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2-1-1994

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Drought Classifications and Crop Plans Developed for Tamilnadu*

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Drought is defined as inadequate soil moisture to support crop growth and normal yield. The degree of drought for a given location depends on the crop, rainfall and its distribution, soil type, and various management practices. Drought occurs frequently in Tamilnadu—some part of the state experiences drought every year.

The state of Tamilnadu is located in the southernmost tip of peninsular India. It lies between 8°5" and 13°35" latitude north and 76°15" and 80°20" longitude east, covering an area of 0.13 million km^2 and including a long coastline (about 1,000 km). The mean annual rainfall is 945 mm, with 45 rainy days. The state benefits from northeast monsoon rains (October–December), unlike other parts of India, where southwest monsoons (June–September) bring more rain. In Tamilnadu, 85% of the total area benefits from the northeast monsoon; only 15% benefits from the southwest monsoon. Potential evaporation always exceeds rainfall in most (8-10) months each year. The severity of drought depends on the type of soil prevalent in a region. It was once thought that farmers, through generations of experience, could learn to live with the limitations of their local climatic conditions through trial and error. That is no longer true. Modern agriculture requires precise information on rainfall and on flood- and drought-prone areas. It is now clear that to obtain maximum yields, a proper knowledge of agroclimatic conditions is necessary to plan the most effective cropping system for different areas. With this idea in mind, the state of Tamilnadu has been classified into drought-prone areas, based on precipitation, potential evaporation, and soil type, so that a suitable crop plan may be developed for each area.

Materials and Methods

Monthly normal rainfall (P) has been identified for 16 evenly distributed stations of Tamilnadu. Crop water demand has been assumed to be equal to potential evaporation (PE). Monthly values of PE for these stations have been taken from the 1976 reports of the National Commission on Agriculture.

When rainfall at any station is equal to the corresponding PE values for that station, crops theoretically do not experience any water deficiency during that period. The ratio of P/PE thus provides a measure to determine which crops can be grown in a given area. Any value of this ratio equal to or exceeding 1.0 signifies uninterrupted growth, while lesser values denote moisture stress. The values of this ratio for different months are shown in Table 1. A month is assumed to be humid if P/PE for the month equals or exceeds 1.0. A climatic index has been developed using the following technique: if a, b, and c, respectively, are the number of months in which the ratio P/PE is £ 0.5, > 0.5 but < 1.0, and ³ 1.0, then the climatic index (CI) equals a + 2b - 3c (Chowdhury and Sarwade, 1980). Superimposing the climatic values on the soil map allows drought-prone areas of the state to be identified. The criteria adopted in delineating drought-prone areas, taking into consideration the water-holding capacity of the soil, are shown in Table 2.

Station	Code	No. of months with ratio P/PE		
		≤ 0.5	> 0.5 to > 1.0	≥ 1.0
Madras	MDS	7	2	3
Vellore	VLR	6	3	3
Tirupattur	TPT	6	3	3
Cuddalore	CDL	7	2	3
Salem	SLM	5	4	3
Coimbatore	CMB	10	0	2
Nagapatinam	NPT	9	0	3
Tiruchirapalli	TRP	8	2	2
Madurai	MDR	7	3	2
Pamban	PBN	7	3	2
Tuticorin	TTC	9	2	1
Palayamkottai	PLM	8	3	1
Kanyakumari	KYK	4	5	3
Ootacamund	OTC	3	1	8
Coonoor	CNR	0	8	4
Kodaikanal	KDK	1	0	11

Table 1. Distribution of P/PE ration for various stations. For example, in Coimbatore, P/PE ratios for October and November are more than 1.0. For the other 10 months, the ratios are below 0.5. Therefore, the crop plan for this area would call for growing millets or pulse between October and December so that the crop will not suffer any moisture stress.

Results and Discussion

The monthly distribution of P/PE ratios indicates that except for hilly locations, where half or more of the months are humid, no more than three months per year are humid in Tamilnadu. In the plains, extreme arid conditions generally prevail for six to nine months. In this period, rainfall is not sufficient to meet even half of the evaporation demand, and crops can be grown only with irrigation.

Value of Climatic Index	DROUGHT: Severe	Moderate	Mild
19	Sandy	Sandy Loam & Loam	Clay Loam
23	—	Sandy & Sandy Loam	Loam & Clay Loam
27	—	Sandy & Loam	Sandy Loam

Table 2. Criteria used to delineate drought-prone areas.

Developing a Crop Plan

Soil type, P/PE ratio, and other types of information can provide the basis for developing crop plans with suitable varieties that are drought tolerant and mature in a shorter period. Although extensive areas of Tamilnadu have sufficient moisture for only three to four months per year, three crops of rice are grown each year with the aid of irrigation. Seventy-five percent of the total water available in Tamilnadu is used for rice production only. By adopting improved technology, it should not be difficult to marginally cut the rice-growing areas without reducing total production. Water saved could be profitably used for growing other crops. Tamilnadu therefore has ample justification to increase cultivation of other crops, such as millets, oil seeds, pulses, vegetables, and so forth. Pulses can be grown successfully in these areas. In places that are prone to moderate to severe drought, millets such as sorghum and pearl millets are recommended. The best crop plan to reduce the risk of crop failure includes cereals mixed with pulses or oil seeds. Suitable crops and varieties should be selected based on the degree of drought in relation to soil types.

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*This article appeared in the February 1994 issue of **Drought Network News**.*