AGROCLIMATOLOGICAL STUDY OF DROUGHT IN THE SCARCITY ZONE OF WESTERN MAHARASHTRA WITH PARTICULAR REFERENCE TO SHOLAPUR DISTRICT*

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Agroclimatological studies for the drought affected areas of Western Maharashtra, carried out with particular reference to Sholapur, are presented. The subject has been discussed under five different heads, such as rainfall distribution in the district, water availability periods, soil moisture studies, moisture extraction pattern by different crops and use of mulch in conserving soil moisture. The study of rainfall pattern indicated breaks in the monsoon which may extend up to 6 weeks at a time during July and August, and heavy rainfall in September. June rains are not sufficient sometimes to sow the Kharif crops. Water availability periods indicated possibility of crop growing between mid July to mid December only. Moisture extraction of crops indicated jowar, safflower and gram as the suitable crops in the region. Mulch has been indicated as a useful practice for growing crops in the scarcity areas.

INTRODUCTION

The scarcity zone of Western Maharashtra comprises of the entire districts of Sholapur and Ahmednagar and eastern parts of the districts of Poona, Satara, Sangli, Nasik and Dhulia. The rainfall of this region ranges between 500 and 700 mm annually and is characterised by prolonged breaks. Generally the topography of the area is reeling with an average slope ranging from 1 to 3 %. The soils of the region are derived from the Deccan trap and they can vary in depth from less than 22.5 cm to 90 cm and above. They are generally clayey in nature and have verse soil moisture characters. They also crack heavily causing high evaporation losses of soil moisture from lower layers. Thus agriculture in this region is comparatively less uncertain in areas of deep soils and heavier rains.

The climatological data and the agronomical aspects of crops available at the Agricultural Research Station, Sholapur were analysed to somewhat quantify the agroclimatic situation prevailing in the district.

Rainfall features

A study of data available for different raingauge stations in the district (Fig. 1 and Table I) would reveal that there is a gradual increase in the precipitation as one moves from the west to the east. There are two distinct peak periods in a year viz., June (80 to 125 mm) and September (150 to 221 mm). These showers are very helpful to saturate the entire soil profile. There is marked decrease in rainfall during July

*The paper was presented at the Symposium on "Drought in Asiatic Monsoon Area", held on 14-16 December, 1972 (Convener: Dr K. R. Ramanathan, FNA).

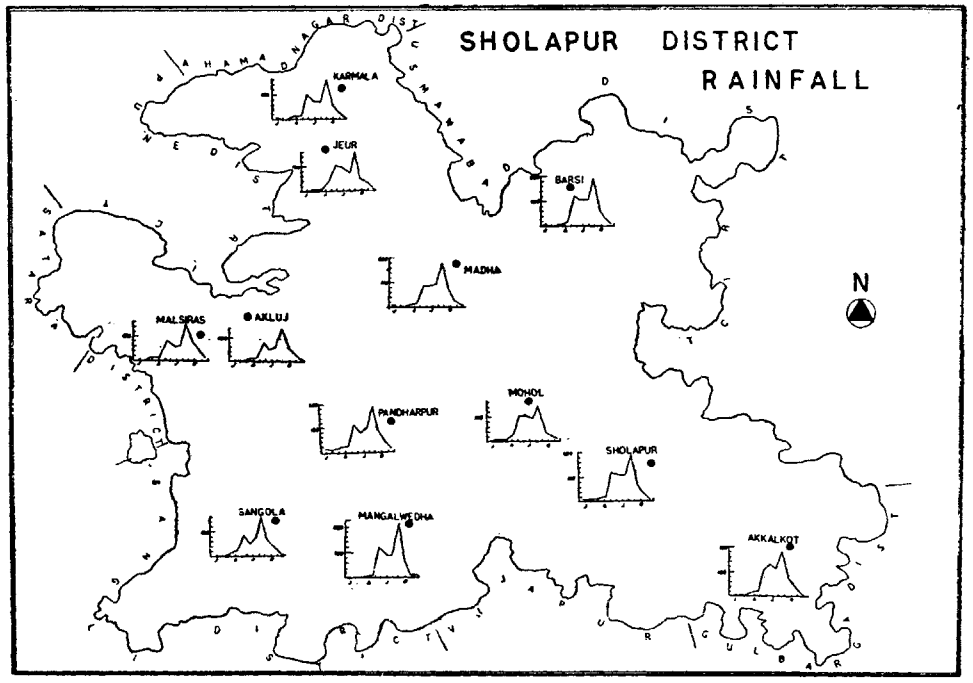

FIG. 1

and August, particularly in the western portion of the district, viz., Malsiras, Sangola, Karmala, Pandharpur and Madha where the amount of precipitation is also very low.

At Sholapur in soils with clay percentage above 50, a rainfall of about 25 mm may moisten the soil to a depth of about 5 cm (Kanitkar *et al.* 1968). As such the eastern portions of the district which present soils with more percentage of clay do not become sufficiently moist to sow the kharif crops. However, the deep nature of the soil leads to better retention of the heavy September rains and the area is mainly a Rabi one.

During breaks in monsoon, the average daily wind velocity exceeds more than 15 km/hr. This brings about a quickened desiccation of Kharif crops and leads to scarcity conditions. The data regarding prolonged breaks in rains (Table II) reveal that breaks as well as their duration in the recent past are on the increase. During the last three years, it has been observed that the June rainfall is so scanty that it had not moistened the soil beyond 5–7 cm. depth. This has resulted in extensive, non-sowing of kharif crops in the entire district, as well as failure of Rabi crops.

WATER AVAILABILITY PERIODS

Water availability periods were calculated by balancing the annual precipitation with the potential evapotranspiration values (Gadre 1972). The climate has been classified as humid, moist and dry. It has been observed that the humid and moist period continues to be longer in the eastern part of the district as compared to the

TABLE I

Monthly rainfall (mm) in the district of Sholapur (1901–1950)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Malsiras	7	1	4	13	19	81	58	55	150	72	43	10	503
Sangola	6	2	3	12	24	91	59	70	155	68	39	8	537
Karmala	8	2	3	11	16	102	77	70	159	58	27	6	539
Pandharpur	6	3	4	14	20	106	71	92	179	78	33	7	613
Mangalwedha	0	1	0	4	16	125	97	89	221	64	13	15	645
Madha	8	0	2	11	17	87	81	90	174	71	29	7	577
Mohol	1	5	3	7	33	106	103	96	151	34	25	11	575
Barsi	6	3	3	9	20	121	105	104	188	60	31	7	657
Sholapur	6	4	6	13	22	113	109	104	190	70	31	9	677
Akkalkot	5	5	6	17	22	105	126	109	187	69	33	5	689

TABLE II

Number of breaks and duration in rainfall at Sholapur

Year	Number of breaks*	Duration in weeks
1946	1	2
1947	2	2, 2
1948	1	2
1949	1	2
1950	1	2
1952	1	2
1953	2	2, 2
1954	1	2
1957	1	2
1958	2	3, 2
1959	1	2
1960	1	4
1961	1	4
1965	2	2, 5
1966	2	3, 4
1967	5	3, 3, 3, 2, 4
1968	4	2, 2, 3, 3
1969	3	2, 2, 3
1970	3	3, 2, 2
1971	2	2, 6
1972	2	9, 4

*Break is defined as a period receiving less than half the normal rainfall for two or more consecutive weeks.

western part. Moreover soils in the western part of the district are comparatively light in texture and shallower in the depth thus with limited available soil moisture storage capacity. This makes crops more vulnerable to drought compared to the eastern section (Gadre 1972).

Incidently, it may be pointed out that the Fact-Finding Committee for Survey of Scarcity Areas in Bombay State (1960) had found a total or almost total failure of crops once every three years in Karmala and Sangola tehsils, once in six years in Madha, Pandharpur and a small southern portion of Malsiras tehsils and once in ten years in Mohol, Mangalvedha, Akkalkot, North Sholapur, South Sholapur and 18 villages situated in the Northeast corner of Barsi. Barring the Northeast portion Barsi tehsil is generally free of scarcity. These findings appear tenable.

MOISTURE-USE BY DIFFERENT CROPS

Actual quantum of moisture extracted by the different crops under field conditions is very important from crop planning point of view in dry farming areas. Important crops grown in this region were studied for their moisture extraction pattern (Pharande *et al.* 1972). Total moisture extracted by different crops has been presented in Table III.

TABLE III

Total moisture used (mm) *by different crops at Sholapur*

Crop	Total moisture extracted (mm)		Yield q/ha	
	1970-71	1971-72	1970-71	1971-72
Jowar (M-35-1)	141.7	176.5	6.9	17.5
Safflower (A-300)	63.5	213.8	5.1	10.1
Gram (N-59)	130.7	162.1	7.3	12.7
Wheat (N-59)	76.9	175.8	3.0	8.8

Season of 1970–71 was not favourable as there were no rains after sowing of crops. As such moisture use as well as yields were low. 1971–72 season was favourable as could be seen from better out-turn of crops. It is interesting to note that jowar and gram crops are more stable in their moisture use in the favourable or adverse seasons. Safflower exhibited most plasticity in adjusting to the conditions available. Moreover this crop was found to extract maximum moisture in the earlier part of life cycle. Wheat was generally found to be unsuitable for dry farming region of Deccan. Gram was the most efficient crop by extracting 95 per cent of available soil moisture, followed by safflower, jowar and wheat in the descending order. Since jowars erves as grain and fodder both, it is the staple crop of the population. These studies are very helpful to decide cropping pattern after knowing climatic conditions and the soil moisture status of the area.

EFFECT OF MULCH ON MOISTURE CONTENT

Evaporation of moisture which is the sum total effect of other climatic elements, forms a major part of consumptive use of moisture under field conditions. The earlier studies at Sholapur indicated that as much as 70% or even more percentage of moisture is lost as evaporation. Studies on the effect of mulches in conserving moisture, initiated at Sholapur (Anonymous 1972) indicated that a mulched plot, compared to the bare plots, had 50 mm net extra moisture for crop growth resulting in 100 per cent increased yield over control.

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