Soil Nitrogen Storage and Availability to Crops are increased by Conservation Agriculture Practices in Rice–based Cropping Systems in the Eastern Gangetic Plains

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On-farm adoption of minimum soil disturbance and increased residue retention will alter nitrogen (N) dynamics in soils and N fertiliser management in the intensive rice–based triple cropping systems of the Eastern Gangetic Plains. However, the consequences of changes in N forms, N mineralisation and N availability for crops in these cropping systems have not been determined. Field experiments were conducted at two locations (Alipur and Digram) of north–west Bangladesh to examine N cycling under three planting practices (conventional tillage (CT), strip planting (SP) and bed planting (BP)) with increased (HR) or low residue retention (LR– the current practice) on Calcareous Brown Flood Plain and Grey Terrace soils. Total N and available N were measured on soil samples as was N uptake by crops at different growth stages in the 13–14th (Alipur) and 12–13th (Digram) crops since treatments commenced. At each location (0–10 cm soil depth), SP, including non–puddled transplanting of rice seedlings (NP), together with HR increased total N by 9 and 32 % relative to BPHR, and CTHR and by 62 % relative to the current farm practice (CTLR). In general, the cumulative available N in soils during mustard and rice cropping under CT with HR was higher than other crop establishment and residue retention practices while under wheat and jute, total availability of N did not vary among crop establishment types with increased residue retention. Nitrogen availability in the initial phase of crop growth (0–60 DAS) was generally higher with CT than SP and BP. By contrast, for all crops, the estimated potentially mineralisable N was higher and its decay rate was lower under SPHR than other crop establishment and residue retention practices. Conservation Agriculture practices (SP, and NP of rice, together with HR) have altered the N cycling by reducing the level of mineral N available to plants in the early growing season when crop N requirement is low but increasing soil total N (0-10 cm) and plant N uptake by enhancing the synchrony between crop demand and available N supply.