

LEGUME CROP ROTATION AND RESIDUE MANAGEMENT TO IMPROVE NITROGEN EFFICIENCY AND SUGARCANE YIELD

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LEGUME CROP ROTATION during the fallow period can improve soil health, add nitrogen (N) into soil through biological N fixation and help conserve soil mineral N in the biomass that would otherwise be easily lost under bare fallow. However, the legume crop residues can also produce large amounts of mineral N prior to the following sugarcane crop's peak N demand, which is susceptible to losses through leaching, runoff and denitrification.

In a field trial at Bundaberg, we compared the capacity of soybean and peanut crops to fix/retain N and assessed the efficacy of different legume residue management practices on soil mineral N contents and cane yield. The legume crops significantly reduced soil mineral N contents in the 0-10 cm depth during the crop growing season and in the 30-90 cm depth at sugarcane planting. After harvest of grain or nut-in-shell, the soybean residues contained 281 kg N/ha, compared with the peanut residues with 88 kg N/ha.

Under conventional tillage, the cane yield following soybean rotation without N fertiliser application was similar to that following bare fallow plus 150 kg fertiliser N/ha (recommended rate). In comparison, the cane yield was 15-18% lower following peanut rotation with 67 kg N/ha applied (after discount of peanut residue N).

Direct drill planting tended to decrease cane yield compared with planting cane after tillage, regardless of legume species. Spraying the nitrification inhibitor DMPG (dimethylpyrazole glycolate) on the soybean and peanut residues before tillage increased cane yield by 3.9% and 12%, respectively, compared with their conventional tillage counterparts (not significant at $P = 0.05$).

Under direct drill, allowing volunteer soybean plants to re-grow to capture the soil mineral N and perhaps fix more N during the three months before sugarcane planting increased the cane yield by 10.7 t/ha compared with the treatment with the volunteer plants sprayed out.

We conclude that soybean as a rotational crop offers greater N benefits than peanut to the subsequent sugarcane crop.

Spraying nitrification inhibitor onto legume crop residues before tillage or allowing volunteer soybean to re-grow before cane planting under direct drill may generate higher cane yield.