Soil Based Fertilizer Recommendation-A Case Study of Narsampet mandal

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Abstract:

A soil test plays an important role in optimizing crop production. Determining pH and fertility levels with a soil test is the first step in planning a healthy nutrient management program. soil samples are collected from cultivated land in rajupet village in Narsampet mandal, Telangana state during Kharif 2022. Major nutrients pH, N, P, KS and organic carbon are tested using a portable soil test kit developed by IOTA. From the results, it is observed that the pH ranges between 6.5 to 7.5, which is suitable for growing chillies and cotton. the amount of nitrogen ranges from less than 250 kg/ha to more than 600 kg/ha. Phosphorus (P as P2O5) ranges from 20 kg/ha to over 60 kg/ha. Most of the territory shows a very high potassium content (ie >340 kg/ha). Sulfur is deficient in fields due to less application of sulfate fertilizers by farmers in the area. Organic carbon ranges between 0.5. to >0.75%. Based on the soil test results, the need for

fertilizer is assessed for a specific yield target according to the STCR equations developed by IOTA Laboratories for the study area.

Key words: Soil test, Fertilizer recommendation, Narasampet mandal, Nutrients

INTRODUCTION:

Modern agricultural production technology is heavily dependent on the application of fertilizers. Since the mid-1950s, farmers have increasingly used fertilizers as part of managing soil fertility and crop production. although growing plants require seventeen essential nutrients, thirteen elements depend on the soil. nutrients that are not available in sufficient quantities as needed by the plant are supplied through fertilizers. Soil tests help quantify the nutrients expected to be available to crops throughout their life cycle. and also those that could limit crop growth and yield. the soil test does not measure the total content of nutrients, but only the index of their available fraction. hence the importance of the response to nutrients applied through fertilizers or manure. In fact, the success of soil testing programs as a diagnostic tool for quantifying the type and amount of nutrients that need to be applied to achieve a desired yield level depends on how accurately this calibration is performed.

Farmers in telangana state apply chemical fertilizers without knowing the N, P, K nutritional status of their soil (Devi and suhasini 2017; srinivasa Rao 2021). The application of excessive crop fertilization can have a detrimental effect on soil health and crop productivity, indicating deficiencies in other major nutrients and micronutrients (Muhammad Yousaf et al. 2017). from this point of view, a fertilizer recommendation methodology based on soil tests was developed (Ramamoorthy et al. 1967; Tamboli et al., 1996, Ray et al. 2000; Balasabramaniam et al. 2005,

singh et al. 2005; Kadam et al. 2006, Ramamoorthy and Vel. 01, Regar et al. 2011, Rajeshwar et al. . 2017). Fertilizer recommendations include several important factors such as soil type, availability of soil fertility, fertilizer form, timing of application and irrigation methods (Hochmuth and Hanlon 2010).

Many researchers have developed models to estimate site-specific fertilizer requirements. QUEFTS models for rice crops developed by Dobermann et al., 2002. Integrated Plant Nutrition System (STCR-IPNS) fertilizer prescriptions are developed for 10 major cropping sequences by santhi et al., 2010. Fertilizer requirement based on soil test during Kharif 2012 in Inceptisol of Agricultural Research Farm, Banaras Hindu University were developed for maize crop (Singh et al., 2015). Sakarvadia et al. In 2016, the requirement of urine for the production of one quintal of pigeonpea seed was estimated based on a correlation study of crop response to test land developed by ICAR in Gujarat during the kharif season. Soil test crop response (STCR) correlation studies on coriander based on targeted yield approach was conducted on Inceptisol of Agricultural Research Farm, Banaras Hindu University, Varanasi during rabi 2018–19 by using integrated plant nutrient management system to get fertilizer recommendation equations for coriander (Singh et al., 2020).

Soil samples are collected from Rajupet village of Narsampet Mandal, Warangal District, Telangana State. The study examines the current situation of the main nutrients in cultivated land and suggests fertilizers to farmers. About 70% farmers are marginal farmers in the mandal. The main crops in the village are cotton, chillies, maize and rice. The main sources of irrigation in the mandal are wells, minor irrigation tanks and canal irrigation under Pakal Lake. To increase crop yield and gain commercial benefit, these farmers widely used different types of pesticides

and fertilizers. Soil tests are conducted in the kharif season in cultivated areas for cotton and chilli. rainfall in the area in 2022 is 1404 mm. farmers using an unbalanced dose of fertilizers.

COLLECTION AND ANALYSIS OF SOIL SAMPLES:

a soil sample is taken from the active root zone to make recommendations for an effective fertilizer based on soil testing. The collected sample is dried. air dry soil is normally sieved through a mm sieve for analysis. before sifting, the soil should be lightly crushed with a wooden pestle and mortar. plant remains, gravel and other foreign substances caught on the screen must be disposed of. for organic carbon, the soil must be gridded so that it passes completely through a 0.5 mm sieve and no part of it must be thrown away. the sieved sample is analyzed using a portable soil test kit developed by IOTA Laboratory, Hyderabad. The major nutrients pH, available nitrogen, phosphorus, potash, sulfur and organic carbon are tested and compared to color scales provided by IOTA laboratories. Soil test values obtained correlate with actual crop response obtained under similar field conditions. soil fertility and crop yield are taken into account for fertilizer recommendations. The dose of fertilizer required for a specific yield target is calculated according to STCR Equations developed by IOTA Laboratories for the study area.

Nutrient requirement = total nutrient intake (kg/ha)/grain yield (q/ha) ----1

% CS = (total nutrient uptake in control plots (kg/ha)/Available soil test values of control plots (kg/ha)) *100 ----2

CF percentage = (total nutrient intake on treated areas (kg/ha)- Available soil Tested values of treated areas (kg/ha)*%CS)/ applied fertilizer dose (kg/ha) ----3

F= (NR*T-CS/100*S) 100/CF ---4

Where

F= Required fertilizer (kg/ha)

NR= Nutrient requirement (kg/ha)

T = Target yield q/ha

CS=% Contribution of N/P/K from soil

S=Soil test value

CF=% N/P/K contribution from fertilizer

RESULTS AND DISCUSSION:

It can be seen from Table 1 that soil pH ranges between 5.5 to 7.5, with most soils being acidic in nature.

TABLE:1 Soil Test Results

S.No	**Name**	**PH**		**N Kg/ha**		**P as P_2O_5 Kg/ha**		**Kas K_2O Kg/ha**		**S ppm**		**OC %**	
			Level		Level		Level		Level		Level		Level
1	Field-1	7.5		<250	low	50 - 60	Above medium	>340	high	10-15	medium	>75	high
2	Field-2	5.5		500-600	High	50 - 60	Above medium	>340	high	10-15	medium	>75	high
3	Field-3	6.5		250-400	medium	>60	high	>340	high	0-10	low	>75	high
4	Field-4	6.5		<250	low	>60	high	>340	high	0-10	low	<50	low
5	Field-5	6.5		500-600	High	>60	high	>340	high	10-15	medium	>0.75	high
6	Field-6	7.5		>600	high	>60	high	>340	high	10-15	medium	>0.75	high

7	Field-7	6.5		<250	low	40-50	medium	145-340	medium	0-10	low	>0.75	high
8	Field-8	6.5		250-400	medium	50-60	Above medium	>340	high	0-10	low	>0.75	high
9	Field-9	6.5		250-400	medium	20-40	Below medium	>340	high	0-10	low	>0.75	high
10	Field-10	6.5		500-600	High	50-60	Above medium	>340	high	0-10	low	0.50-0.75	medium

Nitrogen is the most critical element obtained by plants from the soil and is an obstacle to plant growth. Nitrogen is often absent from the soil, but is often in the form of raw organic material that cannot be used directly. Total nitrogen content depends on climate, vegetation, topography and soil management. Nitrogen availability is divided into 5 categories, i.e. below 250 kg/ha is low, 250-400 kg/ha is medium, 400-500 kg/ha is above medium, 500-600 kg/ha is high and above 600 kg/ha ha is very high. In the study area, the amount of nitrogen varies from low to very high.

Phosphorus is the second most important nutrient for plants. There is an average of 1,000 lb of phosphorus per acre in the soil, generally unavailable in the form of low-solubility phosphates. Total phosphorus makes up about 0.1% of soil weight, but only one percent of that is available. of the available part, more than half comes from the mineralization of organic matter. Agricultural fields may need to be fertilized to replace phosphorus that has been removed in crops. if the crop is not carried out, phosphorus is largely immobile in the soil and is not leached, but actually accumulates in the surface layer. phosphorus is abundantly available when the soil pH is 5.5 in organic soils and 6.5 in mineral soils. Depending on the availability of phosphorus it is divided into 5 categories i.e. below 20 kg/ha is low, 20-40 kg/ha is below medium, 40-500

kg/ha is medium, 50-60 kg/ha is above medium and higher. 60 kg/ha is high. Phosphorus was observed to fluctuate between below medium and high in the study area.

The amount of potassium in the soil can be as high as 80,000 pounds per acre foot, of which only 50 pounds is available for plant growth. Potassium is bound between layers of illite clay. Under certain conditions depending on the soil structure, the intensity of drying and the initial amount of exchangeable potassium, the fixed percentage can be up to 90% within ten minutes. According to the availability of potassium, it is divided into 3 categories, i.e. below 145 kg/ha is low, 145-340 kg/ha is medium and above 340 kg/ha is high. Potassium was observed to fluctuate between medium and high in the study area.

sulfur is necessary for the formation of protein and chlorophyll and necessary for the formation of protein and chlorophyll and necessary for the synthesis of plant vitamins. most sulfur is made available to plants as phosphorus by its release from decaying organic matter. deficiencies may occur in some soils and if harvested sulfur needs to be added. applying large amounts of nitrogen to fields that have marginal amounts of sulfur can cause sulfur deficiency in fast-growing plants by causing plant growth to exceed sulfur reserves. Depending on the availability of sulphur, it is differentiated into 3 categories, i.e. below 10 ppm is low, 10-15 ppm is medium and above 15 ppm is high. Potassium was observed to fluctuate between medium and high in the study area.

TABLE:2 Recommendations of different kinds of fertilizers and complexes

S.No	Name	NITROGEN Kg/ha		Phosphorus Kg/ha		Potassium Kg/ha		Organic manure t/ha	
		Chilli	cotton	Chilli	cotton	Chilli	cotton	Chilli	cotton
1	Field-1	30	22	11	12	8	6	2/1.2	2/1.2
2	Field-2	21	16	11	12	8	6	2/1.2	2/1.2
3	Field-3	24	18	9	9	8	6	2/1.2	2/1.2
4	Field-4	30	22	11	12	8	6	2/1.2	2/1.2
5	Field-5	21	16	11	12	8	6	2/1.2	2/1.2
6	Field-6	18	14	11	12	8	6	2/1.2	2/1.2
7	Field-7	30	22	11	12	12	10	2/1.2	2/1.2
8	Field-8	24	18	14	15	8	6	2/1.2	2/1.2
9	Field-9	24	18	16	18	8	6	2/1.2	2/1.2
10	Field-10	21	16	11	12	8	6	2/1.2	2/1.2

Table 2 presents soil test-based fertilizer recommendations for chilli and cotton crop yields. Recommendations of effective and site-specific fertilizer improve crop yield and help gain profit for farmers.

Conclusions:

A soil test plays an important role in optimizing crop production. Determining pH and fertility levels with a soil test is the first step in planning a healthy nutrient management program. soil samples are collected from cultivated land in rajupet village in Narsampet mandal, Telangana state during Kharif 2022. Major nutrients pH, N, P, KS and organic carbon are tested using a portable soil test kit developed by IOTA. From the results, it is observed that the pH ranges between 6.5 to 7.5, which is suitable for growing chillies and cotton. the amount of nitrogen ranges from less than 250 kg/ha to more than 600 kg/ha. Phosphorus (P as P_2O_5) ranges from 20 kg/ha to over 60 kg/ha. Most of the territory shows a very high potassium content (ie >340 kg/ha). Sulfur is deficient in fields due to less application of sulfate fertilizers by farmers in the area. Organic carbon ranges between 0.5. to >0.75%. Based on the soil test results, the need for

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