Theme 1
Status and trends of global soil nutrient budget

Sustainable Plant nutrient management strategies for food and nutritional security – Current approaches and future strategies

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INTRODUCTION

An ideal plant nutrient management strategy should reduce the inorganic fertilizer requirement, restore organic matter in soil, enhance nutrient use efficiency and maintain soil quality in terms of physical, chemical and biological properties. A precise alignment between nutrient management practices vis-à-vis holistic soil management is sine qua non of sustainable development of agriculture. Nutrient management in India over time has specific syndrome which can be summarised by abuse of nitrogen, disuse of potassium, and generally coupled with overuse of phosphorus. It suggests inherent flaws in fertilizer application practices adopted by farmers that probably promotes imbalance in nutrient applications.

METHODOLOGY

The ICAR-All India Coordinated Research Project on Soil Test Crop Response (STCR) has used the multiple regression approach to develop relationship between crop yield on the one hand, and soil test estimates and fertilizer inputs on the other, can be effectively used to tackle such flaws. Ramamoorthy et al. (1967) established the theoretical basis and experimental proof for the fact that Liebig's law of the minimum operates equally well for N, P and K. This forms the basis for plant nutrient application for targeted yields.

Among the various methods of fertiliser recommendation, the one based on yield targeting is unique in the sense that this method not only indicates soil test based fertiliser dose but also the level of yield the farmer can hope to achieve based on resource endowment capacity, which was validated through large number of Front Line Demonstrations across India (Dey and Santhi, 2014; Dey 2015). Long-term studies were also conducted to ascertain the soil health (Kumar et al., 2021; Singh et al., 2015). The information generated were used to develop ICT based tools for recommending STCR-based precision nutrient management (Dey, 2016).

RESULTS

•STCR prescription equations integrated in Soil Health Card Portal developed by Department of Agriculture & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India (http://www.soilhealth.dac.gov.in)

•Developed region specific Decision Support System for Integrated Fertiliser Recommendation (DSSIFER) for Tamil Nadu state of India which was found useful for about 1645 situations and for 190 agricultural and horticultural crops for prescribing fertilisation schedule.

• Developed STCR recommendations for drip fertigation for dry regions for enhancing nutrient and water use efficiency.

•Moisture component integrated in targeted yield approach to enhance predictability using machine learning algorithms and fuzzy logic.

•STCR prescription equations were used to develop customised fertiliser under PPP mode for cluster based crop specific nutrient management and included in Fertiliser Control Order of Government of India.

•Low cost soil test kit developed for recommending the plant nutrients based on STCR approach; Patent granted (#347189) by the Office of the Controller General of Patents.

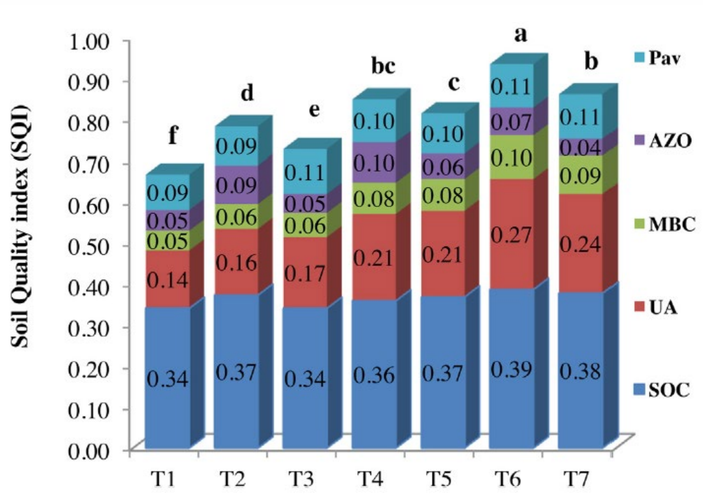

Fig. 1: Minimum data set and Soil Quality Index in STCR vis-à-vis other mode of nutrient application in jute (T1: Control, T2: FYM 5 Mg/ha, T3: Farmers' practice, T4: STCR 3.5 Mg/ha, T6: STCR-IPNS 3.5 Mg/ha, T7: STCR 4 Mg/ha jute)

Fig. 2: Farmer with produce (cotton) from STCR treatment at Front Line Demonstration site

CONCLUSIONS

Through adoption of STCR approach, the twin aspect of devising strategies for leveraging resources to tackle the challenge of low carbon transformation and strategies to enhance soil health and carbon sequestration will help in combating climate change without compromising agri-economic development. Moreover, the region-specific amalgamated technological prescriptions refined with targeted policy analysis are required for effective implementation and obtaining positive outcomes within a finite time horizon. This will provide a strong foundation for pragmatic policy formulation on natural resource conservation and combating climate change.

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