient requirement of the crop.

BALANCED NUTRIENT MANAGEMENT - GIVE CROPS WHAT THEY NEED

Plants require nutrients in appropriate quantities and at the right time. Excessive or imbalanced fertilizer application may waste money and contribute to nutrient losses and soil or water-related problems.

What is Integrated Nutrient Management (INM)?

Integrated Nutrient Management involves the judicious combination of different nutrient sources to maintain soil fertility and meet crop nutrient requirements.
It may include:

- Chemical fertilizers.
- Farmyard manure and compost.
- Vermicompost.
- Green manure.
- Crop residues.
- Crop-specific biofertilizers.

Five practical steps for farmers

1. Follow soil-test-based recommendations

Use the Soil Health Card and crop-specific fertilizer recommendations.

2. Apply organic manures

Use available, well-decomposed FYM and compost as part of the nutrient management plan.

3. Use fertilizers judiciously

- Apply the recommended dose.
- Avoid excessive nitrogen application.
- Use the recommended placement and timing.
- Apply nitrogen in suitable splits according to the crop and local recommendation.
- Place phosphorus and other nutrients as recommended for the crop.

4. Include legumes in crop rotations

Leguminous crops such as pulses can contribute to biological nitrogen fixation when suitable varieties and effective root-nodule bacteria are present.
Examples:

- Wheat followed by summer moong.
- Maize with suitable intercrops such as pulses.
- Rice-based systems with suitable pulse crops.

5. Use quality biofertilizers

- Select crop-specific products.
- Check the manufacturing and expiry dates.
- Follow label instructions.
- Store them under recommended conditions.
- Apply through the recommended method.

Do not confuse biofertilizers with fertilizers

Biofertilizers contain beneficial microorganisms that help improve nutrient availability or supply through biological processes. They are not direct substitutes for all the nutrients required by crops.

Remember: Balanced nutrition is more important than simply increasing fertilizer quantities.



PROTECT YOUR SOIL – CONSERVE WATER AND PREVENT DEGRADATION

Soil erosion, compaction, waterlogging, salinity and loss of organic matter can reduce soil productivity.

1. Prevent Soil Erosion

- Maintain vegetation cover.
- Use contour farming on suitable sloping lands.
- Grow cover crops.
- Adopt appropriate bunding practices.
- Avoid leaving soil exposed during heavy rainfall.

2. Adopt Mulching

Mulching means covering the soil surface with suitable materials.

Materials: Crop residues, Dry leaves, Straw, Suitable cover crops.

Benefits:

- Reduces direct exposure of soil to sunlight.
- Helps conserve soil moisture.
- Suppresses some weeds.
- Reduces the impact of raindrops on soil.
- Adds organic matter when plant materials decompose.

3. Prevent Soil Compaction

- Avoid unnecessary movement of heavy machinery.
- Do not operate machinery on excessively wet soil.
- Use suitable tillage practices.
- Maintain organic matter.
- Avoid repeated traffic over the same areas where possible.

4. Manage Irrigation Properly

- Irrigate according to crop requirements.
- Avoid prolonged waterlogging.
- Maintain field drainage.
- Use drip or sprinkler systems where technically and economically suitable.
- Conserve rainwater through farm ponds and other appropriate structures.

5. Manage Problem Soils

Saline soils: Excess soluble salts may restrict crop growth. Seek soil and irrigation water testing and follow suitable reclamation measures.

Sodic/alkali soils: High exchangeable sodium can affect soil structure and water movement. Gypsum may be recommended in suitable cases, based on soil testing.

Acidic soils: Liming materials may be recommended depending on soil pH, crop and soil characteristics.

Important: Reclamation practices must be based on proper diagnosis. Avoid using amendments simply because neighbouring farmers are using them.

FIELD-LEVEL ACTION PLAN – WHAT CAN FARMERS DO?

A Seasonal Soil Health Management Calendar

Farming stage	Recommended farmer activity
Before sowing	Collect soil samples and review the Soil Health Card
Land preparation	Apply recommended FYM/compost and prepare drainage
At sowing	Follow balanced fertilizer recommendations
Early crop growth	Observe plant growth and identify possible deficiencies
Vegetative stage	Manage weeds, moisture and soil cover
Flowering stage	Avoid unnecessary nutrient application; follow crop-specific advice
After harvest	Retain suitable crop residues and plan crop rotation
Between seasons	Grow green manure or cover crops where feasible

Five Simple Soil Health Practices

1. Test soil regularly.
2. Apply nutrients according to recommendations.
3. Add organic matter through suitable sources.
4. Protect soil from erosion and compaction.
5. Rotate crops and include legumes where suitable.

A Farmer's Soil Health Record

Particulars	Farmer's record
Farmer's name	_____
Village	_____
Field identification	_____
Field area	_____
Soil type	_____
Previous crop	_____
Current crop	_____
Soil testing date	_____
Soil organic carbon	_____
Soil pH	_____
Fertilizer recommendation	_____
Organic manure applied	_____
Crop yield	_____

FARMER CHECKLIST, COMMON MISTAKES AND WHERE TO GET HELP

Are You Taking Care of Your Soil?

Tick the practices you follow:

☐ I get my soil tested.

☐ I maintain a record of my Soil Health Card.

☐ I follow recommended fertilizer doses.

☐ I use well-decomposed organic manure.

☐ I recycle suitable crop residues.

☐ I include legumes in my cropping system.

☐ I protect my field from soil erosion.

☐ I avoid unnecessary irrigation.

☐ I prevent soil compaction.

☐ I seek expert advice when soil problems occur.

Common Mistakes to Avoid

Avoid this practice	Adopt this practice
Applying fertilizers without knowing soil status	Follow soil-test-based recommendations
Applying excessive urea	Apply nitrogen in recommended doses and splits
Burning crop residues	Recycle or manage suitable residues
Using fresh undecomposed manure carelessly	Use mature, well-decomposed manure
Excessive tillage	Adopt suitable soil-conserving tillage
Ignoring micronutrients	Correct deficiencies based on diagnosis
Applying gypsum or lime without testing	Apply amendments only when recommended

Where Can Farmers Get Help?

Contact:

- Krishi Vigyan Kendra (KVK).
- State Department of Agriculture.
- Soil Testing Laboratories.
- Agricultural Universities.
- ICAR research institutes.
- Agricultural extension personnel.

Healthy Soil Today, Productive Farms Tomorrow!

Soil conservation is everyone's responsibility. Every farmer can contribute by testing the soil, using nutrients wisely, recycling organic matter and protecting land and water resources.

Know Your Soil – Improve Your Soil – Secure Your Future