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## SOIL TESTING: AN INEVITABLE STEP TO SUSTAINABLE AGRICULTURE

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"Healthy soil is the foundation of a healthy crop and healthy farm." Soil testing is an important step for optimization of soil potentiality to sustainable agricultural production. In modern agriculture, soil testing became the most important practice to manage fertilizer application and crop production. Without soil testing, it is very difficult to ensure the right application of fertilizers for the crop and get the optimum yield.

### Introduction:

Knowing the actual amount of nutrient found in particular farm soil, its physical as well as chemical property like texture, pH, electrical conductivity, water holding capacity, excess or deficient nutrient is the very first step of any healthy crop production. Nutrient requirements of different crop varied and depend upon soil health and condition. An inaccurate determination or lack of knowledge about the soil may result in imbalance in soil ecosystem and in the long run caused adverse effects to the environment, causing water contamination and the micro, macro flora of the ecosystem.

Out of the several reasons, some of the important ones are as follows: to optimize crop production, to protect environment from the adverse effects of runoff and leaching of excess fertilizers, to enhance the proper nutritional balance of the soil for optimal growth of the plant and to reduce the input cost and retain energy by applying only required amount of fertilizer needed to optimize the potential of the soil for plant growth. Pre-plant media analyses provide an indication of potential nutrient deficiencies, pH imbalance or excess soluble salts. This is particularly important for growers who mix their own media. Media testing during the growing season is an important tool for managing crop nutrition and soluble salts levels. For an effective exploration of this tool, one must know how to do sampling of the soil to send it for analysis or for in-house testing, followed by a skill

interpretation of media test results. So, considering the overall impacts, a soil testing becomes an essential step before growing crops.

### **Soil Testing and its objectives:**

Soil testing can, thus, be defined as an important diagnostic process by which elements such as calcium, phosphorus, potassium, sodium, magnesium, sulphur, copper zinc and manganese are chemically removed from the soil and measured for their available content within the sample of soil and also other related physico-chemical property of the soil is analysed. Some important objectives can be discussed as follows ([www.harvestogroup.com](http://www.harvestogroup.com)):

- 1) To evaluate an index of nutrient availability or supply in a given soil from the fertility and nutrient status of soil
- 2) To determine soil pH to understand the acidity, alkalinity and salinity problems.
- 3) To provide recommendation dose of fertilizer and manure based on soil test value and type of crop.
- 4) To avoid excess consumption of fertilizer and ensure environmental safety.
- 5) Repeated crop production reduces a considerable amount of nutrients from the soil, to restore the loss soil fertility and ensure for sustainable and productive soil for crop productivity profitability and sustainability
- 6) To find the suitability of crop in a particular soil.
- 7) Regular analysis of the soil fertility status is important to decide the choice of crop and site-specific balanced fertilization program to sustain productivity.
- 8) To achieve the best profitable response of the crop to the applied fertilizers.

### **Why farmers need to get their soil tested before crop production practices?**

Soil testing provides immense benefits for the farmers. Maintaining good soil healthy is a must to improve crop growth. A proper soil testing will help the farmers by providing necessary nutrients and thereby improving yields and profitability, consistency in increasing nutrient availability across a field, promote more uniform crop growth and maturity, which altogether will help to simplify crop harvesting and drying along with improving market quality. Besides, these beneficial effects can be detailed out as follows:

- 1) **The soil testing results will help the farmer to understand the current health of the farm's soil and strategies to improve it :**

Soil's physical, chemical and biological properties determined the status of soil fertility. Physical properties of the soil like soil structure, texture, and colour can be determined through visual observation and touch. However, it is a difficult task to determine the chemical composition of the soil, which can be diagnosis through laboratory analysis. The accuracy of the test also depends on process of soil sampling. The test will provide information on the soil's nutrient level and pH. This information will act as a decision support system for the farmers to quantity the required fertilizer for application to improve the soil quality.

**2) Optimal used of fertilizer and reduced fertilizer expenditure :**

Determination of exact requirement of the nutrient will help to reduce farm inputs and zero wastage. The choice of fertilizers and the quantity of fertilizers of crops will prevent unnecessary expenditure on agricultural input related to fertilization. Moreover, testing will allow using the limited or finite nutrients resource such as phosphorus and potassium, inorganic fertilizers in a very efficient way which will prevent the future shortage of such limited resources.

**3) Soil testing results in judicious application of fertilizer :**

Over utilization of fertilizer is harmful to the plant, causing fertilizer toxicity as well as causing contamination to the environment. Over-fertilization is associated with environment degradation through nutrient leaching, water pollution, and harming the aquatic life. Prior knowledge of the status of soil fertility will help to prevent the negative environmental effects. Testing soil prior and applying only the recommended dose of fertilizer will prevent farmers from excessive application of fertilizers and minimizing collateral damages of the environment.

**4) Avoid soil degradation and can retain the fertility status of the soil for longer period of time :**

Research has estimated that every year more than 24 billion tones of fertile soil are lost due to erosion resulting from unbalanced soil management. Degradation of the soil has a direct impact on the livelihoods and health of an estimated 1.5 billion people. Restoration of soil is a costly affair, hard process and time-taking. Therefore, prior management of soil before deterioration of the resource through soil testing techniques is the need of the hour with the application of right amounts of fertilizers.

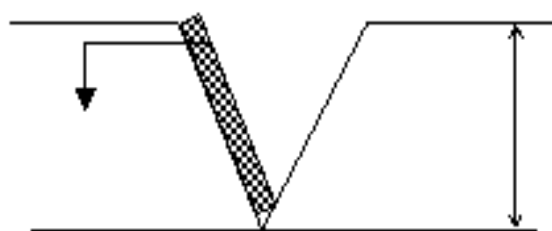
**5) Farmers with fertile soils will help to challenge the world's ever increasing population :**

### Soil is the based for crop production:

From early years, the importance of soil testing has been in existence, however, the importance has been rarely realized and practice. Variation in soils properties and the need of the soil according to this variation also differs. Understanding this is important, as the overall performance of the crop depends on the soil to a large extent. Soil moisture, soil texture, and soil chemistry are determinants of choice of crops that can be grown and how much yield the farm can produce. The current agriculture practices put more pressure on the soil than ever before. And the ever increasing population of the world also puts more pressure on agriculture. There is a need to produce more yields from limited resource available. These demands for more fertile soils to produce optimum yields from fix area that will help to feed the ever-growing population. Improved soil health implies more food security of the world. Soil testing is the first step in attaining food security of the increasing population.

### How can soil sampling be done?

Firstly, the field must be selected for which the testing is to be done and it is divided into different homogenous units based on the visual observation and farmer's experience. This spots will be considered as sampling spots. Surface litters must be removed from these spots. Then, with the help of an auger, a depth of 15 cm is plough down and the soil sample is drawn. From the sampling unit, at least 10 to 15 samples will be collected and place in a bucket or tray. In the absence of auger, a 'V' shaped cut to a depth of 15 cm is made in the sampling spot using spade. Thick slices of soil from top to bottom of exposed face of the 'V' shaped cut are removed and place in a clean container.



1 inch / 2.5 cm

6 inches (15 cm)

(<https://agritech.tnau.ac.in>)

All the collected samples are mixed thoroughly and foreign materials like roots, stones, pebbles and gravels have to be removed. Then, finally the bulk of the sample is reduced to

about half to one kilogram by quartering or compartmentalization. Quartering is done by dividing the bulked samples into four equal parts and only two quarters are retained and remixed and other remaining ones are discarded. The process is repeated until the desired sample size is obtained. For compartmentalization, the soils are uniformly spread out over a clean hard surface and then, divided into smaller compartments by drawing lines along and across the length and breadth. A pinch of soil is collected from each compartment and collected as sample in a clean cloth or polythene bag. The process is repeated until the required quantity of sample is obtained. Finally, the sample bag is label 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 (<https://agritech.tnau.ac.in>). These samples are then sent to soil testing laboratories linked with agricultural universities, Krishi Vigyan Kendras etc.

#### **Conclusion:**

Importance of soil sampling and testing must be realized by every farmer to optimize production from limited area and to prevent environmental pollution. There is a need to understand the importance to conserve the soil quality and maintain soil health for efficient production of crop. The farmers must realize it to be an essential step in their crop production practice which will greatly impact the yield of the produce later on. Skill to collect the sample and easy accessibility and proper technical support to the farmers is needed.

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