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Impact of Alternative Management Practice on Fertiliser Recovery by Cotton in Different Soil Types of West-Africa

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Abstract

Cotton is still one of the most dominating cash crops grown by the smallholder famers in most of the countries of West-Africa. However, it is mainly grown in the lands with inheritably poor soil fertility and therefore, the most limiting nutrient, nitrogen, is often applied in a greater quantity. As a consequence, the task of improving nitrogen use efficiency by cotton cultivated in such soils has become a major challenge. In an attempt to recommend an alternative management practice for improving crop nutrient uptake, use efficiency, and yield, an experiment was conducted in 2013 on a Haplic Lixisol and a Plinthic Lixisol in Ouriyouri, Benin Republic, and on a Ferric Lixisol and an Eutric Plinthosol in Tambiri, Burkina-Faso. The main goal of this study was to assess the single and interactive effects of tillage, crop residue incorporation, and nitrogen management on cotton nitrogen uptake (NU), and apparent nutrient recovery efficiency (ANR) from N fertiliser under 4 different soil types. The experiment was a strip-split-plot design with four replicates comprising two tillage systems (contour ridge and reduced tillage) in main plots, and two levels of crop residue (with and without) and three mineral nitrogen fertiliser rates (0, 45, 90 kg ha^{-1}) randomised within the sub-plots. At 4 weeks (vegetative stage) and 8 weeks (reproductive stage) after planting, whole cotton plants were sampled and analysed for nitrogen content. In Ferric Lixisol, Eutric Plinthosol, and Haplic Lixisol, the highest level of both NU and ANR was recorded under contour tillage with crop residue incorporation and 90 kg ha^{-1} N dose. On the other hand, in Plinthic Lixisol, NU and ANR was highest under contour ridge tillage with crop residue and 45 kg ha^{-1} N dose. A higher NU and ANR by contour ridge tillage, crop residue incorporation and judicious N application also significantly increased cotton yield at all the soil types. Therefore, the use of contour ridge tillage with judicial application of nitrogen fertiliser and crop residue should be promoted for the smallholder cotton farmers in West Africa as a measure to optimise farming practices.

Keywords: alternative management practice, apparent nutrient recovery efficiency, cotton, nitrogen uptake, soil type, West-Africa

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