

A Practical and Simple Graphic Model to Appraise the Occurrence of Dry Spells in the Humid Tropics¹

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ABSTRACT

Data and observations from a site in the mountainous humid tropics of Puerto Rico show the occurrence of dry spells even during the wet seasons. It is postulated that dry spells of more than 3 to 5 days of duration might induce considerable moisture stress particularly on soils of low moisture retention capacity. The recognition of this fact and the use of rainfall data in conjunction with appropriate soil data can be of paramount importance in timing planting and other farming operations. A graphic model that is very simple and practical and can be prepared and interpreted easily by agriculturists is proposed to appraise the occurrence of dry spells.

INTRODUCTION

The occurrence of short dry spells within the rainy season is not infrequent in the humid tropics (1, 2, 3, 4). Rainfall, although seemingly adequate as measured by total amounts, is really inadequate at given periods because of erratic distribution within the rainy season. Knowledge of this phenomenon may lead to more adequate selection of adaptable cultivars and planting dates and the timing of other important field operations. Care should be exercised to prevent that critical crop growth periods highly sensitive to water stress might coincide with the occurrence of these dry periods.

Mean monthly averages, although helpful for certain particular purposes, might be meaningless because they mask the occurrence of these dry spells. The occurrence and extent of these dry periods can be determined only when data on monthly rainfall are analyzed on the basis of shorter time spans (3).

Wolf determined that, under conditions in Brasilia, there is only an 8% probability that the longest dry spell will be limited to 8 days or less; i.e., in only 1 out of 13 years, rainfall will be well distributed during the rainy season. There is a 50% probability that the longest dry spell might exceed 14 days and 15% probability that it might exceed 21 days (4).

Studies in this respect are underway in Puerto Rico. During the initial stages of this work, the need for a simple way of preparing and presenting the information was evident. This paper reports on one such approach to

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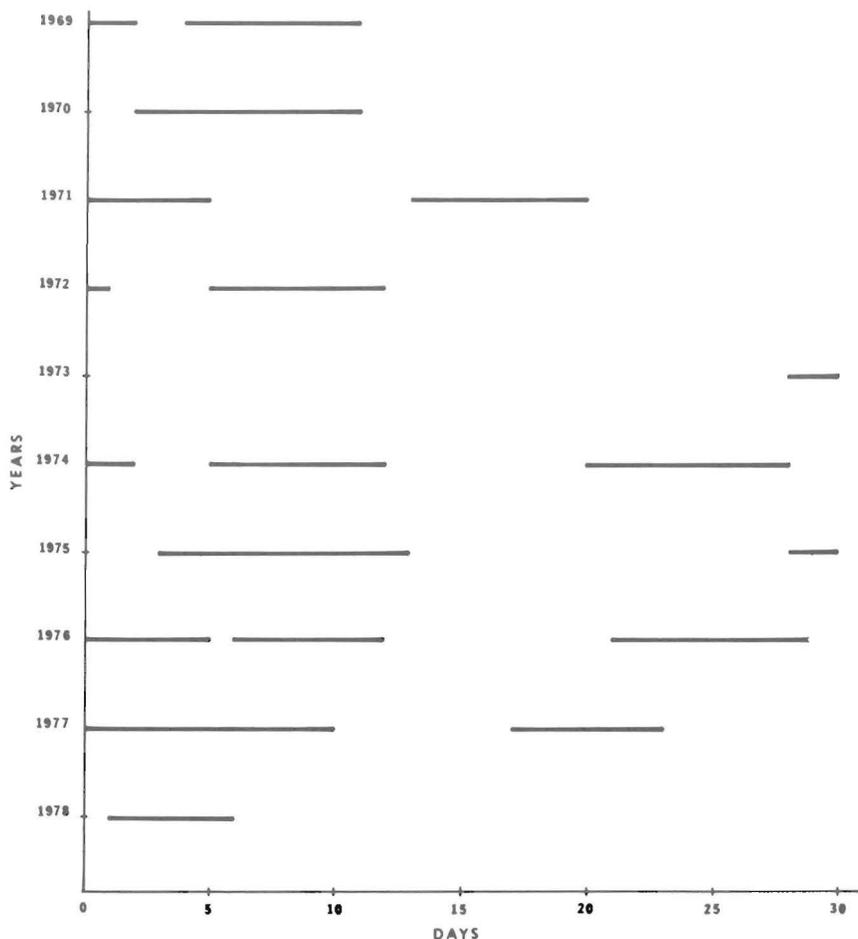


FIG. 1.—Distribution of dry spells during June for 10 consecutive years.

present data on dry spells in a graphic, simple fashion, which can be easily prepared, interpreted and used as a basis for crop decision-making. The simplicity of the approach will permit extension workers and farmers to keep a graphic record on the occurrence of dry spells.

MATERIALS AND METHODS

Daily rainfall distribution data was obtained for a 10-year period from Adjuntas, a humid mountain region site in Puerto Rico. Dry spells (no rain at all) of 5 days and more were indicated on graph paper for each month during each of the 10 years of the selected period and also for each month within a given year. June and August, both considered

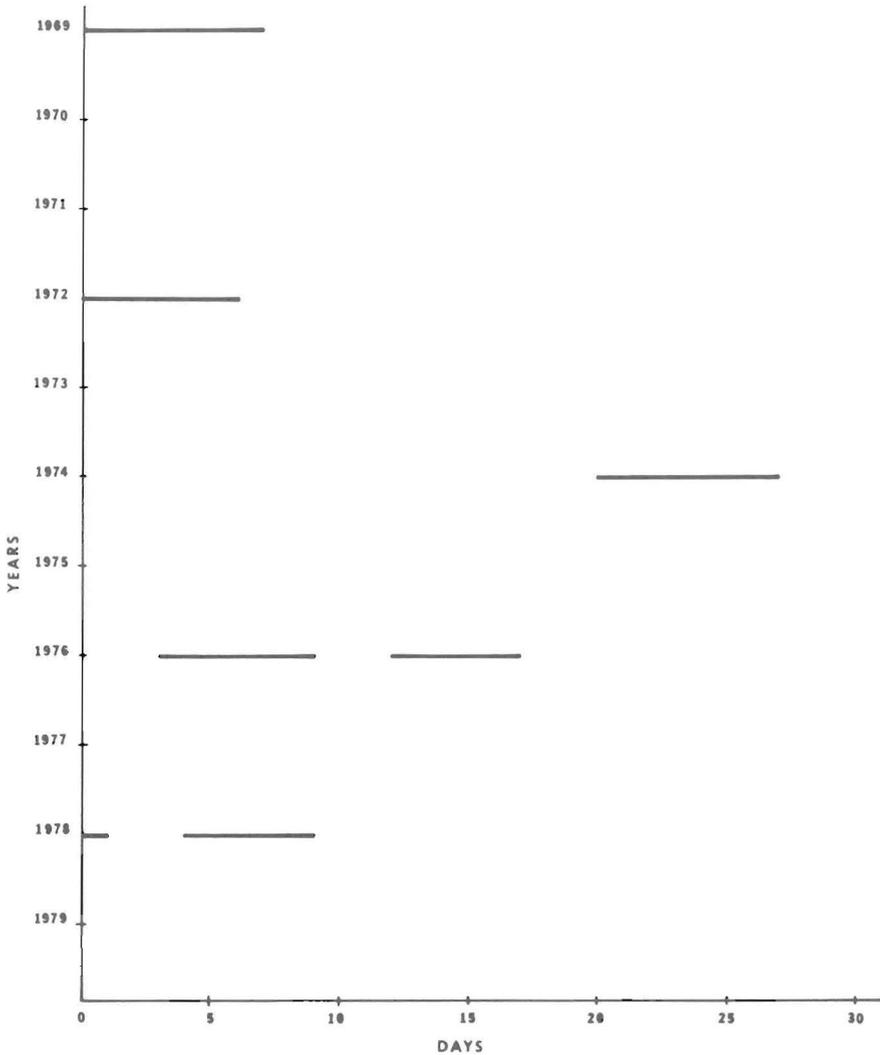


FIG. 2.—Distribution of dry spells during August for 10 consecutive years.

“rainy” months, were taken as examples for the presentation of data on dry spells in a graph. Data from 1977 were also plotted in order to appraise the frequency of dry spells within a given year.

RESULTS AND DISCUSSION

Figure 1 shows the distribution of dry spells during the month of June for the 1969-1979 period. During that period, there were dry spells of up to 10 days. A well-defined pattern emerges from figure 1. Most of the 5-

day dry periods during June are concentrated in the first half of the month. There were 13 dry spells by mid-month (including the last 4 days of May), all more than 5 days. Of these, 6 were above 7 days, 3 above 8 days and 2 above 10 days. Less frequent dry spells are shown in the second part of the month with 2-, 6-, 7- and 8-day periods of no rain. During the first part of the month, in 4 years out of 9 there were 2 dry spells separated from each other by 1, 2, 3 and 4 days. For practical

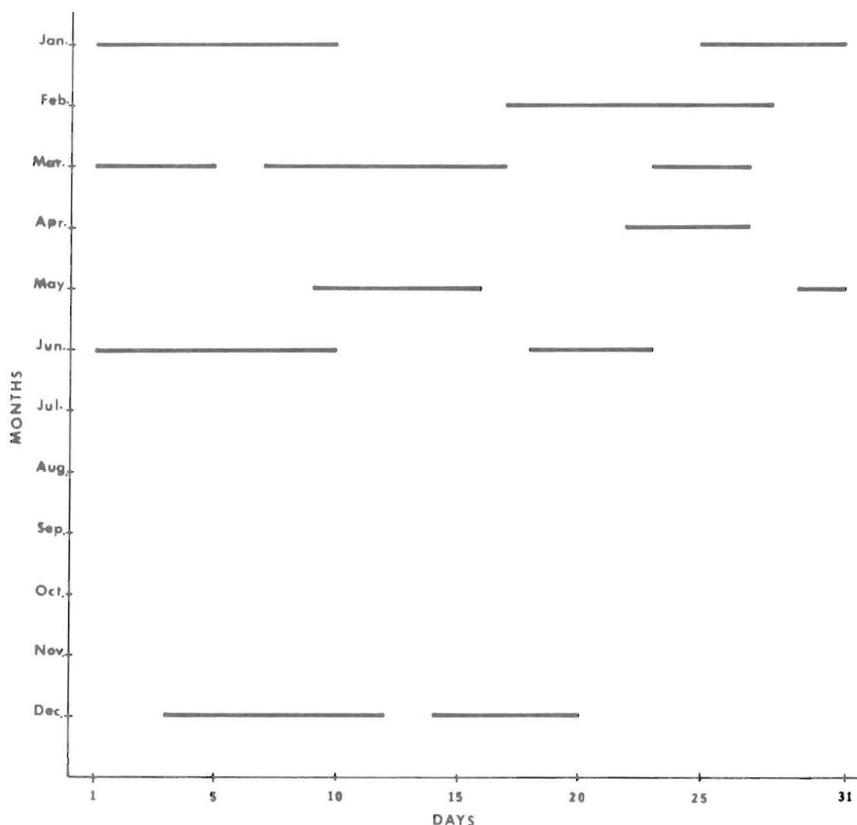


FIG. 3.—Distribution of dry spells each month for 1977.

purposes the 1- and 2-day intervals with rain between two prolonged dry spells are of doubtful value particularly in regions where deep, well-drained Oxisols are prevalent because these soils tend to be droughty (5, 6, 7). When looking at equivalent figures for the preceding (May) and succeeding (July) months, four of the five apparent 5-day dry periods extend to 8-, 10- and even 17-day dry spells.

Figure 2 shows a graphic picture of the situation for the month of August. Five definite dry spells of 5 days and more are observed during

the 9 years of record for the first 17 days of the month. A 7-day dry spell occurred once during the period that begins on August 21.

A typical year of data is presented in figure 3. A definite pattern appears in which dry spells were frequent from December through June; some lasted more than 15 days. Two dry spells a month are frequent; even three occurred in March for a total of 22 days with no rain at all. The records for February 17 to March 17 show two dry spells for a total of 29 dry days with only 1 day of rain in between.

A simple graph like the one proposed could be valuable, together with other climatic and soil-water retention and release data, to plan for the adequate timing of farming operations.

The occurrence of dry spells within the rainy season can be harmful to crop growth and production, especially if they extend beyond 3 to 5 consecutive days. Under these conditions plants might be subjected to considerable moisture stress, especially in areas where the soils tend to be low in water retention capacity, a common feature in the humid tropics.

RESUMEN

Observaciones y datos de una localidad en particular de la zona montañosa tropical y húmeda de Puerto Rico indican que aun en las épocas lluviosas ocurren períodos críticos de sequía. Se postula que si estos períodos se sequía se prolongan por más de 3 ó 5 días consecutivos las cosechas están sujetas a un déficit hídrico considerable que puede afectar los rendimientos particularmente en suelos de baja capacidad de retención de humedad aprovechable. El reconocimiento de este hecho puede ser de vital importancia en la planificación de las siembras y otras labores agrícolas. En este trabajo se propone el uso de un modelo gráfico sumamente sencillo y práctico que puede prepararse e interpretarse con facilidad.

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