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Sustainable Management Options for Improved Cassava-Maize Intercropping System Productivity and Resource Utilisation in Southeastern Nigeria

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Abstract

Cassava-maize intercropping is a popular, traditionally practised system in southern Nigeria where both crops are staples. Maize offers food and income early in the season (within 3 months) before the cassava harvest (9 months later). However, both crops produce low yields (cassava <10 t ha^{-1} and maize <1 t ha^{-1}) in farmers fields relative to their attainable yields (>48 and >5 t ha^{-1}, respectively). To increase the system's productivity, two intensification options were investigated: i) two N:P:K inorganic fertiliser rates (90:20:40 (F1) vs 75:20:90 (F2)), and ii) increased maize population densities (20000 vs 40000 plants ha^{-1}) on-farm in three agroecologies in Nigeria. F1 and F2 regimes were 300 kg ha^{-1} N:P:K 15:15:15 (basal), two equal splits of urea 3 and 5 weeks after planting (WAP), and 100 % P (TSP basal), three equal splits of urea and MoP at 4, 11 and 17 WAP, respectively. The objectives of the study were to elucidate the effects of: i) F1 and F2 on the growth, development and root yield of cassava and maize cobs, ii) the increased maize population density and fertilisation on solar radiation capture and soil moisture, and iii) the rates of inorganic fertilisers (N:P:K 90:20:40 vs 75:20:90) on cassava root quality (starch yield). Cassava (height, canopy dimension, leaf production) and maize (height, leaf number, visible leave collar per plant) growth were increased by fertiliser application; no effect of maize density was observed. Correspondingly, maize and cassava intercrop yields increased with fertiliser application and were highest at high maize density (>3.5 tha^{-1}) with F1 for maize, and 20 tha^{-1} of cassava roots with F2. Nitrogen uptake was significantly correlated with maize yield and yield components. Highest incident PAR and soil moisture (3 months data) was intercepted and retained, respectively under the two fertilisation regimes with high density maize. F2 was superior over F1 and zero fertilisation in starch yield (>158 kg ha^{-1}) across locations. The use of 40000 maize plants ha^{-1} and inorganic N:P:K fertilisers at the rates and regimes used here was a viable option to increase productivity of cassava-maize cropping in farmers' fields.

Keywords: African Cassava Agronomy Initiative (ACAI), agroecology, fertiliser, soil moisture, solar radiation, sustainable intensification, yield

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