

## Soil Test Crop Response (STCR) in Modern Agriculture

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### SUMMARY

Soil-test crop response (STCR) approach is aiming to precise adjustment of fertilizers under varying soil-test values for targeted-yield, presently gaining wider recognitions for sustainable nutrient management. Customary nutrient management in field crop production without considering the soil fertility status has emerged as non-sustainable practice in long-run. Among the various methods of fertilizer recommendation, the one based on yield targeting has found popularity. This method not only indicates soil test-based fertilizer dose but also the level of yield the farmer can hope to achieve if good agronomy is followed in raising the crop. It provides the scientific basis for balanced fertilization not only between the fertilizer nutrients themselves but also that with the soil available nutrients.

### INTRODUCTION

The major challenges in 21<sup>st</sup> century is to ensure food security, environmental quality and soil health for growing population and also shrinking land holdings and increasing cost of inputs in India. Besides, Crops fertilization based on generalized recommendation leads to under fertilization or over fertilization, results in lower productivity, profitability along with environmental pollution (Venkatesh *et al.*, 2017).



For that it necessitates remunerative production of food grain from limited area of land without losing the production potential of soil. So, there is need for adoption of scientific use of plant nutrient which not only enhance the production and sustainability of food grain and benefit: cost ratio of farmers, but also improve soil health and environmental aspects too. For this reason, Ramamurthy and his co-workers in 1967 established the theoretical basis and experimental proof to suit under Indian soil condition for the fact that Liebig's law of the minimum operates equally well for N, P and K. This principle forms the basis of application of fertilizers for achieving fixed targeted yield of crops, this approach first advocated by Truog in 1960.

Intensive land use with continuous use of higher doses of inorganic fertilizers significantly influences soil health and crop growth and does not give expected 'Targeted yield'. Therefore, All India Coordinated Research Project on Soil Test Crop Response (AICRP-STCR) introduced inductive approach for creating a fertility gradient in the same field and application of fertilizes according to soil test values for various crops under different agro climatic regions and sub regions. By following this approach, nutrient supplying capacity of soil, response of crop to added organic and inorganic fertilizes are calibrated with sound soil testing programmer (Dey P., 2015). This technology not only provides fertilizer recommendation for single crop but also for the whole cropping system based on initial soil test values. Nutrient requirement for the production of 1q/t of grain, contribution from soil, organic and inorganic sources are taken into consideration to develop fertilizers prescription equations for obtaining desired yield target of crops (Ghosh *et al.*, 2020).

### Advantages of STCR

**Achieved 'Targeted Yield' of Crop:** Among various methods of fertilizer application *viz.*, general recommended doses, soil test-based recommendation, blanket recommendation, farmer's practice, critical value etc., STCR approach is the unique in terms of not only providing the exact amount of fertilizer required for

particular crop under a specific climatic condition, but also expected levels of yield fixed by farmer can be achieved with good agronomic practices.

**Judicious use of fertilizers and manures:** Soil testing programme helps in determining the plant available nutrient status in soil and based on that optimum dose of fertilizers and manures can be calibrated for rising crop for a particular area.

**Improves the soil fertility status:** Application of fertilizers by the farmers in the fields without proper knowledge of fertility status of soil and nutrient requirement by crop causes adverse effects on soil and crop regarding both nutrient toxicity and deficiency either by excess quantity or imbalanced use of fertilizer. To overcome this problem and to maintain the soil health, 'targeted yield' approach is possibly the best, which keeps a balance between 'fertilizing the soil and fertilizing the crops. It not only enhances the nutrient status of soil but also increase the microbial biomass through use of organic and inorganic fertilizers under Integrated Plant Nutrient Management System (IPNS).

**Higher response ratios and benefit: cost ratios:** STCR approach has advantage over other method of fertilizer application in terms it increases not only response ratio of crop but also good agronomic and economic yield of crop can be assured by the farmers.

### Disadvantages of STCR

**Site Specific:** Application of fertilizers and achieving targeted yield of crop through this methodology is site specific in terms of fertilizer recommendation. Recommendations for one agroclimatic region is not applicable for others as it is influenced by different climatic and soil condition. So, fertilizers recommendation for a specific agroclimatic region and sub region must be done according to particular region.

**Applicable only for Primary Nutrients:** Only primary nutrients (N, P and K) are applied through this technology. It does not involve the use of other secondary (Ca, Mg and S) and micronutrients (Fe, Cu, Mn, Zn, B, Mo, Ni and Cl). This is a huge lacuna in STCR as holistic crop growth and yield and soil health is only maintained if a balance between primary and secondary nutrients is sustained.

**Targeted yield is hampered:** Due to lack of proper management practices, attack of insect pest and diseases, many a times the expected targeted yield cannot be achieved.

### CONCLUSION

Fertilizer is one of the most capital-intensive inputs in agriculture and application of fertilizers in right amount, right time and in right way by following right method of application is most important for maintain soil health and environmental protection and for achieving sustainability in crop production. Thus, the STCR-based fertiliser recommendation could be the sustainable nutrient management options for nutrient-responsive crop and certainly had the yield advantages over the current recommended dose of fertilizers (NPKS) treatments. It would be the realistic and sustainable approach.

### REFERENCES

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