Indian Farmer
Volume 8, Issue 05, 2021, Pp. 361-367.
Available online at: www.indianfarmer.net
ISSN: 2394-1227 (Online)

POLICY PAPER OPEN ACCESS

Soil, Water & Plant Sampling Techniques: An Overview

Kaushal Kishor[1], Vipin Kumar[2] and Bharati Upadhaya*[3]

[1]Assitant Professor, [2]Assitant Professor,
[3]Farm Manager, KVK, Birauli,
Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar

**Corresponding author: bharati.upadhaya@rpcau.ac.in*

***Article Received**: 20 May 2021* ***Published:** 25 May 2021*

ABSTRACT

Soil testing is a useful tool for making fertilizer recommendations for various crops as well as for reclamation of problem soils and its major objectives are to evaluate soil fertility status, to predict the probable crop response to applied nutrients and to classify soils into different fertility groups for preparing soil fertility maps. Simultaneously, a superior quality of water is crucial for economic, health and social benefits. Testing water quality regularly is very important to maintain safe water sources and eliminate the potential risks related to water contamination. Plant analysis is also an aid to soil testing. Error in plant sampling may results in wrong interpretation of results for making recommendations.

Key words: Soil sampling, Water sampling and Plant sampling

INTRODUCTION

Soil testing is an essential part of soil resource management. Because a very small fraction of the huge soil mass of a field is used for analysis, it becomes extremely important that each sample collected must be a true representative of the area being sampled. In general, soil sampling is recommended at the rate of one sample for every 0.5 hectare area.

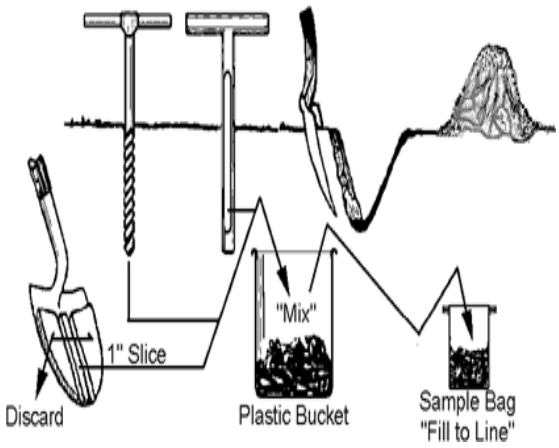
Points to be considered for soil sampling

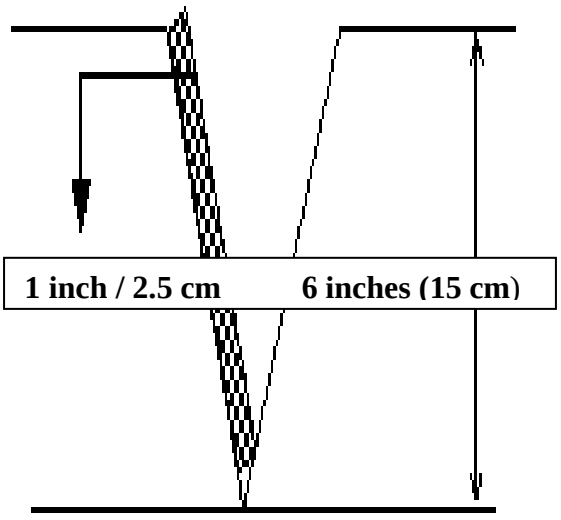
- Collect the soil sample during fallow period.

- In the standing crop, collect samples in between rows.
- Sampling at several locations in a *zig-zag* pattern ensures homogeneity.
- Collect separate samples from fields that differ in color, slope etc.
- Always collect the soil sample in presence of the farm owner who knows the farm better.
- In case of saline, alkaline and acidic type of soils, salt crust, if visible on the soil surface or suspected, should be sampled separately anf the depth of sampling recorded.

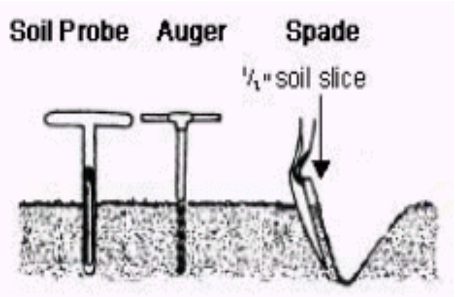
Soil Sampling Procedure

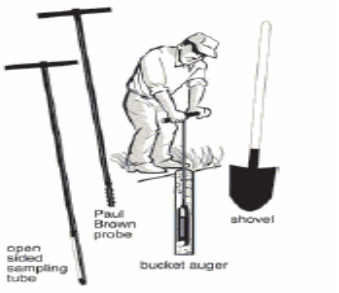
1. Divide the field into different homogenous units based on the visual observation.
2. Remove all the surface litter at the sampling area.
3. Drive the soil auger to a depth of 15 cm for drawing the soil sample.
4. Collect at least 10 to 15 samples from each sampling area.
5. If auger is not available, make a 'V' shaped cut to a depth of 15 cm in the sampling spot using spade or khurpi.
6. Remove thick slices of soil from top to bottom of exposed face of the 'V' shaped cut area and keep the sample in a clean container.
7. Mix the soil collected from the different spots covering the entire area thoroughly.
8. Reduce the bulk to about 500 gram by quartering process. Repeat the process until about 500 gram soil is left.

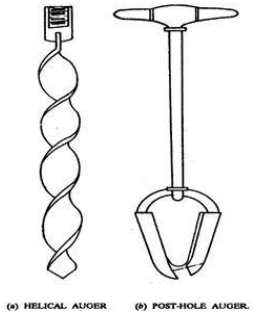




Tools for Soil Sampling







Soil Sampling Tools

Samples can be drawn with the help of (a) Screw type auger (b) Tube auger (c) Post hole auger (d) Spade (e) Khurpi

Tool	Type of soil
Tube auger, spade or khurpi	Soft and moist soil
Screw auger	Hard or dry soil
Post hole auger	Wet area like rice fields
Spade or khurpi	V-shape cut in soft and moist soil

Soil sampling depth

Crop type	Soil sampling depth
	Cm
Grasses and grasslands	5
Shallow rooted crops	15
Deep rooted crops or longer duration crops	30
Perennial crops, plantations and orchard crops	0-30, 30- 60 and 60-100 cm soil profile
Salinity, alkalinity and acidity	15

Processing and storage

- Dry the sample collected from the field in shade by spreading on a clean sheet.
- Discard the plant residues, gravels and other material, if present.
- Spread the soil on a hard surface and powder the sample by breaking the clods to its ultimate soil particle using wooden pestle and mortar.
- Sieve the soil material through 2 mm stainless steel sieve.
- Repeat powdering and sieving until only materials of >2 mm (no soil or clod) are left on the sieve
- For certain types of analysis *viz.,* organic carbon, grind the soil further so that it passes through 0.2 to 0.5 mm sieves.
- Remix the entire quantity of sieved soil thoroughly before analysis.

Precautions while taking soil sample

1. Soil samples should not be drawn immediately after rain, irrigation and fertilization or burning of crop residues.
2. Samples should not be taken from sites near to or along an irrigation canal and recently fertilized plots, marshy tracts, farm ways buildings, wells, farmyard manures pits, shady trees, threshing floor and roads.
3. Contamination from soil surface materials (crop residues, manures, fertilizers etc) should be avoided.
4. An area of about 2-3 metres along sides of the field should not be sampled in large fields.
5. Use stainless steel augers instead of *khurpi* for soil sampling for micronutrient analysis.
6. Store soil sample in clean, preferably new, cloth or polythene bags.

WATER SAMPLING

The quality of irrigation water is a crucial for maintaining long- term soil productivity. Poor quality water if used for a long time can make the soil less productive and even barren. In such a situation samples of water should be tested. Irrespective of the source of irrigation water all that is required to be done is to draw a proper sample for testing in the laboratory.



Water sample for irrigation quality assessment are analysed on following these basis:

1. Physical basis

- Colour
- Odour & taste
- Temperature
- Turbidity

2. Chemical basis

- Ph
- BOD & COD
- EC
- SAR & RSC
- Boron concentration
- Nitrate and chloride concentration
- Magnesium concentration

3. Biological basis

- *E.coli* & Coliform bacteria as bio-indicator
- Insects like Mayfly, Stonefly, Caddisfly
- Bivalve mollusca as bio-indicator

Water sampling procedure

- ❑ The sample of irrigation water is collected in about 500 ml glass or polythene bottles which should preferably transparent.
- ❑ The container must be thoroughly cleaned before use and should rinse 3 to 4 times with water from which the sample is to be drawn.
- ❑ If the source of irrigation water is tank, canal or river the sample should be drawn either from a spot 5 to 10 meter away from the sides or from the mid-stream. The tube-well or hand pump is to be run for about 15 to 20 minutes prior to sampling and for open well, several buckets of water have to be thrown out first. if water sample is taken from open water bodies then try to remove the material which is floating on the surface so that it can prevent the contamination.

Storage of water sample

- The water sample after proper marking and labelling must be sent to the laboratory immediately (preferably within 2-3 days) for testing to avoid any change or deterioration.
- If a few days delay then 2-3 drops of pure toluene may be added to prevent bacterial activity.
- The water sample is straightway taken for analysis. Any little amount of sediment if present may be allowed to settle down. In few cases, it becomes necessary to filter the water for testing purpose.

PLANT SAMPLING

Plant sampling is also an essential component of the resource management of soil. Each sample collected must be a true representative of the plant being sampled. Hence, collection of large number of samples is advisable so that sample of desired size can be obtained by sub-sampling.

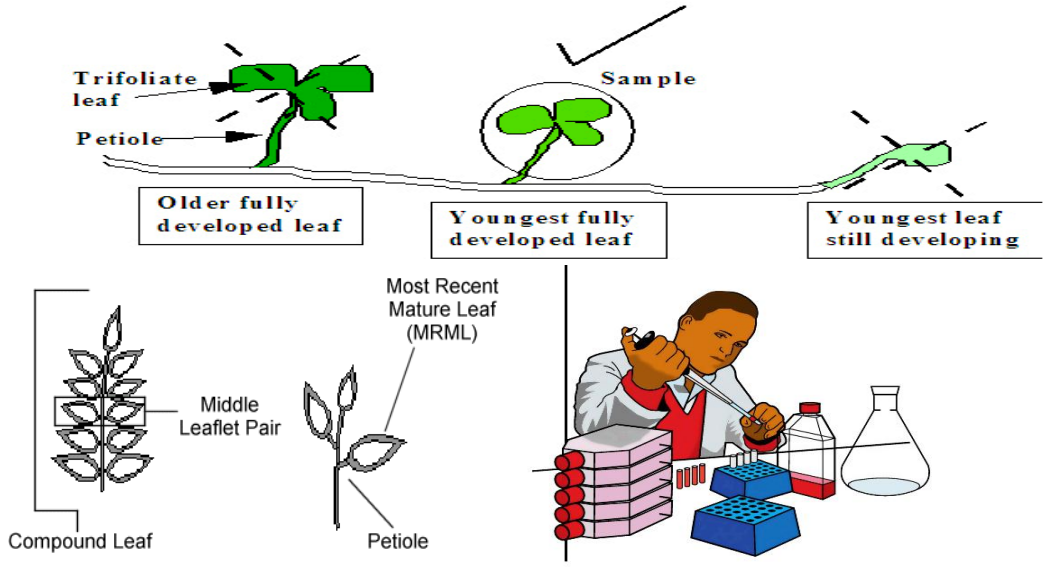
Plant parts recommended for sampling

Crop	Part to be sampled with stage/leaf
Rice	3rd leaf from apex, at tillering stage
Wheat	Flag leaf, before head emergence
Maize	Ear leaf, before tasseling
Barley	Flag- leaf at head emergence
Oat	Flag – leaf, before inflorescence emergence
Pulses	Recently matured leaf at bloom initiation
Mustard	Recently matured leaf at bloom initiation
Sugarcane	3rd leaf from top, after 3-5 months of planting
Cotton	Petiole, 4th leaf from the apex, at initiation of flowering
Jute	Recently matured leaf, at 60 days age
Potato	Most recent, fully developed leaf (half grown)
Tomato	Leaf adjacent to inflorescence (mid- bloom)
Brinjal	Blade of most recent, fully developed leaves
Banana	Petiole of 3rd open leaf from apex, 4 month after planting
Guava	3rd pair of recently matured leaves , at bloom (August or December)
Mango	Leaf with petiole (4 -7 month old) from middle of shoot
Papaya	6th petiole from apex, six months after planting

Plant Sampling Procedure

1. Collection of plant samples
2. Washing of samples
3. Use 0.2% liquid solution to remove wax coating on the leaf surface

4. Place the washed samples on filter paper for air dried for 24 hrs.
5. Hot air circulation at 60 degree centigrade for 48 hrs.
6. Grind the samples
7. Store in paper bags for further analysis



Precautions while taking sample and storage of plant samples

- Avoid sampling the plant which is infected with disease or insect or suffering from effects of excess or scarcity of water.
- Decontaminate the collected samples by thorough washing.
- Washed samples should be dried as soon as possible. The samples should not be packed tightly during in an oven and the temperature should not exceed 70^0C.
- The processed sample should be kept in polythene or paper bags and should be stored in room free of dust and soil.

CONCLUSION

There is great importance of sampling of soil, water and plant, because on the basis of that we can apply nutrient and irrigation to the crop. Majority of the farmers are continuously using imbalanced fertilization to the crops which lead to the lower productivity and also causes hazardous effect on soil, water and environment. If we apply the balanced fertilization (optimum level) to the crop on the basis of soil and plant test and proper method of irrigation, it will reduce the cost of cultivation. So, sampling of soil, plant and water results in accordingly application of fertilizer and irrigation to the crop that ultimately helps to enhance profitability and sustainability.