

ABSTRACT

Soil water availability and its influence on aspects of growth and total plant yield were demonstrated in sole and mixed cropping systems where Banana [Musa (AAA)] cv. Valery, Cassava (Manihot esculenta Schott.) cv. M. Col. 22 and Gungo (Pigeon Pea) [Cajanus cajan (L.) Millsp.] were grown as the main crops. The other crop components of the mixed systems were cowpea [Vigna unguiculata (L.) Walp.] cv. Laura B, sweet potato [Ipomoea batatas (L.)] cv. Government and corn [Zea mays (L.)] cv. 304A.

Banana was grown as a sole crop or mixed with cowpea or with gungo and sweet potato; Cassava was grown as a sole crop or mixed with cowpea or with cowpea and corn; Gungo was grown as a sole crop or mixed with sweet potato or with sweet potato and corn. All identifiable sources of water entering the soil were recorded, as were other relevant meteorological data and soil water contents were monitored 0-70 cm below ground twice weekly using a neutron-probe moisture meter. Total plant yields were recorded and total water use efficiency assessed and evaluated based on kilogram dry matter produced per day from mm of water added to the soil ($\text{kg mm}^{-1} \text{ day}^{-1}$).

Yields from each cropping system were influenced primarily by the cropping system; by both the interaction between crop components and by the cultural practices employed. These yields were modified by individual plant responses to varying levels of soil moisture.

At the soil moisture levels recorded, except for banana cropping systems, yield advantages with an attendant increase in total water use efficiency were demonstrated in all mixed systems compared to their monoculture alternatives. There was no advantage to growing bananas in mixed cropping systems when soil water levels were kept at 66% of field capacity. Additionally, within this soil moisture level, flowering in banana was significantly delayed in mixed systems. For cassava and gungo cropping systems, at some stage after plant establishment, there appears to be an optimum moisture level close to 50% of field capacity above which additional water applied to the cropping system does not improve total yields, and the total water use efficiencies of the system begin to decrease.

The data indicate that in situations where water for plant growth is seasonal or limited, there are significant advantages to growing cassava, gungo and banana in mixed cropping systems. Where there are no limitations on water, banana is best grown in pure systems. Under similar conditions, if optimum water use efficiency is to be realised for cassava and gungo cropping systems, there is need for further investigations into appropriate watering regimes and other management practices.