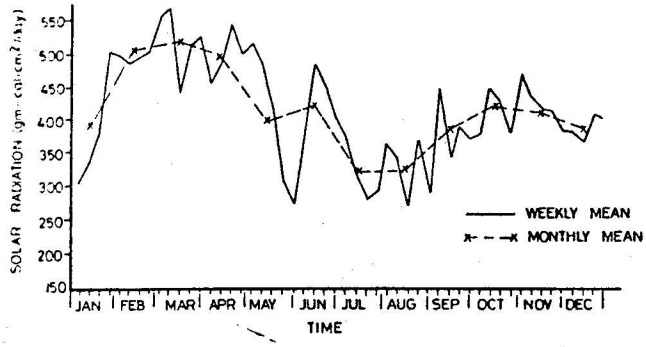

Fig. 3. Weekly and monthly mean solar radiation (IITA, 1980).

During the period May through August, which in effect covers the first cropping season, incident radiation dropped to a mean of 363.7 g-cal cm-2 day-1 or 6 percent less than the multiannual mean for these 4 months. The rest of the year, except for the month of November, saw a return to higher than normal insolation regimes.

Temperature and relative humidity. Higher temperatures prevailed on the average, mainly as a result of higher night-time temperatures, an apparent result of the more humid and cloudier conditions (Fig. 4). Monthly average minimum temperatures were record-high in many cases.

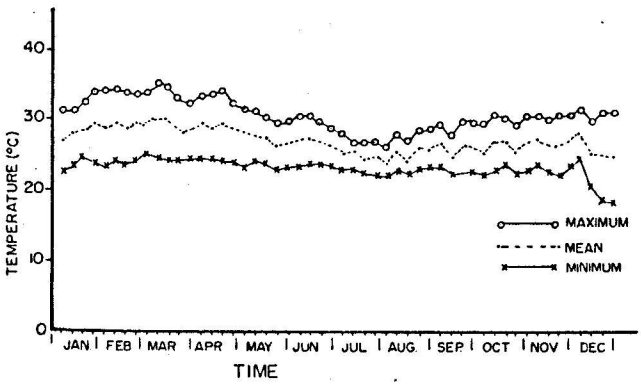

Fig. 4. Weekly mean, maximum, and minimum mean air temperature (IITA, 1980).

Daytime hours were by contrast cooler. The only above-average maximum temperature occurred in April (departure: +0.6°C), a month of subnormal rainfall. With the delay in the onset of the rains, soil temperatures remained rather high well into the month of April with a mean maximum of 41.3°C at 5 cm.

Observed relative moisture contents of air were also higher than normal, except for April (Fig. 5). These higher humidities evidently account, in part, for the lower values of evaporative demand.

An unusual prevalence of southerly and southwesterly winds in January and February constituted the basis for the observed cloudiness noted earlier. In general, wind speeds also remained above average throughout the year. The incidences of gusts during the wet period, particularly in late July and in August, account for the considerable lodging and stalk breaking observed during the period.

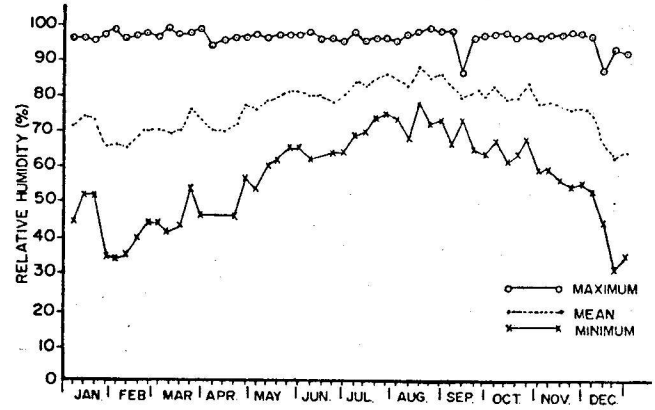

Fig. 5. Mean, maximum, and minimum relative humidity (IITA, 1980).

Dew/light precipitation. The contribution of dew to the water budget was much less than in the previous year. This is not surprising in view of the record high minimum temperatures and the high incidence of rainfall. The measured total for the year was 11.59 mm, ranging from a monthly maximum of 1.57 mm in November to 0.48 mm in August.

Agroclimatic analysis

Agroclimatic zones of West Africa

To provide a uniform framework for research to facilitate the choice of priority areas and determine the range of applicability of research results, an agroclimatic zonation of West Africa was undertaken. It is based on the concept of water-balance and Franguin's method of interception of rainfall potential evapotranspiration cure.

Months of positive water balance were defined as months with rainfall greater than or equal to potential evapotranspiration. On the basis of the number of the months determined for the network of approximately 88 stations over the region, 7 generalized agroclimatic zones were defined (Fig. 6).

Commonly used terminologies were retained in describing these zones. It is believed that the basic definition used in this classification is not only more meaningful from the cropping point of view but also avoids complex indices and is, thus, easier for the user to follow.

Crop water requirements.

There is a scarcity of research information regarding the water requirements for tropical food crops. It is important, therefore, to define the optimum water requirements of these crops to maximize their productivity under different ecological conditions.

Evapotranspiration and cowpea yields. Many studies on a variety of crops have tended to show a linear relationship between actual evapotranspiration and, more particularly, actual transpiration and yield. Using cowpea, TVu 3629 and TVu 4557, yield figures from a series of