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NUTRIENT Expert fertilizer decision support tool: improving yield and profitability of smallholder soybean farmers' in Asia

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Soybean (*Glycine max [L.] Merr*) productivity in China (1685 kg/ha) and India (1024 kg/ha) are low compared to the world average of 2577 kg/ha. Inappropriate fertilizer management is identified as one of the main reasons for low yields in farmers' fields. Soil test-based fertilizer recommendation is either unavailable or not timely in these countries. A new fertilizer recommendation strategy for soybean has been developed based on on-farm yield response studies in China and India. The on-farm nutrient omission trials assessed the mean yield responses of soybean, the indigenous nutrient supplying capacities (INS) based on nutrient uptake in omission plots, and nutrient use efficiencies (NUE) across large domains. The average yield responses to N, P and K application in soybean varied between 286, 297 and 241 kg/ha in India and 404, 386, and 393 kg/ha in China, respectively, with significant regional differences in yield response, INS and NUE in both the countries. The above parameters and their inter-relationship were used to develop Nutrient Expert for Soybean (NE Soybean), a site-specific fertilizer decision support tool. Field validation in China showed that NE Soybean-based fertilizer recommendation improved grain yield by 8.4% and profitability by 8.5% as compared to farmers' practice. Similar studies in India, showed that the tool-based recommendation improved yield by 21% while the net return increased by 20% over the farmers' practice. The NE Soybean is a robust site-specific fertilizer recommendation tool that could help bridge yield gaps in regions where fertilizer decision support for farmers is unavailable or weak.