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IMPORTANCE OF SOIL TESTING AND THE APPROPRIATE USE OF FERTILIZATION

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ARTICLE ID: 95

India is an agriculture-based economy as about 50% of its population dependent on agriculture, and it is clear that for an agricultural economy to flourish, the role of the quality of soil cannot be ignored or undermined. For the crop yields to meet the expectation of the farmers and the government the quality of the soil must be of a certain level.

But owing to the rapid industrialization, increasing population, and widespread use of chemical fertilizers and pesticides, the quality of soil can get deteriorated. And therefore the agricultural soil must be tested for its quality and fertility. A soil test is crucial because it will help in the optimization of crop production, diagnosing the nutrient deficiencies in the soil, and consequently working towards improving the lacking nutrients.

Soil testing informs the farmers of the imbalances in the soil and guides them in adopting specific fertilizers or soil conditioners to deal with the diagnosed issues. These tests can equip us in taking preventive and corrective measures even before sowing the crop, and that results in an uncompromised final yield. Thus, it is evident that the testing of agricultural soil is pertinent in India.

Why soil sampling is important in agriculture?

Crops need nutrients just like people do. Fertile soil contains all the major nutrients for basic plant nutrition (e.g., nitrogen, phosphorus, and potassium), as well as other nutrients needed in smaller quantities (e.g., calcium, magnesium, sulfur, iron, zinc, copper, manganese). Usually a fertile soil will also have some organic matter that improves soil structure, soil moisture retention, and also nutrient retention, and a pH between 6 and 7. Unfortunately, many soils do not have adequate levels of all the necessary plant nutrients or conditions in the soil are unfavorable for plant uptake of certain nutrients. Most of the

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time, the average person treats the soil "like dirt". A wise farmer will care for the soil because he knows that man is dependent on the top 6 inches (15.2 centimeters) of soil.

Fertilization is an important issue because it is needed in order to produce enough food for the increasing population from the decreasing cultivated land, but too much or inappropriate use can be detrimental to the environment. Soil testing is an essential component of soil resource management. Each sample collected must be a true representative of the area being sampled. The utility of the results obtained from the laboratory analysis depends on the sampling precision. Hence, collection of a large number of samples is advisable so that the samples of the desired size can be obtained by sub-sampling. In general, sampling is done at the rate of one sample for every two hectare area. Every area is different when it comes to soil types and nutrient contents in soil. Soil sampling and testing can show you the plant's available nutrients

Why there is a need for Soil Testing?

Knowing the exact nutrient found in your farm soil and the pH is the first step of any healthy crop production program. Crops are usually grown on a very wide variety of soil types and different fertilizer requirements, depending on the soil's health and condition. The application of many nutrients can result in an imbalance in soil and eventually affecting the environment and contaminating water and the creatures beneath. Regular, repeated soil sampling is best management practice. The better you know your soil, the easier it will be to get the best out of it.

How to Get Your Soil Tested

You can get your farm’s soil tested at soil testing laboratories, your local cooperative extension offices, or any garden centers.

Materials required for soil sampling

1. Spade or auger (screw or tube or post hole type)
2. Khurpi
3. Core sampler
4. Sampling bags
5. Plastic tray or bucket

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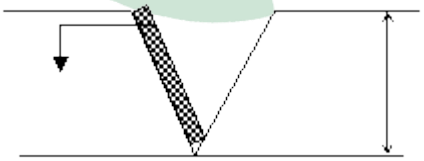
Points to be considered

- Collect the soil sample during fallow period. In the standing crop, collect samples between rows.
- Sampling at several locations in a zigzag pattern ensure homogeneity.
- Fields, which are similar in appearance, production and past-management practices, can be grouped into a single sampling unit.
- Collect separate samples from fields that differ in colour, slope, drainage, past management practices like liming, gypsum application, fertilization, cropping system, *etc*.
- Avoid sampling in dead furrows, wet spots, areas near the main bund, trees, manure heaps and irrigation channels.
- For shallow-rooted crops, collect samples up to 15 cm depth. For deep-rooted crops, collect samples up to 30 cm in depth. For tree crops, collect profile samples.

Procedure

- Divide the field into different homogenous units based on the visual observation and farmer's experience.
- Remove the surface litter at the sampling spot.
- Drive the auger to a plough depth of 15 cm and draw the soil sample.
- Collect at least 10 - 15 samples from each sampling unit and place in a bucket or tray.
- If the auger is not available, make a 'V' shaped cut to a depth of 15 cm in the sampling spot using a spade.
- Remove thick slices of soil from top to bottom of the exposed face of the 'V' shaped cut and place in a clean container.



1 inch / 2.5 cm 6 inches (15 cm)

- Mix the samples thoroughly& remove foreign materials like roots, stones, & gravels.
- Reduce the bulk to about half to one kilogram by quartering or compartmentalization.

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- Quartering is done by dividing the thoroughly mixed sample into four equal parts. The two opposite quarters are discarded and the remaining two quarters are remixed and the process repeated until the desired sample size is obtained.
- Compartmentalization is done by uniformly spreading the soil over a clean hard surface and dividing into smaller compartments by drawing lines along and across the length and breadth. From each compartment a pinch of soil is collected. This process is repeated till the desired quantity of sample is obtained.
- Collect the sample in a clean cloth or polythene bag.
- Label the bag with information like name of the farmer, location of the farm, survey number, previous crop grown, present crop, crop to be grown in the next season, date of collection, name of the sampler *etc*.

Processing and storage

- Assign the sample number and enter it in the laboratory soil sample register.
- Dry the sample collected from the field in shade by spreading on a clean sheet of paper after breaking the large lumps, if present.
- Spread the soil on a paper or polythene sheet on a hard surface and powder the sample by breaking the clods to its ultimate soil particle using a wooden mallet.
- Sieve the soil material through 2 mm sieve.
- Repeat powdering and sieving until only materials of >2 mm (no soil or clod) are left on the sieve.
- Collect the material passing through the sieve and store in a clean glass or plastic container or polythene bag with proper labeling for laboratory analysis.
- For the determination of organic matter it is desirable to grind a representative sub-sample and sieve it through a 0.2 mm sieve.
- If the samples are meant for the analysis of micronutrients, at-most care is needed in handling the sample to avoid contamination of iron, zinc and copper. Brass sieves should be avoided and it is better to use stainless steel or polythene materials for collection, processing, and storage of samples.
- Field moisture content must be estimated from an un-dried sample or to be preserved in a sealed polythene bag immediately after collection.

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- Farmers may bring soil samples directly to the laboratory.

S.No.	Crop	Soil sampling depth	
		Inches	cm
1	Grasses and grasslands	2	5
2	Rice, finger millet, groundnut, pearl millets *etc.*(shallow rooted crops)	6	15
3	Cotton, sugarcane, banana, tapioca, vegetables *etc.* (deep rooted crops)	9	22
4	Perennial crops, plantations and orchard crops	Three soil samples at 12, 24 and 36 inches	Three soil samples at 30, 60 and 90 cm

TABLE: Guidelines for sampling depth

Key Advantages of Testing Farm Soil

- It informs the farmer of the current health of the soil and how to improve it.
- Soil test leads to minimization of fertilizer expenditure
- Soil testing results in limited over-fertilization
- Soil degradation can be avoided
- Farmers with fertile soils can contribute to feeding the world's growing population

The current generation puts more pressure on the soil than ever before. There is need of fertile soils to produce yields that will feed the world's ever-growing population. Improved soil health implies more crops, potentially closing the world's food security issues. This will eventually bring a better life to millions of people. Soil testing is the first step in soil management. The activity gives farmers valuable information that helps them improve the soil's health; healthy soils eventually imply healthy crops!

The importance of soil testing has been in existence since the early years. Different types of soils and variation in soil properties are important factors to note in farming. Soil texture, soil moisture, and soil chemistry are determinants of what crops can be grown and how much yield the farm can produce.