most promising cassava clones at IITA between 1973/1974 and 1977/1978 (IITA Annual Report 1977). The results, indeed, show a negative and highly significant linear relationship between the cumulative pan evaporation from 1 December through 28 and 29 February (the dry season for IITA) and the cassava yield. The relevant equation is as follows: $Y = 176.69 - 0.3421$, $r = -.978^{**}$, where Y is the yield of cassava and $I = \sum_{1}^{n} (Ep)$ (1 = Dec., n = Feb. 28/29). This relationship could prove useful in estimation of the performance of cassava across climatic zones.

Soil and land characterization and evaluation

Technical soil evaluation system based on soil mineralogy

Two distinctive approaches have evolved in recent years regarding the management of tropical soils for higher agricultural productivity. The high-energy input, extensive food and cash crop production systems are well suited for the fine-textured oxidic Oxisols, Alfisols, Ultisols and Inceptisols; whereas, agroforestry and low-energy input, food crop production systems are more suitable for the kaolinitic and siliceosis Alfisols, Ultisols and Inceptisols.

A key factor differentiating these 2 major categories of soils and their response to agricultural exploitation is soil mineralogy. A technical soil evaluation system using mineralogical characteristics as the main criterion is being developed at IITA with the primary objective to provide agricultural planners in the tropics with a set of simple guidelines for agricultural soil utilization. It is intended to provide supplementary information to the established soil classification systems with special reference to agricultural soils in which variable charge colloids dominate. Vertisols, Alfisols, Ultisols and Inceptisols dominating in high activity clays or constant charge minerals are excluded from this system since the agricultural soil evaluation systems for such soils are well established for the temperate and subtropical regions.

The proposed system may be briefly summarized as follows:

Soil group	Sub-group	Condition modifiers (or soil fertility limitation)	
		Physical	Chemical
Kaolinitic soils	Eutric	w, r, c	t*, (m*)
	Dystric	w, r, c	t, k, a, (m)
Siliceous soils	Eutric	w, c	t*, k*, (m*)
	Dystric	w, c	t, k, a (m)
Oxidic soils	Eutric	w	i
	Dystric	w	i, t, k, a
Allophanic soils	Eutric	-	i
	Dystric	-	i, t, k

The eutric subclass refers to high "base" status, and dystric to low "base" status. The soil fertility limitations in the last 2 columns refer to:

Physical condition modifiers:
w —low available water reserve
r —high soil erosion hazard
c —high soil compaction hazard
Chemical condition modifiers:
k —low potassium reserve
i —high phosphate fixation
t —secondary/micronutrient deficiencies and/or imbalances
a —aluminum toxicity for most legume crops
m —manganese toxicity to most legume crops
** —potential soil toxicity and/or secondary and micronutrient deficiencies and imbalance due to continuous cultivation with conventional chemical fertilization.*

Tentative quantitative limits of the "soil condition modifiers" have been defined, and refinement of these can be introduced in the future on the basis of further research information.

It is proposed to integrate this soil evaluation system in the land types and agroclimatic information so as to establish comprehensive guidelines for land clearing and management for different regions of the tropics. Close collaboration with FAO and other development agencies and interested national soils research institutions will be fruitful in further development of the system.

Soil erodibility characterization

Field experiments have been established to directly monitor soil erodibility at 3 locations in Nigeria—Onne, Ikom and Jos. In addition, soil detachability and transportability measurements on 20 soils collected from different parts of Nigeria are being made with a laboratory rainfall simulator. The accumulative infiltration measured for 3 locations prior to establishing the runoff plots are described by the following equations:

$I = 30.8t^{1/2} + 26.1t$ . . . Onne
$I = 16.0t^{1/2} + 93.3t$ . . . Ikom
$I = 2.1t^{1/2} + 6.3t$ . . . Jos

Where I is the accumulative infiltration in centimeters, and t is the time in minutes.

Field measurements of soil bulk density for 20 soils indicated a range of 0.70g cm^{-3} for Ikom to 1.5g cm^{-3} for Bakura and Tumu, Nigeria. Similarly, the soil-water transmissivity ranged from 236 cm/hr for Ikom to 1.4 cm/hr for Samaru, Nigeria. A plot of the accumulative infiltration vs. time for some Nigerian soils is shown in Fig. 9. Estimates of erodibility for some Nigerian soils by using the USDA Nomogram indicate a range of 0.05 t/acre/foot-ton for Ikom to 0.56 t/acre/foot-ton for steep lands near Abakaliki, Nigeria. A majority of the soils, however, have a low erodibility of about 0.1.

Hydromorphic soils in West Africa

A study was carried out to assess the quality and distribution of hydromorphic soils in various wetland areas in West Africa and their suitability and limitations for rainfed and irrigated rice production.

Hydromorphic soils could be defined simply as those soils where water can gather in sufficient volume and time to produce the effects of gleying or reducing re-