

Productivity of a Maize-Promiscuous Soybean Intercrop as Affected by Fertilizer in the Southern Guinea Savanna Zone of Nigeria

A. O. Osunde^{1*}, P. A. Tsado¹, A. Bala¹ and N. Sanginga²

¹Department of Soil Science, Federal University of Technology Minna, PMB 65, Minna, Nigeria

²International Institute of Tropical Agriculture (IITA), PMB 5320, Ibadan, Nigeria

*Corresponding author: E-mail: aosunde@skannet.com; kimosunde@yahoo.co.uk

Abstract

A 2-year field experiment was conducted to assess the response of a maize-promiscuous-soybean cropping system to different rates of NPK fertilizer (20:10:10) in the southern Guinea Savanna zone of Nigeria. Additions of 100 kg ha⁻¹ of fertilizer (equivalent to 20 kg N ha⁻¹) was shown to decrease dramatically the number and dry weights of the promiscuous soybean nodules in both the sole and intercropped systems. Without the addition of fertilizer the proportion of N derived from N₂-fixation was about 40% in the intercropped soybean and 30% in the sole crop. Increasing rates of fertilizer from 0 kg ha⁻¹ to 300 kg ha⁻¹ (equivalent to 60 kg ha⁻¹) led to an increase in N₂-fixation in the sole crop with about 60% of plant N derived from N₂-fixation. On the other hand, N₂-fixation in the intercrop decreased with increasing rates of fertilizer; and an increase was only obtained with an application of 300 kg ha⁻¹ fertilizer. Nitrogen accumulation in shoots and grains of the intercropped maize was shown to be less than that of the sole-cropped maize. Also, P yield in the grains of sole maize was significantly larger than that of the intercropped maize. Grain yields and shoot dry matter were increased by additions of fertilizer, with the component crops in the intercrop systems yielding less than the corresponding monocrops. However, the cumulative yield of the component crops in the intercrop resulted in about 30% more income above those of the sole crops. The most profitable fertilizer level for the maize-intercrop system was shown to be 300 kg ha⁻¹.

Introduction

Typical of most soils of sub-Saharan Africa, agricultural production in the Nigerian savanna is largely limited by low soil fertility. The use of fertilizers to overcome this limitation is hampered by their high cost, which the peasant farmers can hardly afford. One promising alternative that can substantially reduce investment in fertilizers is the inclusion of legumes in the various farming systems. Farmers in the Nigerian savanna are aware of the importance of legumes in soil fertility improvement, and have had a long tradition of cultivating grain

legumes in various combinations with cereals (Bala & Osunde, 1995).

Mixed cropping of cereals and legumes is a widespread practice because legumes enable farmers to cope with weed infestation (Akobundu, 1993), erosion and declining levels of soil organic matter and available N (Fujita *et al.*, 1992). Companion crops benefit from such mixtures through N accrual from legume root and nodule senescence and direct N transfer from the legumes (Fujita *et al.*, 1990), while subsequent crops benefit from the N mineralized from the fallen leaves and