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Soil Testing for the Purpose of Crop Production and Soil Testing Laboratory Information

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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 pH level. A soil test is a chemical method for estimating nutrient supplying power of a soil. A soil test can determine fertility, or the expected growth potential of the soil which indicates nutrient deficiencies, potential toxicities from excessive fertility and inhibitions from the presence of non-essential trace minerals. Primary advantage of soil testing is its ability to determine the nutrient status of the soil before the crop is planted. A soil test value measures a part of the total nutrient supply in the soil and represents only as an index of nutrient ability. The result of a soil test is known as soil test value. Soil testing plays an important role in nutrient management.

Objective of soil testing in relation to agriculture

1. To find out the nutrient availability index
2. for information on the beneficial reaction of fertilizers.
3. To provide recommendation of fertilizers
4. To estimate soil fertility

General steps of soil testing process

1. First the soil samples are collected
2. Extraction and assessment the available nutrients
3. Calibrating and interpreting the analytical results
4. Fertilizer recommendation and proper soil management

Soil sampling

The most critical aspect of soil testing is obtaining a soil sample that is representative of the field. Make a 'V' shaped cut to a depth of 15 cm in the sampling spot using spad. For shallow rooted crops, collect samples up to 15 cm depth. For deep rooted crops, collect samples up to 30 cm depth. An area not exceeding 0.5 ha is taken as one sampling unit. The sampling error in a field is generally greater than the error in the laboratory analysis.

Preparation of the composite soil sample in the laboratory

It involves the following steps: Drying, grinding, sieving, mixing, partitioning, weighing, and storing. The soil sample is coned in the center of the mixing sheet. Cone is flattened and divided through the center with a flat wooden sheet. One half is moved to the side quantitatively. Then each half is further divided into half, the four quarters being separated into separate 'quarters'. Two diagonally 'opposite quarters' are discarded quantitatively.

The two other are mixed by rolling. This process is repeated, until 250-500 g composite soil material is obtained. For micronutrient analysis – sampling and processing of samples should alone be done only with stainless steel materials, plastic, or wood to avoid contamination. The soil test values calibrated nutrient functions are advocated to the farmers as a package of nutrient management that aims at judicious use of fertilizers. Ultimately any soil testing and interpretation must involve economics' because it is used to make a fertilizer recommendation to achieve an economic goal that would give maximum profit per hectare of land.

Common extractant and determining the available nutrients

Several types of extractant have been developed for soil testing. The ability of an extractant to extract a plant nutrient in quantities related to plant requirements depends on the reactions that control nutrient supply and availability. The common extractant used in soil testing are given below.

Plant nutrient	Common extractant	Nutrient source extracted
NO_3^-	KCl, $CaCl_2$	Solution
NH_4^+	KCl	Solution Exchangeable
Available N	$KMnO_4$ - NaOH	Mineralizable Organic N
$H_2PO_4^-$/ HPO_4^{2-} (Available P)	0.03 N NH_4F + 0.025 N HCl (Bray-p)	Fe/ Al mineral solubility
	0.5 M $NaHCO_3$ - P(Olsen-P)	Ca mineral solubility
K^+(Available K)	NH_4OAc-K	Exchangeable
Ca^{2+}, Mg^{2+}	EDTA	Exchangeable
SO42-	0.15 $CaCl_2$, 1 % Nacl	Solution AEC
Zn^{2+}, Fe^{3+}, Mn^{2+}, Cu^{2+}	DTPA extraction	Chelation
Boron	Hot water	Solution
Organic C	Chromic acid	Oxidizable C

SOIL TESTING LABORATORY

Soil Testing Laboratories of the Department of Agriculture funded by State Government are functioning at identified centres in each district. Soil testing services are also extended to the farming community in the Soil Laboratories operated by Central government and Agricultural Universities.

Functions of State Soil Testing Laboratory are:

- Analysis of soil samples which are collected from the farmers by the Assistant Agricultural Officers for texture (by feel method), lime status, Electrical conductivity, pH and available N, P and K status at lower charges/ sample; and advocating fertilizer recommendation for different crops. Available micronutrients will be analyzed on request.
- Analyzing irrigation water samples for EC, pH, cations, and anions; Assessing their quality based on different parameters; and suggesting suitable ameliorative measures for different soil condition and crops.
- Based on the soil test value for the soil samples collected during the particular year they are rated as low, medium, and high; and village fertility indices will be prepared.
- Conducting trials related to soil fertility to solve the site-specific problems.

General information about mobile soil testing laboratory

- The personnel of the mobile soil testing laboratory will visit the villages, collecting and analyzing the soil and irrigation water samples in the village

- Showing the audio-visual programmes in the villages educating the importance of soil testing, plant protection measures and other practices related to crop production. and mobile soil testing laboratory is carrying out other regular functions of stationary soil-testing laboratory.

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