Table 41. Percentage of applied cations and anions in the leachate after 2,012 mm of water under bare fallow (uncropped, weed free) IITA, 1980).

Ions	Free drained Lysimeter 1	Tension drained (0.2 Atm) lysimeter 6
	%	
NO_3^-	78	70
Ca^{++}	35	30
Mg^{++}	64	60
K^+	9	9

at Onne in 1978. Results of the second year cropping during the 1979-1980 season are shown in Table 42. In the second year of cropping, the soil K-status even with K application was very low. There was a distinct effect of Mg application in increasing the soil Mg status. The tuber yields of both varieties showed a more pronounced and significant response to K application. Despite the presence of Mg deficiency symptoms without Mg applications, similar to the first year results, there was no definite response of tuber yield to Mg application.

Cropping systems

In 1980, research in cropping systems or crop management focused on the following areas: mixed cropping, alley cropping, live mulch system and the role of agroforestry in food crop systems. The ultimate goals are to achieve high and stable crop yields while maintaining long-range soil productivity. Several projects were initiated to investigate the inclusion of leguminous cover crops and managed tree and shrubs into food crop production systems in an attempt to find more efficient, low-energy input and stable alternative systems to traditional bush fallow cultivation. Special emphasis was given to the production system of plantain in the humid and perhumid regions.

Intercropping agronomy and meso/micro-climatic studies

Light regime and productivity in mixed crops. Competition for light and moisture are clearly 2 key factors in mixed cropping systems. As a follow up on previous studies showing or establishing a range of modifications that may be brought about in the light regime in maize canopies through modifications of planting geometry and density (IITA Annual Reports 1978 and 1979), studies were carried out in 1980 with the aim of quantifying and standardizing some of these relationships partly to provide a basis for optimal design in mixed cropping systems. Attempts were also made to relate the effects of the modified light climates within the established crop (maize) on the lower or slower growing intercrop (cassava).

Results show that at full development of the maize canopy in a maize/cassava mixture, the percentage of incident radiation depleted at cob height is a power function of the combined plant population. The relevant equation is as follows:

$$Y_{el} = 1.735X^{0.851} \qquad r = .917^{**}$$

where Y_{el} is the amount of light intercepted (to cob level), and X is the combined plant population (Fig. 32A). A similar relationship was obtained at ground level (Fig. 32B).

As previously reported (IITA Annual Report 1979), plant populations in this experiment were varied from 10,000 plants/ha in the pure cassava to 80,000 plants/ha in the maize/cassava mixtures. The maize (TZPB) population varied from 10,000 to 70,000 plants/ha by increasing the number of maize plants per stand from 1 to 7. Spacing was maintained at 1 m × 1 m with the plants along the same row.

For the lower or slower growing cassava, which was shaded through much of the growth of the maize, the crop yields were very significantly affected by the amount of light reaching it through the maize canopy (Fig. 33). Again, a similarly linear relationship was obtained between the cassava yield and the total light transmitted through the combined maize/cassava canopy at full maize development (Fig. 34). These amounts of transmitted light can also be systematically related to the combined plant population as shown in Fig. 35. The relationship between the 2 factors is expressed:

$$Y_g = 82.198e^{-0.0165X} \qquad r = -0.903^{**}$$

where Y_g is the amount of light transmitted through the canopy, and X is the combined plant population.

Table 42. Effect of K and Mg application on tuber yield of cassava cultivars TMS 30395 and TMS 30211 and K and Mg status of an Ultisol (Typic Paleudult), Onne, 1980.

Fertilizer Treatment kg/ha		Soil K and Mg status Me/100g		TMS 30395		TMS30211	
				Tuber yield t/ha			
K	Mg	K	Mg	Fresh	Dry	Fresh	Dry
0	40	0.09	0.33	15.84	6.47	14.99	5.66
30	40	0.09	0.27	19.41	8.08	18.67	6.11
60	40	0.11	0.33	19.97	8.84	18.20	6.36
120	40	0.10	0.30	20.13	8.52	19.08	6.73
120	0	0.11	0.22	21.47	9.39	17.33	6.69
120	20	0.11	0.22	19.47	8.06	17.50	5.97
Mean				19.38	8.23	17.63	6.25

LSD (5%) Variety means fresh tuber 0.63; Dry tuber 0.78.
Between fertilizer treatments within variety: fresh tuber 3.48; dry tuber 1.83.
Between fertilizer treatments among variety: fresh tuber 5.29; dry tuber 2.88.