

Influence of soil nitrogen fertilisers on soil acidification in Papua New Guinea

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Abstract

Soil acidification is a worldwide concern with many cropping systems where nitrogen (N) fertilisers are used. Inorganic N fertilisers are generally used to improve and maintain high yields, especially with oil palm; however, little is known about their effects on soil acidification in tree crops, especially oil palm cropping systems. This study looked at the effects of different N fertilisers on soil pH, and suggests strategies to sustainably grow oil palm in Papua New Guinea. Soil samples were collected in a grid design from a N-fertiliser trial that has been receiving five different N-fertiliser types for more than 8 years. The palms were receiving N at 0, 420, 840 and 1,680 g N/palm/year. Soil pH was measured for composite samples from all the plots and individual grid points for two of the plots that received the highest ammonium chloride rates. Soil pH was significantly ($p < 0.001$) influenced by N-fertiliser type and rate but the effects reduced with depth. Soil pH was reduced to the greatest extent by ammonium chloride at the highest rate, to depths greater than 90 cm, while urea had the least effect. At normal N rates, pH was reduced by 0.2–0.4 units. Soil pH was highly variable ($p < 0.001$) between points within the same plot, ranging from 3.86 to 6.87. Soil acidification at different grid points was a function of N-fertiliser placement. Alternating use of different N sources and application of empty fruit bunches are recommended to minimise acidification rates.

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