TARGETED YIELD APPROACH BASED FERTILIZER RECOMMENDATIONS FOR HIGHER PRODUCTIVITY AND PROFITABILITY

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Widespread nutrient deficiency and injudicious fertilization is a major constraint for achieving higher crop productivity in the country. This necessitates the use of an adequate and balanced level of fertilizer for increased and profitable crop production. Targeted yield approach of balanced fertilization is devised on sound scientific principles to provide optimum nourishment to crops through fertilizers, organic manures and bio-fertilizers. This minimises nutrient losses from crop production system, improves soil health and offers higher profit (Das et al., 2016). Fertilizer recommendations based on this concept are quantitative, precise and meaningful as both soil and plant analyses are involved.

TARGETED YIELD EQUATION

There are several approaches for recommending fertilizer rates. Among these, target yield approach given by Trougin 1960, modified by Ramamoorthy et al. (1967) was popularized by ICAR All India Co-ordinated Research Project on Soil Test Crop Response (AICRP on STCR) throughout the country. It involves a series of experiments from creating fertility gradient, growing of exhaust crop, growing of test crop with different treatments and final transformation into fertilizer prescription equation using three basic parameters i.e., nutrient requirement by crop, nutrient contribution from soil as well as nutrient contribution from fertilizer and organics. This accounted the variation in nutrient requirement as well as percent utilization efficiency of soil and fertilizer nutrients even among different varieties within a crop. Thus, nutrients from all possible sources are tailored for a specific yield goal in an integrated manner.

FOLLOW-UP TRIALS AND FRONTLINE DEMONSTRATION

Subsequent to equation generation, multi-locational follow-up trials are conducted at different locations to test and verify the fertilizer prescription equation for crop in that agro-ecological region. The equation is valid if the targeted yield is achieved within a variation of ±10%. Then, it is taken to farmers' fields through frontline demonstrations (FLDs) where scientists directly demonstrate the technology to the farmers. The dual aim of FLDs is to study the suitability of the target yield equation and to disseminate STCR technology to farmers' fields so that neighbouring farmers can be convinced about the performance of the technology (Figure 1). This also brings a synergy between scientists and famers.

Figure 1. Scientist explaining STCR technology to farmers through frontline demonstrations at TNAU, Coimbatore, Tamil Nadu

ECONOMICS AND SOIL FERTILITY IN STCR TECHNOLOGY

Several FLDs of STCR technology showed that there is ample opportunity for farmers to enhance their productivity and profit (Table 1 & Figure 2). The fertilizer doses used by farmers are often inadequate or imbalanced to achieve higher yield. STCR technology gives opportunity to farmers to plan for moderate yield target according to their limited resources, optimizing all nutrients and drawing benefits from their synergistic interaction. This approach provides a balance between applied nutrients and soil available nutrients thereby maintaining or improving the long term fertility of soil (Table 2). Inclusion of organic manures in STCR-IPNS is crucial as, in addition to supplying nutrients directly, it also improve soil carbon storage, structure, porosity, aggregate stability, decreases bulk density enabling the soil to hold more nutrients and water (Singh et al., 2020). Moreover, application of fertilizers based on this approach reduces excess fertilizer application, thereby reducing farm input cost.

Figure 2. Comparison of STCR technology and farmers practice of fertilization on Groundnut pod formation at Dindigul district in Tamil Nadu

Table 1. Frontline demonstration of targeted yield approach of fertilizer recommendation in ten different crops at Coimbatore district of Tamil Nadu

S. No	CROP	FARMERS' PRACTICE				STCR-IPNS$			
		Fertilizer dose@	Yield (t ha^{-1})	RR#	B:C	Fertilizer dose@	Yield (tha^{-1})	RR#	B:C
1	Rice	90-30-40	3.74	7.09	1.10	100-52-25	6.03 (6)&	11.1	1.62
2	Maize	120-50-30	6.12	8.35	1.63	248-86-38	9.95 (10)	12.8	2.37
3	Gingelly	20-10-10	0.58	3.00	1.22	11-8-7	0.925 (0.9)	6.14	1.79
4	Sorghum	55-24-30	2.04	3.66	1.01	45-23-23	3.56 (3.5)	13.4	1.62
5	Bhendi	55-35-30	9.80	23.7	1.57	100-50-50	15.1 (15)	40.8	2.23
6	Turmeric	92-40-60	17.2	31.2	1.69	109-43-131	29.6 (30)	39.3	2.75
7	Cotton	50-30-30	1.45	4.27	1.25	74-30-30	2.48 (2.5)	6.51	1.99
8	Black gram	20-30-15	0.58	2.31	1.30	12.5-25-13	0.93 (0.9)	4.08	1.96
9	Groundnut	23-32-30	1.56	1.56	1.56	14-38-95	2.54 (2.5)	5.43	1.67
10	Sugarcane	200-70-50	76.4	69.4	1.95	191-60-185	123.8 (125)	111	2.93

$ FYM@12.5 t ha^{-1} @N-P_2O_5-K_2O #Response Ratio inkg kg^{-1} &value in parenthesis is the target yield

Table 2. Soil fertility level after 20 years of long term STCR-IPNS in rice - rice cropping system at TNAU, Coimbatore

TREATMENTS	AVAILABLE NUTRIENTS (kgha^{-1})			OC (g kg^{-1})
	N	P_2O_5	K_2O	
State recommendation	232	23.6	515	6.0
STCR –NPK-7 t ha^{-1}	254	27.6	552	7.5
STCR-IPNS-7 t ha^{-1}	270	31.0	590	8.2
Absolute Control	174	17.2	426	5.0
Initial fertility status	280	20.2	670	4.6

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