

Table 40. Maize grain yield and N recovery as affected by methods of application (IITA Onne substation, 1980).

Treatment#	Grain yield kg/ha	N removed by crop (grain + stover) kg/ha	Estimated fertilizer N in soil (0-120 cm) at harvest + + kg/ha	Estimated recovery of applied N** %
LoN ₁ (Bare)	-	-	70.6	47.1
LoN ₁	2,492 c	54.5 d	58.9	75.5
LoN ₂	3,208 ab	73.7 bc	43.0	78.5
LoN ₃	3,376 ab	82.7 ab	55.3	92.0
L N ₁	2,853 bc	61.4 cd	32.9	62.5
L N ₂	3,499 a	81.6 ab	32.6	76.3
L N ₃	3,717 a	92.4 a	59.1	100.8

#Lo = unlimed; L = limed, 2t/ha; N rate = 150 kg/ha; N₁ = one application at planting; N₂ = 2 splits; N₃ = 3 splits.
+ + Corrected for mineral N (NH₄-N and NO₃-N) in soil (0-120 cm) from unfertilized bare fallow plot (190.2 kg/ha).

**Crop removal plus estimated fertilizer N in soil (0-120 cm) at harvest.

ther splitting into 3 applications had no significant effect on yield though it reduced leaching loss.

Estimated percentage recovery of applied N is also given in Table 40. Loss of applied N in the form of calcium ammonium nitrate under cropping was not as high as expected although more reliable measurements on N recovery can only be obtained with N-15 tagged fertilizers.

When N was applied in 3 split applications, nearly all the applied N could be accounted for by plant uptake and the amount present in the soil (0-120 cm) at the end of season. At 2 split applications, about 80 percent of the applied N was recovered in plant and soil.

It is important to point out that the unfertilized bare fallow plot contained 60-80 kg/ha of mineralized N (NH₄-N plus NO₃-N) in the surface 30 cm layer for both the unlimed and limed treatments, suggesting relatively high rates of mineralization during the early part of the cropping season. It appears that application of N fertilizer may not be necessary at the time of planting during the first season if sufficient mineralized N is already present in the surface layer.

Lysimeter studies

The installation at IITA of 6 monolith lysimeters (80 cm in diameter and 130 cm deep) with undisturbed profiles of



Monolith lysimeter cutting and installation at IITA Onne substation.

the Ultisol (Typic Paleudult) from Onne was completed in early 1980. The primary objectives are to study leaching of nutrients under high-rainfall conditions and determine crop water use. The high-rainfall condition, which prevails at Onne, was simulated during the experimental period by supplementing natural rainfall with irrigation using the 1979 rainfall regime at Onne as a basis. Nutrient losses over the 2 cropping seasons were determined by measurements of fertilizer ions in the leachate collected as samples of the drainage through the profile, and evaporation/evapotranspiration was assessed by the water balance method.

Maize was planted as a test crop on 3 of the lysimeters and in the surrounding area to maintain adequate fetch while the remaining 3 were left bare. All except 1 of the lysimeters was tension drained by applying a suction of 0.2 atmosphere at the base of the column. Fertilizers were applied in each of the 2 seasons to all 6 lysimeters as follows:

- N (Calcium nitrate): 150 kg/ha, 3 split applications
- P (Monocalcium phosphate): 60 kg/ha, basal
- K (Potassium chloride): 150 kg/ha, basal
- Mg (Magnesium sulfate): 30 kg/ha, basal

No lime was applied during this preliminary run. As a result, there was poor growth of maize inside the lysimeters due to strong soil acidity. On the basis of the preliminary results, total drainage through the seasons averaged 1,153 mm or 58 percent of the total equivalent rainfall (2,012 mm) received by the bare (uncropped) lysimeters and 977 mm or 49 percent of the total equivalent rainfall received by the cropped lysimeters. The corresponding values of evaporation and evapotranspiration were 832 mm and 1,035 mm, respectively, averaging 3.70 mm/day and 4.60 mm/day, respectively, over the period. Preliminary leaching data of nutrient cations and anions calculated as percentage of total amount applied are given in Table 41.

These data indicated that nitrate and magnesium ions leached readily; whereas, potassium ions, were preferentially retained. Further studies are being conducted under maize and upland rice cropping where adequate amounts of lime have been applied to ensure normal crop growth.

K and Mg response of cassava

Investigations on the K and Mg response of cassava varieties TMS 30395 and 30211 were initiated on an Ultisol