

Recycling of Crop Residues for Sustainable Crop Production in Maize-Groundnut Rotation System



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Burning is a common practice in Malaysian farms, to control weeds and pests. This renders the C and N sequestered in the biomass to be lost, apart from contribution to pollution. A long-term field experiment was established in February 1997 to investigate the contribution of crop residues to the N – economy of a maize-groundnut rotation system. The experiment consisted of three treatments: (i) T1 – recommended rate of chemical fertilizer with residue, (ii) T2 – recommended rate of chemical fertilizer without residue and (iii) T3 – combination of organic fertilizer (chicken manure) and chemical fertilizer with residue. In order to investigate the N contribution, derived from the first crop



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(maize) residue to subsequent crops, the 1st maize crop was labelled with ¹⁵N in the T1 and T2 treatments. The first crop was sown in March 1997 and ¹⁵N-labelled N fertilizer (ammonium sulphate, 9.82% a.e.) was applied (60 kg ¹⁵Nha⁻¹) to the T1 and T2 treatments in a microplot (4m x 4m) within each yield plot (20m x 8m), to generate labelled maize residue. At the same time 90 kg Nha⁻¹ unlabelled N fertilizer was applied to supplement the recommended N rate for maize of 150 kg Nha⁻¹.

Recoveries of fertilizer ¹⁵N by the first crop ranged from 19.3% to 21.6%. In the following crop the recoveries of applied fertilizer ¹⁵N were only 5.1% and 5.6% in plants of T1 and T2 treatment plots and trace recoveries of ¹⁵N in the subsequent crop. However, fertilizer ¹⁵N retained in the soil after harvest of the first crop was 35.3 – 43.8% whereas after the 2nd crop there was 33.0% in crop residue treated plots and 26.2% in plots where crop residues were removed. Nitrogen and K uptake by the subsequent crops were significantly higher in crop residue treatments (T1 and T3) whereas P, Ca and Mg were not significantly affected by application of crop residues. Soil pH and physical characteristics were not changed after four crop residue applications. However, soil available P and exchangeable K were significantly higher in plots with crop residues. The contribution of crop residues to the crop yield was not significant after 6 crop cycles. Crop response to crop residue incorporation may be more significant in the long-term.

Reader Enquiry

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