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Review Article

Soil Health Card: A Boon for the Indian Farmers

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Abstract

Agriculture is the backbone of Indian economy and food is a physiological necessity for the survival of human being. One of the major factor for soil health degradation is imbalanced use of fertilizers. Low or negligible application of organic manures and non-replacement of depleted essential nutrient elements over the years, caused widespread nutrient deficiencies and decreased soil fertility in many parts of the country. Presently, the number of nutrients deficient in Indian soils are about ten. The deficiencies grew from one with Nitrogen (N) (in 1950) to ten viz. Phosphorus (P), Potassium (K), Sulphur (S), Zinc (Zn), Iron (Fe), Manganese (Mn), Molybdenum (Mo), and copper (Cu). The widespread nutrient deficiencies and impaired soil health are the reasons for low nutrient use efficiency, stagnation or decline in crop productivity and profitability. The Government of India started a scheme called "Soil Health Card" (SHC) from Sri-ganganagar district of Rajasthan (February 2015) to provide SHC to all farmers in the country for sustaining crop productivity without deterioration in soil health. The aim of scheme is to promote integrated nutrient management through judicious use of inorganic fertilizers including secondary and micro nutrients in conjunction with organic manures and biofertilizer for improving soil health and its productivity. The SHC provide necessary information to farmers about present nutrient status of their soil/farm and recommendation for appropriate dosage of different sources of nutrient for improving soil health and its fertility. The utmost step in maintaining soil fertility and achieving sustainable crop production is possible through proper blend of knowledge of current soil nutrient status. It can be achieved by scientific soil sampling method, testing and recommendations. Thus, soil health card provides sound information or recommendations on integrated nutrients management through right source and right amount to be applied in soils in order to enhance soil health and crop productivity.

Keywords

Fertilizers; Organic Manure; Soil Health; Soil Health Card.

Introduction

The future of world's food security depends upon the attention we pay to soil health care and the conservation and efficient use of water [1]. Intensive agriculture with introduction of improved or high yielding varieties, application of fertilisers and assured irrigation has resulted in substantial growth in food grain production. However, imbalanced use of chemical fertilisers and high yielding varieties caused mining of nutrients from soil which inturn resulted in depletion of soil fertility, decrease in organic matter content and deterioration of soil health. The focus of research during past few decades was improving crop productivity to achieve the food security. However, in due course of time this has not only led depletion of soil fertility status but also nutritional disorders in human beings. Soils remain a biggest source of nutrition to the mankind. Thus, poor soil health means poor human health.Recent trends in agricultural research show that focus is on nutritional security along with the food security.

Indian Council of Agricultural Research, New Delhi through Indian Institute of Soil Science and All India Coordinator Research Project on Soil Test Crop Response (STCR) and AICRP on secondary, micro

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nutrients and pollutant elements in soils and plants, Long Term Fertilizer Experiments (LTFE) and Network Project on soil biodiversity-biofertilizers are addressing soil health and fertility related problems in our country. The ICAR is advocating soil test based balanced and integrated nutrient management (INM) through conjunctive use of both inorganic and organic sources of plant nutrients to sustain physical, chemical and biological health of soils for higher crop productivity. The ICAR regularly organizes training and field level demonstrations (FLDs) etc., to educate farmers in this regard. The Government of India under the component of soil health management of National Mission for Sustainable Agriculture (NMSA) is promoting INM,encompasses judicious use of chemical fertilizers in conjunction with organic manures, compost, biofertilizer etc., [2]. Recently, Government of India has launched a scheme from Sri-ganganagar district of Rajasthan on February 2015 to provide Soil Health Card to farmers of the country for sustaining crop productivity without deterioration in soil health.The card will have information on crop wise recommendations of nutrients/fertilizers required for asked farm size and other inputs, making it possible to use one of the costliest input of agriculture i.e. fertilizer.

The first and most critical step to get correct soil health card depends on sound soil sampling. An analysis can only be as good as the sample sent to the soil testing laboratory. The results of even very carefully conducted soil analysis are as good as the soil sample itself. Thus, the efficiency of soil health card scheme depends upon the care and skill with which soil samples are collected. Non-representative samples constitute the largest single source of error is assessment of soil fertility. Hence, the most important phase of soil analysis is accomplished not only in laboratory but also in field where soil samples are taken. The soils are heterogeneous. In view of this, efforts should be made to take the samples in such a way that it should be fully representative of the field.

Soil health card is a report on soil fertility status and provides an advisory on soil test based use of fertilizers and amendments for required crop, variety, area of application, desired fertilizer or amendment grades, etc. It has information on the current status of soil health. The SHC is a tool to help the farmers, extension functionaries, researchers and decision makers to monitor and improve the soil health based on their own field experience and working knowledge to maximize the production by judicious recommendation on fertilizers and organic manures. Soil health needs to be assessed at regular intervals so as to ensure that farmers apply the required nutrients by taking advantages of the native soil nutrients.

Excess or under application of nutrients sources without considering native soil nutrients and crop demand creates toxicities or deficiencies in many part of the country. The loss of nutrients following the rapid intensification of agriculture from 1950 onwards, has contributed to eutrophication of many surface waters [3]. Furthermore,it adds to the cost of production and degradation of soil health. Escalation in the prices of the chemical fertilizers also needs to be taken into account while deciding their use. To break the paradigm of all these issues, simplest and viable solution is use of soil health cards as provides sound information for recommendation of judicious use of fertilizers and organic manures, bio fertilizers as integrated nutrient management, proper doses of amendments for correcting the problem soils etc.,in order to maintain or enhance soil health, crop productivity and economical benefits to the farmers. Thus, use of soil health cards is one of the ways to achieve the sustainability in agricultural production.

Objectives of Soil Health Card Mission/Scheme

1. To issue soil health cards to all the farmers in a span of three years, so as to identify and provide a basis to address nutrient deficiencies with fertilizer application practices.
2. To diagnose soil fertility related constraints with standard procedures for sampling and chemical analysis and to prepare strategies for location specific nutrient recommendations.
3. To develop crops specific and district wise nutrient management strategies for improving the nutrients use efficiency.
4. To promote soil test based nutrient balancing to manage fertility related constraints for higher production.
5. To conduct demonstrations with diversified crops to quantify benefits of improved nutrient management practices in terms of increased crop yields and economic viability of farmers.
6. To create or generate the soil data base for future research and interventions.
7. Overall, to increase agricultural production and boost economical income of the Indian farmers.

Why SHC is Important?

It has been documented that, one of the major reasons for decline or stagnant crops yield is macro and micronutrient deficiencies and imbalanced use of the fertilizer.The number of nutrients deficient in

Indian soils increased from one i.e. N in 1950 to ten *viz*., N, P, K, S, Zn, Fe, Mn, Mo, B and Cu presently. Multinutrient deficiencies coupled with the imbalance fertilizer use are actually the principal factor limiting crop production and an uneconomical use of fertilizers [4]. In most of the cases, blind application of fertilizers on his own experiences or advices of fellow farmers are being done. This necessitates a proper mechanism which allows a farmer to make decisions on use of the fertilizers and other nutrient sources. The SHC is one such approach to address these problems.

Where from the Farmers can Get the SHC?

A schematic on how and where to get the SHC has been depicted in Figure 1. A farmer can directly bring their field's representative soil samples to the nearest District Soil Testing Laboratory (STL) or STL of the State Agriculture University or Krishi Vigyan Kendra. The sample can also be deposited to the Agriculture supervisor, Assistant Agriculture Officer, ATM or BTM for testing and to obtain the SHC. After analysis of the samples and interpretation, the recommendation made for the particular soil/field by the subject specialist. The SHC are prepared by the District soil testing laboratory, soil testing laboratory of the State Agriculture University, Krishi Vigyan Kendra is dispatched to the farmers address or they can collect in person.

Soil sampling

Soil sampling is a pre-requisite for sound soil health card. Hence, scientific soil sampling method is presented in a pictorial manner for easy understanding of the farmers (Figure 2) [5].

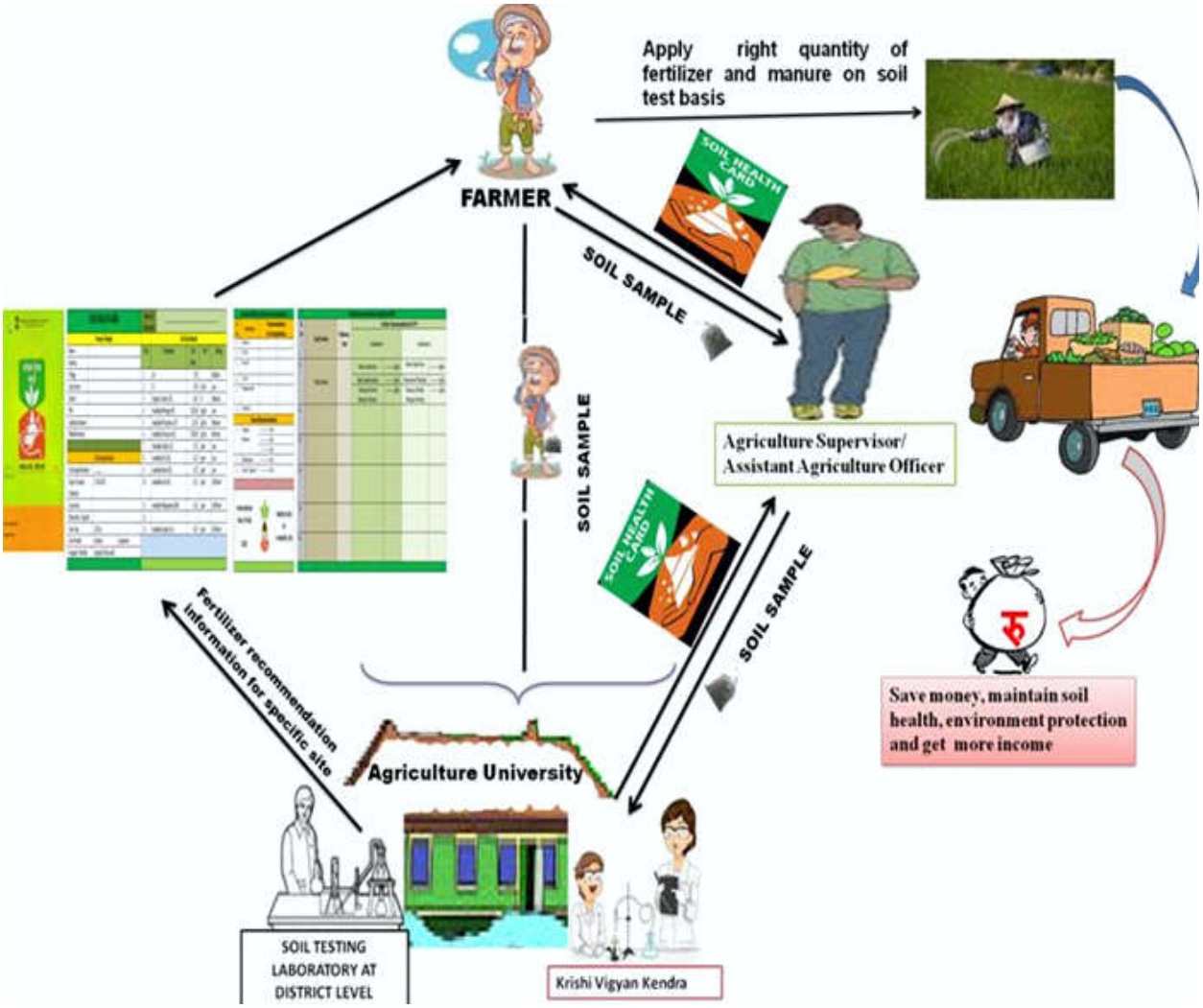

Fig 1. Schematic of how and where to get the soil health cards.

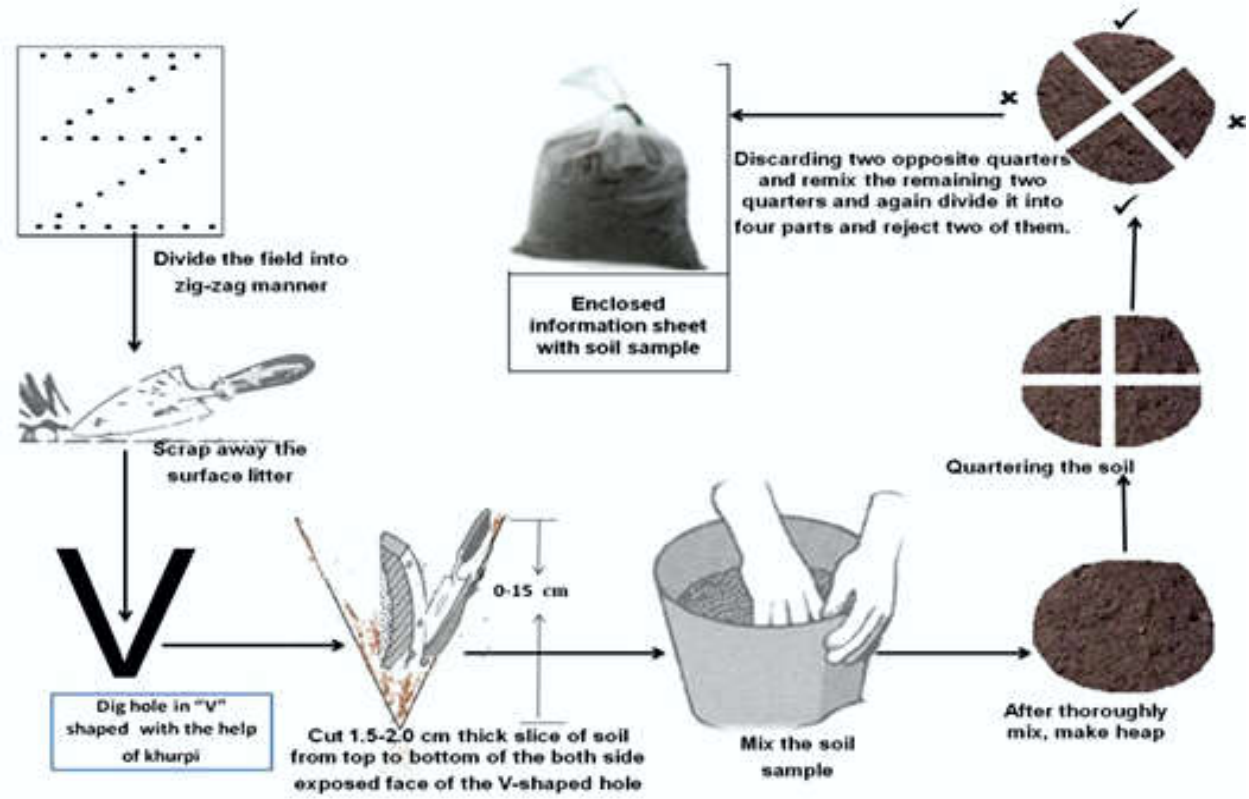

Fig. 2: Schematics on the scientific soil sampling procedure

Precaution While Drawing the Soil Samples from the Field

1. A single field can be heterogeneous or variable thus soil sampling should be done considering this.
2. Based on the soil colour, slope, depth, crop type, salinity, sodicity, etc. separate sample should be collected.
3. To get accurate soil testing analysis, avoid sampling from the following places: farmyard manure applied places, chemical fertilizer applied places, near bund areas, waterlogged areas, below tree areas, near cattle shed areas, etc.
4. Simple equipments- spade, weeding hoe, etc. should be used for soil sampling.
5. Avoid use do the metal instruments, if testing of the soil for micronutrients has to be done. Use the wood instrument in these cases.
6. In general, one soil sample for 1.5 to 2.0 acre or 0.5 ha land should be collected.
7. The soil sample should be collected after the harvesting of the crop or before sowing or planting or before onset of monsoon or before application of the fertilizers.
8. In standing crop, the soil sample should be collected in between two rows of the crops.
9. The depth of soil sample should be based on the depth of the roots of the crops to be cultivated.

How to Take the Soil Sample?

1. The places for soil sampling should be chosen in a zig-zag fashion. The waste material like grasses, leaves, etc. should be removed from the surface.
2. A V shaped 15 cm deep pit should be dug (Depth of soil sample should be based on the type of crop)
3. From the sides of the pit a 1.5-2.5 cm layer should be scrapped and the soil should be collected.
4. This way, soils from 8-10 places depending on the area should be collected and mixed uniformly.
5. Remove the stones, sticks, roots, leaves, etc. Material other than soil should be removed.
6. Spread the soil on a plastic or cloth in a circular fashion and divide it into four equal parts. Remove the two opposite parts. Again mix the soiland spread in the circular fashion. Repeat the same process till you get 500 grams of soil sample.

Soil sampling followed analysis of the sample, interpretation and suitable recommendations are given to the farmers to enable them for application of fertilizers and manures in order to get better yields besides maintaining soil fertility.

Constraints

1. Limited number ofsoil testing laboratories(STL) and poor infrastructure of the STL in the country limit the adoption of soil testing.
2. Distance location of STL i.e. away from the village headquarter is main problem in adopting soil testing.
3. Lack of awareness on following the scientific method of soil sampling by the farmers.
4. Poor inclination towards adoption of the soil testing.

What is the possible way out?

1. Capacity building on specifics of soil sampling and testing facilities should be given to farmers at their doorstep and other extension personnel involved in the same. This will remove the misgivings of farmers about true soil test results.
2. Extension efforts to popularize soil sampling and testing as a means of income generation through reduction in cost of fertilizers should be done to attract the farmers.
3. Establishment of new STL and mobile STL at each tehsil level of all the states and empowering them with knowledge, technical and material support would help in tackling the constraints.
4. Development of rapid soil testing kits to enable soil testing at Panchayat level.
5. It is well known that micronutrient deficiencies also started becoming critical, beginning with the intensification of agriculture and using higher dose of analytical chemical fertilizers. Thus micro nutrient testing facilities to be created in the soil testing laboratories.
6. The STL may be well equipped and our aims should be quality oriented rather than target oriented soil testing.

Conclusion

Widespread nutrient deficiencies and deterioration of soil health are main causes of low nutrient use efficiency, productivity and profitability. Primary and secondary production depends on soil-based ecosystem functions such as nutrient cycling, soil health and biotic population regulation. Soil testing can be an effective tool for diagnosing present nutrient status and problems of the farmer's fields. Soil test recommendations allow a judicious or balanced use of integrated nutrient management involving major and micro nutrients, organic manures and amendments for specific site. Moreover, finally soil testing and its recommendations in the form of soil health card can be a real solution for self-sufficiency in food, feed, fodder and fiber to fulfill daily needs of living-beings and future generation without deterioration of soil health.

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