

SECTION 4

The Effects on Maize Yields

4.1. Introduction

In this section we simulate the effects of various climatic scenarios on maize yields using a dynamic crop production model, applied in conjunction with data that describe the production environment of the districts of Kirinyaga, Embu and Machakos in Kenya. An analysis of the climate characteristics is presented below. These data, together with soil characteristics, are essential input for the production model. The model is described briefly and the potential maize yields generated for different climatic scenarios are reported.

4.2. The Production Environment

4.2.1. The climate

The dynamic crop production model estimates crop yields based on the following climate characteristics:

- Air temperature
- Windspeed
- Relative humidity
- Global radiation
- Rainfall

Information for these variables are shown for the climatological station of Machakos Dam (*Figure 4.1*). The plotted averages are decadal values, i.e., values for 10-day periods, and are based on observations for the period 1963–1982. Each of the average decadal values of the variables is accompanied by its 25 and 75 percentile values as a measure of the variability.

The annual amplitude of the air temperature is small, with a range of about 4 °C between the warmest and coolest months. The coolest period of the

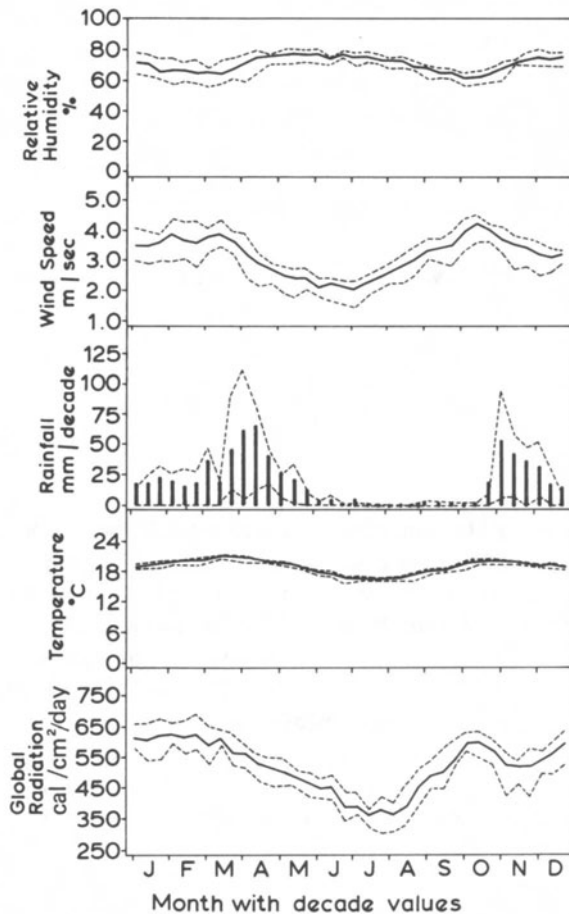


Figure 4.1. Average climatic values for Machakos Dam for 10-day periods (decades).

year is June–August, when there is persistent cloud cover. On a few nights, at that time of the year, the temperature may fall below 10°C . This period, when the intertropical convergence zone (ITCZ) is about 15° latitude to the north of the region (see Section 2) is also the driest part of the year.

The presence of cloud cover is reflected in the plots of global radiation. At the end of July, average radiation is about $1470 \text{ Joule cm}^{-2} \text{ day}^{-1}$, roughly 60% of the level of January–February. The radiation reaches its highest values just before and at the beginning of the rains; this is especially apparent when the short rains start (in October).

The seasonal rainfall exhibits a typically bimodal pattern. Machakos Dam receives relatively more rain during the period of the long rains (March–April). Farther north, the dominance of the long rains is more accentuated, while to the south it is the short rains that bring relatively more rain (see also Figure 4.7).