ISSN–0974–0759 | ●●● Article ●●● |Visit us : *www.researchjournal.co.in*|

Soil testing: Important diagnostic tool for the farmers

Kiran K. Khokhar[1*], Vishal Goyal [2], Sawan[3] **and** Ankit Kamboj[3]
[1]Krishi Vigyan Kendra Karnal (Haryana) India
[2]Krishi Vigyan Kendra, Yamunanagar (Haryana) India
[3]Chaudhary Charan Singh Haryana Agricultural University, Hisar, (Haryana) India
(Email : kirankhokhar123@gmail.com)

In modern agriculture, soil testing is the most important practice which can manage fertilizer application and crop production. Valuable information on nutrients content allows accurate fertilization to support plant needs. Based on the soil test results, recommendations can be made for the application of amendments to rectify soil problem if any, we can apply fertilizer based on nutrient availability in the soil and crop requirement. Soil testing gives an overall assessment of essential elements in the soil, salinity, sodicity, pH, organic content of the soil which may help us to visualize soil health and fertility status.

Objectives of soil testing : Soil testing is a very useful tool for the farmers to determine the fertility status of the soil. Soil testing is done with the following objectives:

– To evaluate the fertility and nutrient status of soil which helps us to provides an index of nutrient availability in the soil.

– Determination of acidity, salinity or alkalinity problems in the soil.

– To provide recommendation for the application of manure and fertilizer on soil test basis and according to the crop.

– To avoid excessive use of fertilizer and to ensure environmental safety.

– Evaluation of the suitability of the soil for a particular crop.

– Restoration of soil fertility.

– Time to time evaluation of the inherent soil fertility status of the soil.

– To investigate nutrient deficiencies, toxicities, or imbalances, identifying "hidden hunger", to help increase crop/plant yield.

Soil testing : Agricultural productivity depends on the farmland quality and a soil test can timely report a problem in crop growth conditions. In agriculture, a soil test commonly refers to the analysis of a soil sample to determine nutrient content, composition and other characteristics such as the acidity or alkalinity or pH level, salt concentration, organic carbon content etc. Thus, it is an important diagnostic tool for determining the availability of nutrient for plants and analyze for basic physical and chemical properties of the soil.

Soil testing provides an overview of the following soil characteristics:

Soil pH: This measures the acidity or alkalinity of the soil and is one of the most important factors which govern the availability of all the nutrients required by the plants.

Soil nutrients: Primarily, soil tests report provide information about the availability of nitrogen (N), phosphorus (P) and potassium (K), which are the most important nutrients for crops. Availability of secondary nutrients such as calcium (Ca), sulfur (S), and magnesium (Mg) and micronutrients such as iron (Fe), copper (Cu) manganese (Mn), boron (B), molybdenum (Mo) availability can also be determined by soil testing.

Soil structure: This measures the arrangement of the particles in the earth. The structure of the soil affects its ability to support plant growth.

Soil salinity: This measures the salt content of the ground. Salinity can damage plants and affect their development.

How is soil testing done?

Soil testing involves following steps :

– Collecting soil samples from fields

– Chemical analysis of samples

– Evaluation and interpretation of results

– Suggestion of any amendments or addition of fertilizers or manures required to the soil.

Collection of soil sample is the most crucial step which must be accomplished with utmost care. In the following headings the process of soil testing is explained in detail.

Collection and processing of soil samples for analysis:

The chemical analysis becomes meaningless if there is an error in collection and preparation of soil samples. Hence, the collection and preparation of soil samples should be done with utmost perfection. The steps involved are:

Collection of soil samples : The soil sample collected should be representative of the area sampled. A field can be treated as a single sampling unit if it is uniform in all respects. Variation in slope, texture, colour, crop (s) growth and management levels should be taken into account for soil sampling. Separate sets of composite samples need to be collected from areas differing in these characteristics.

Recently fertilized plots, bunds, channels, marshy tracts, area near trees, farm ways, buildings, wells, compost piles or other non-representative locations must be avoided during sampling. When crops are grown in rows, samples can be taken in between the rows. Soil samples should be taken in zig zag pattern or randomly.

Depth of sampling : The plant roots penetration is very important for deciding the sampling depth. The following parameters may be kept in consideration:

– For field crops (cereals, vegetables and others seasonal crops) a sampling depth of 0-15 cm (plough layer) is desired.

– For deep-rooted crop like sugarcane or under dry farming conditions, samples from different depths may be taken.

– For horticultural crops, sampling is done at depths of 0-15, 15-30, 30-60, 60-90, 90-120, 12-150 and 150-180 cm.

– In saline-alkali soils, salt crust (visible or suspected) should be sampled separately and sampling depth be recorded.

– Sampling should be done every year if the field is under intensive cultivation. If one crop per year is grown, sampling once in three years is sufficient. Soil sampling should be done at the same time in each year.

Preparation of composite sample : For making composite sample, mix the collected soil samples thoroughly by hand on a clean thick paper or cloth or polythene sheet. Reduce the bulk sample to about 500 g by quartering process in which entire soil mass is spread, divided into four quarters, two opposite samples are discarded and the remaining two are remixed. Repeat this process until about 500 g soil is left.

Sampling tools : Soil sampling can be done with the help of following tools: i) Tube auger ii) Screw type auger iii) Post-hole auger iv) Spade or Khurpi. For sampling soft and moist soil, a tube auger, spade or khurpi is quite satisfactory. A screw type auger is more convenient on hard or dry soil, while the posthole auger is useful for sampling in excessively wet areas *viz.,* rice fields. Tube Auger is convenient for sampling from lower depths. If a spade or khurpi is used, a V-shaped cut may be first made upto the plough layer and a uniform 2 cm thick slice is taken out.

Labeling of samples : For identification, label the soil samples. A label of thick paper with identification mark along with the details of the sample should be put inside the sample bag and another label carrying same details tied outside the bag. In addition to location, field number, name of cultivator and relevant information about slope, drainage, previous cropping history, irrigation, fertilizer, manure used etc. must be recorded.

Processing of soil samples for analysis : Processing of soil samples involves several procedures in sequence as follows:

Drying : The soil samples should be dried in shade at room temperature.

Grinding : Crush the soil clods lightly and grind with the help of wooden pestle and mortar. Care is taken so that primary sand and gravel particles are not crushed.

Sieving : Sieve the entire quantity of soil through 2 mm stainless steel sieve. Remove plant residues, gravel and organic material as much as possible by retaining them on the sieve. For specific type of analysis (e.g. organic C) grind the soil further and pass it through the 0.2 to 0.5 mm sieves. Remix the whole quantity of sieved soil before a sample is weighed for analysis.

Precautions in collection and processing of soil samples: In order to avoid the contamination, special care is required in the collection and processing of soil samples. Following precautions should be taken to minimize error:

- Keep away the sample from chemicals, fertilizers or manure.

- For sampling of micronutrient analysis, always use auger made up of stainless steel instead of rusted iron khurpi or spade.

- Do not use bags previously used for storing fertilizers or any chemical.

- Store soil samples in clean cloth or polythene bags.

- Use glass or polythene jars for storage of soil samples for a longer duration

What are the soil testing benefits for the farmers? Soil testing provides plenty of benefits for the farmers. Healthy soil improves crop growth. Farmers can begin testing their soil before harvest season to get a jump on how they can improve their soil. These benefits can help farmers by :

- Improving yields and profitability because you are providing necessary nutrients to your crops.

- Increasing consistency of nutrient availability across the field.

- More uniform crop growth. This also helps individual plants stronger against weeds and simplifies other processes like cultivation and spraying.

- More uniform plant maturity. This can help simplify crop harvesting and drying along with improving market quality.

- Soil testing keeps a check on soil problems *i.e.* Salinity, sodicity etc. and if diagnosed recommend the farmer with appropriate amendment to be applied.

Received : *02.04.2022* ***Revised :*** *07.05.2022* ***Accepted :*** *04.06.2022*