Article title	Recovery of nitrogen fertilizer can be doubled by urea-briquette deep placement in rice paddies
Topic Keywords	Deep placement, Rice, Nitrogen Fertilizer
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Abstract	Nitrogen (N) recoveries in rice paddies have barely exceeded 60%, despite the implementation of several management strategies, amounting to significant N being lost to the environment. We conducted field experiments for three consecutive rice growing seasons at two locations in Myanmar to investigate the performance of urea-briquette deep placement (UDP) against variable rates of surface broadcast urea for improving N recovery and yields in rice paddies. The experiment consisted of a control (N0), 77.6 kg N ha^{-1} as UDP, and surface broadcast urea at 77.6 kg N ha^{-1} (N78), 100 kg N ha^{-1} (N100) and 160 kg N ha^{-1} (N160). Surface broadcast urea was applied in two equal splits at 10 days after transplanting (10 DAT) and at panicle initiation (PI) stage. Urea briquettes (2.7 g) were deep placed (75 mm) in the middle of four rice hills between alternate rows as a single dose at 10 DAT. Microplots receiving ^{15}N labeled urea were installed in each treatment plot (except N100) to trace the fate of the applied N. Nitrogen input almost always produced higher grain yields ($p < 0.05$) compared to the control. Rice grain yield in the UDP treatment was similar or higher than in the N78, N100 and N160 treatments. Crop dry biomass yield in the UDP treatment was mostly higher ($p < 0.05$) than in the N78 and always similar to the N160 treatment. Higher crop (47–61%) and soil (24–40%) recovery of ^{15}N was observed in the UDP treatment than in the N78 and N160 treatments, leading to total recoveries of 77–95%. The N78 treatment had crop recoveries of 30–37% and total recoveries of 41–60% and the N160 treatment had crop recoveries of 29–39% and total recoveries of 40–54%. The rice plants in the UDP treatment relied less on native soil N, indicating that the UDP practice can minimize soil N depletion. Our results show that UDP has substantial advantages over surface broadcasting in terms of N fertilizer recovery and may provide environmental benefits.
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