

Sustainability of cotton in problematic soils

C.S. Praharaj and K. Sankaranarayanan

Cotton is the most important commercial crop contributing up to 75 % of total raw material needs of the textile industry with exports accounting half-a-lac crore of rupees, thereby remitting one-third of total foreign exchange earnings of India. With more than 60 million people involved in cotton related trade directly or indirectly, the seed cotton production has reached to 245 lac bales from 88.73 lac hectares with a productivity of 469 kg only (Estimates by EICA dated 27.07.2006).

Despite multiplicity of hybrids/varieties with proven tolerance to major pests, input related constraints and problems of instability, cotton productivity in India is still rated as low. And the improvement can further be accelerated with quality crop nutrition especially in large tract of problematic soils where low nutrient efficiency is again complemented with loss of soil organic materials either by erosion and high temperature (especially in semi arid and arid soils). In addition, calcareous cotton soils with high EC cause problem in nutrient availability and its uptake. Thus, judicious and balanced use of nutrients has always been a key for improving physical, chemical and biological properties of the soil on a sustainable basis.

Field experiments tried on a calcareous (8.70 pH) clay loam soils of Coimbatore under SOUTHERN HILLS AND PLATEAU REGION with medium fertility (low in OC & avail. N, medium in P & high in K) with poor quality irrigation water (EC of 3.52 dsm^{-1} and total salt concentration of 0.23 %) revealed that consistently higher yield was obtained with integrated nutrient (INM) practices i.e., 30:13:25 kg as N,P & K/ha plus 5 t FYM/ha leading to an increase in yield by 11.9% over control over the years. The treatment also out yielded over other NPK combinations including RDF and suppressed the adverse effect of salinity also. Imbalanced application of plant nutrients viz., N, NP, NK or higher levels of nutrients could not produce desirable responses as evident from decline in the yield levels and quality of the fibre (epidermal outgrowth of the seed coat of fertilized ovule).

Moreover, both organic based INM options and higher NPK levels (150 % RDF) could restore the fertility status of the soil especially P by maintaining higher nutrient balances in the soil. RDF, INM and manure could maintain the positive P balances over the initial levels but significantly over control and other imbalanced fertilizer levels. However, the supply of FYM in large amounts resulted in build up of available P and K in the soil. There was also reduction in N availability (and consequently lower yields) following K supply especially in absence of P in this K-enriched montmorillonite clay soil. Thus, a minimum maintenance K has to be applied in these soils.

On sustainability front, both SYI (sustainability yield index based on variability in productivity i.r.t. maximum yield over the years) and PE (productivity efficiency) for cotton were significantly higher under the above balanced nutrient level. Thus, organics based INM option could be a long-term viable alternative as it sustains the performance of both crop and soils. On the contrary, although regular annual application of organics in bulk quantities (15 t/ha) enabled maximum output of cotton with all its beneficial effects yet it was not feasible/ economical under the existing agro-bio-physical condition.