

## Agricultural drought of 1972 Kharif season

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**ABSTRACT.** By computing weekly water balance of a selected network of stations in the country, agricultural drought of the 1972 Kharif season was studied. Weekly aridity index value above the climatic aridity index has been used to identify drought incidence. The study shows that prolonged drought spell abating only for short periods prevailed in the season over large areas of Madhya Maharashtra, Marathwada, Gujarat, Rajasthan, Interior Mysore and Andhra Pradesh. Newspaper and crop reports of the period substantiated these findings.

### 1. Introduction

The year 1972 was one of the worst drought years in India caused by the failure of the southwest monsoon rains. Newspaper and other reports mentioned about the prevalence of severe drought conditions over extensive areas of the country, particularly over Maharashtra, Gujarat, Rajasthan, Andhra Pradesh and Mysore, where large scale drought relief measures had to be undertaken by Government. Agricultural production fell appreciably. Discharges into dams and reservoirs became low and drastic curtailment of electric power generation had to be resorted to, affecting badly industrial production and the whole economic structure of the country. It was a case of agricultural and hydrological droughts combined having disastrous impact on every activity in the country.

An attempt is made in this paper for studying the incidence, spread and recession of the agricultural drought of the 1972-Kharif season by computing the weekly water balance of a selected network of stations in the country.

### 2. Southwest monsoon of 1972

Although there was a temporary advance of the southwest monsoon over the south Peninsula in the second week of May, good monsoon activity commenced over Kerala only after the middle of June. Further advance of the monsoon took place thereafter and in the course of the next fortnight, it covered almost the whole country. The delay in the onset of the monsoon was about a fortnight over the south Peninsula and northeast India, ten days over the north Peninsula and a week over Uttar Pradesh and central parts of the country. Its advance over northwest India was by the normal date.

After the onset, monsoon activity was maintained till the middle of July. 'Break' monsoon conditions then set in and continued for 3 weeks.

During this period, large areas of the country received little rain. With the revival of the monsoon activity in the first week of August, good rainfall occurred over parts of the central and north India. The Peninsula, however, continued to have weak monsoon conditions till the end of August.

In the first week of September, break monsoon conditions again set in, but it lasted only for a short period. In September, generally good rainfall occurred in many parts of northeast India and south Peninsula but in the other areas, rainfall was poor.

Three cyclonic storms developed over the Bay of Bengal during the season. Of these, the one which developed in July weakened rapidly after crossing the coast. The other two developed on September, of which one dissipated over Uttar Pradesh hills while the other recurved and weakened over north Bihar. Of the 6 depressions, two formed over the Bay of Bengal, two over the Arabian Sea and two over land.

The southwest monsoon started withdrawing in the first week of September and by the middle of October, it withdrew from almost the whole country.

The rainfall of the season June to September was in large defect in Saurashtra & Kutch and in moderate defect in Nagaland, Manipur, Mizoram and Tripura, Sub-Himalayan Bengal, Bihar Plains, east Uttar Pradesh, Himachal Pradesh, Jammu & Kashmir, Rajasthan, Gujarat Region, Madhya Maharashtra, Marathwada, Vidarbha, Telangana and Rayalaseema. The 1972 monsoon season's rainfall departure is shown in Fig. 1.

### 3. Methodology of study

The drought situation of Kharif season of 1972 was studied from the standard week 23 to 43

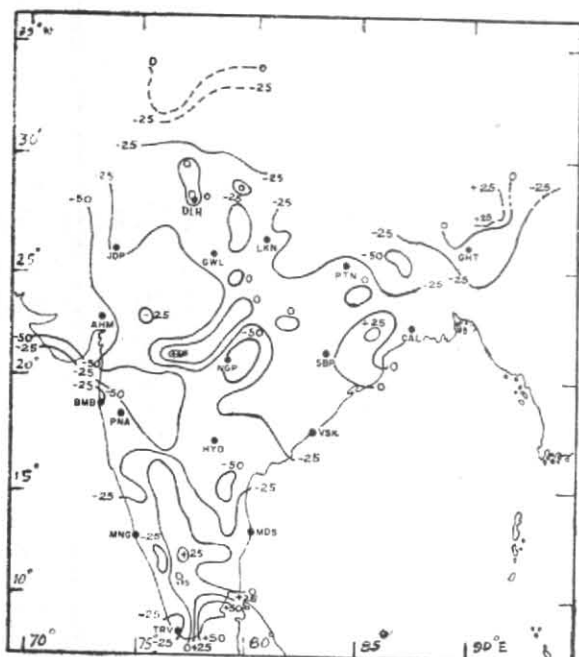


Fig. 1. Rainfall departure percentage (June-Sep 1972)

(4 June to 28 October). The network of 100 stations selected is shown in Fig. 2. Weekly water balance was computed for each station according to Thornthwaite's water balance procedure (1957). Potential evapotranspiration values were computed according to Penman's equation (1948, 1971) using weekly means of the different meteorological parameters. The aridity index for each week of each station was computed from the weekly water balance parameters and above normal aridity index value was taken as the agricultural drought index. This index has been used to identify area of agricultural drought—their incidence, spread and recession (George & Ramasastri 1971). For the sake of indicating drought intensity, the following criteria were followed: slight drought when index value was between 0 and 25, moderate drought when index value was between 26 and 50 and severe drought when index value was greater than 50.

#### 4. Agricultural drought over the country in 1972

##### *First phase of drought (Fig. 3)*

At the beginning of June 1972, (23rd week, 4-10 June), large areas of the country were experiencing drought. Over the Peninsula as well as over extensive areas in the northeastern parts of the country, drought intensity was moderate to severe (Fig. 3).

In the next week (24th, 11-17 June), there was slight easing of the drought situation in the interior of the Peninsula to the east of the Western Ghats due to scattered thunderstorm

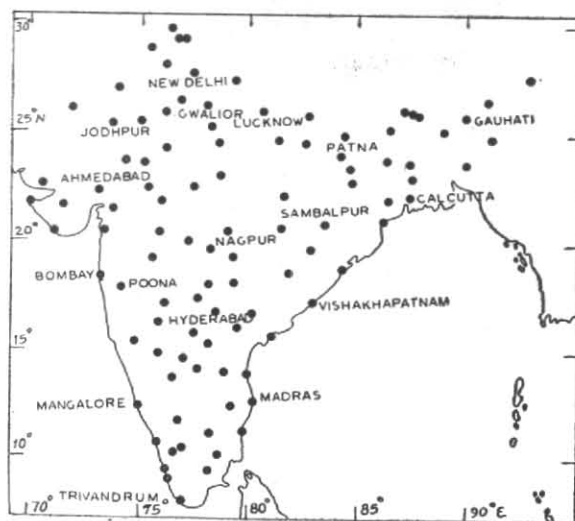


Fig. 2. Locator map of stations whose water balance was computed

activity. But the major drought belts (severe intensity) showed extension due to delay in the onset of the monsoon. The whole country, except portions of Interior Peninsula, was experiencing drought. The drought of severe intensity was most widespread in this week than at any time of the season.

By 25th week (18-24 June), the drought situation over the country began to show signs of easing with the revival and advance of the monsoon into Gujarat State and south Madhya Pradesh. Drought ceased over most of west coast and areas experiencing severe drought began to diminish in extent. In the next two weeks (26th, 25 June-1 July, and 27th, 2-8 July), situation improved further under the influence of low pressure systems which moved westward across north India.

##### *Second phase of drought (Fig. 3)*

In 28th week (9-15 July) a fairly extensive drought belt of moderate intensity appeared over the eastern parts of the Peninsula extending to Madhya Maharashtra and Marathwada. With the setting in of 'break' monsoon conditions in the 29th week (16-22 July), there appeared a drought belt of severe intensity extending from east Rajasthan eastwards to Uttar Pradesh. The drought over Madhya-Maharashtra and Marathwada also became severe in intensity. The belt of moderate drought over the eastern parts of the Peninsula extended to southern portions of

Madhya Pradesh and Orissa. In the next week (30th, 23-29 July), there was further extension of the Peninsular drought belt westwards into Maharashtra; portions of Madhya Maharashtra and Marathwada continuing to have severe drought. These developments are shown in Fig. 3.

In 31st week (30 July-5 August), drought over Madhya Maharashtra and Marathwada began to decrease in intensity (from severe to moderate) with the cessation of break conditions. The severe drought belt over east Rajasthan and Uttar Pradesh covered Haryana and Punjab also.

By 32nd week (6-12 August), the drought situation began to ease over the whole country in association with the movement of a depression from the Bay of Bengal westwards to Haryana and adjoining east Rajasthan. The drought areas got confined to a belt stretching from Andhra Pradesh to Saurashtra-Kutch and south Rajasthan.

In the 33rd week (13-19 August) with the movement of a depression from north Bay of Bengal to Rajasthan, the drought belt over the country split into two, with drought abating over parts of Gujarat and Maharashtra. The Peninsular drought pocket, however, extended south. In the next week (34th, 20-26 August), the drought belt over north India almost disappeared while in the Peninsula, the belt began to show signs of shrinking Fig. 3.

In the 35th week (27 Aug-2 Sept), some spread of drought areas was seen in association with the second 'break' monsoon conditions. In the subsequent 2 weeks (36th, 3-9 Sep and 37th, 10-16 Sep), drought belts of severe intensity almost disappeared although drought belts of moderate intensity persisted over Rajasthan and adjoining areas.

#### *Third phase of drought (Fig. 3)*

From 38th week (17-23 Sep), an extensive drought belt began to appear stretching from Telangana northwards to Punjab. By 39th week (24-30 Sep), its intensity over Telangana, northern parts of Mysore and Maharashtra assumed severe intensity. This position continued till the middle of October. Thereafter also, the drought belt began to spread though intensity started to decrease.

Thus 1972 Kharif season drought was in three phases: the first occurred in association with delayed monsoon onset, the second in association with 'break' monsoon conditions which set in from the middle of July and the third over

central and western parts of the country due to less westward travel of pressure systems in September from the Bay of Bengal.

#### **5. Drought in Maharashtra**

Agricultural drought index of 4 stations (Poona, Ahmednagar, Aurangabad and Nagpur) is shown in Fig. 4.

At Poona, drought commenced from 29th week (16-22 July) and continued to 41st week (8-14 October) with the exception of two weeks, namely, 37 and 38 (10-23 Sep). Intensity of drought over the entire period was generally moderate only. In Sholapur, however, drought conditions commenced earlier from 25th week (18-24 June) and continued to 41st week (8-14 October) with the exception of 3 weeks, namely, 36, 37 and 38 (3-23 Sep). The intensity of drought was severe here during most of the weeks. At Aurangabad, drought commenced from 28th week (9-15 July) and continued to 32nd week (6-12 August).

The drought intensity was generally severe during this period. From 33rd week (13-19 August) to 37th week (10-16 September), there was no drought. From 38th week (17-23 September) onwards severe drought conditions again prevailed. At Nagpur, there was no significant drought spell except towards the end of the season.

Reports about crop failure in Maharashtra State began to appear in newspapers from the middle of July 1972 onwards. Crop report of 19 July 1972 issued by the Department of Agriculture, Maharashtra State, besides other features mentioned "Crops withering eastern parts Nasik, crop condition not satisfactory Dhulia . . . Rains urgently needed whole Deccan for completing sowings and proper growth". Subsequent reports also spoke of the same unsatisfactory crop condition. The report of the week ending 16 August 1972 mentioned "Due inadequate rains crop withering Poona division, more rains needed immediately. Crops withering growth stunted Marathwada, crops fair Nanded". The report of 20 September 1972 mentioned "Crops not satisfactory major areas Marathwada while fairly satisfactory Vidarbha region, more rains needed however proper growth". Again the report of 25 October 1972 mentioned "Standing Kharif crops unsatisfactory Deccan, Marathwada, Vidarbha. Germinated Rabi crops withering and stunted growth". Thus newspaper reports as well as the crop reports issued by the Maharashtra Agricultural Department lent good support to the drought conditions revealed by the index.

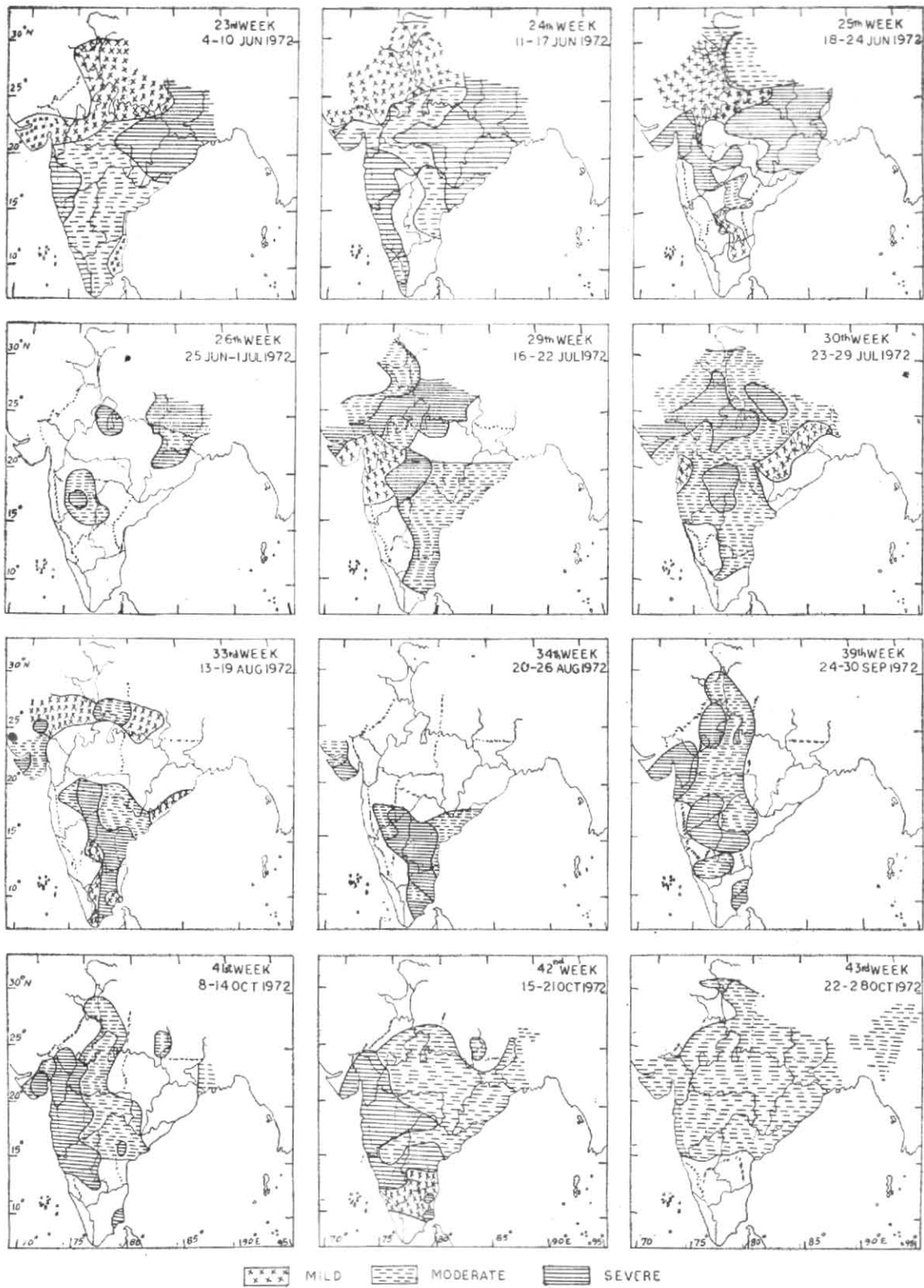


Fig. 3. Drought areas



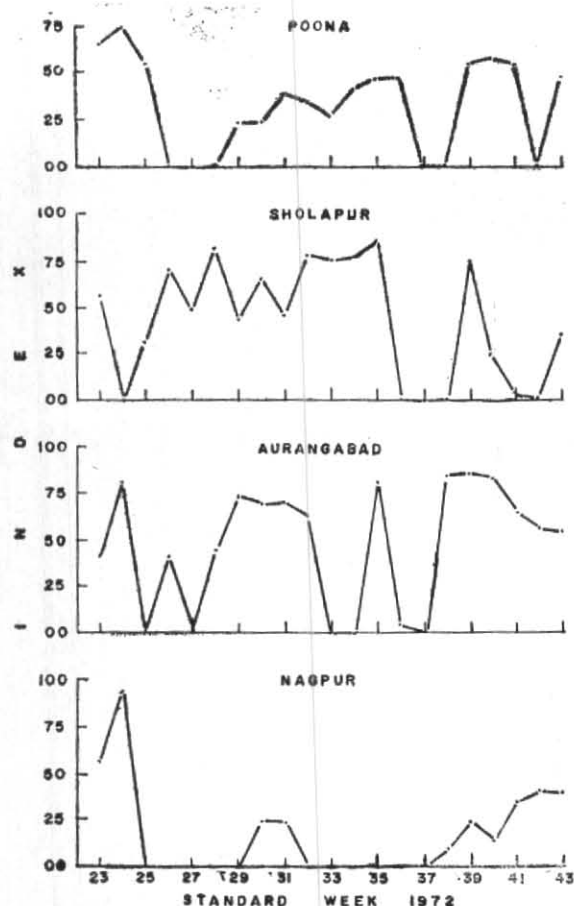


Fig. 4. Maharashtra

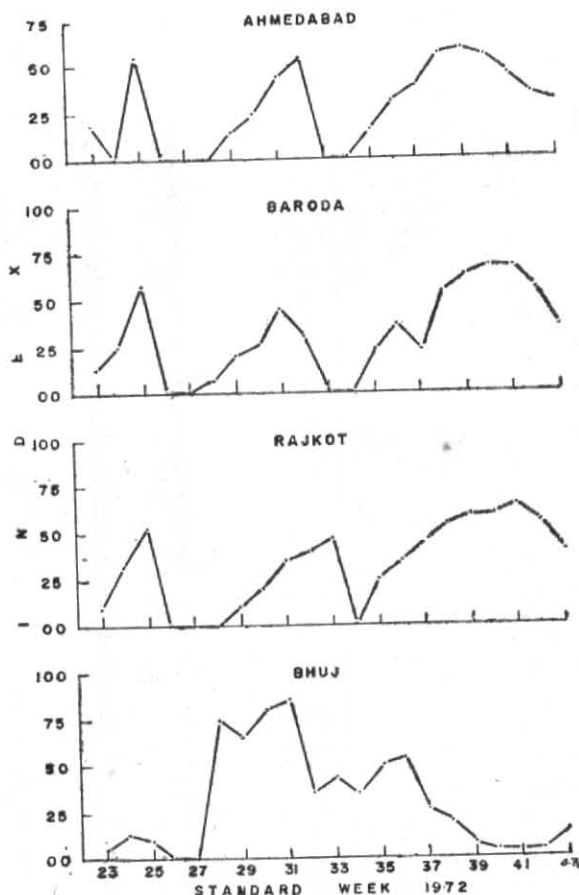


Fig. 5. Gujarat

Agricultural drought index

6. Drought in Gujarat

Agricultural drought index of 4 stations in Gujarat (Ahmedabad, Baroda, Bhuj and Rajkot) is shown in Fig. 5.

Index showed drought commencement from 28th (9-15 July) /29th week (16-22 July). The crop reports issued by the Director of Agriculture, Gujarat Government of the weeks ending 19 July and 26 July 1972 are given below —

Week ending  
19 July 1972

Kharif crops (Bajri, cotton, groundnut and vegetables) reported satisfactory in Baroda, Broach, Bulsar, Kaira, Mehsana, Panchmahals, Surat, Jamnagar, Junagadh and Rajkot districts, normal in Ahmedabad, Sabarkantha and Kutch districts.

Week ending  
26 July 1972

Kharif crop condition reported normal in Mehsana, Sabarkantha, Bhavnagar, Kutch and Rajkot districts, withering in Ahmedabad, Banaskantha, Broach, Gandhinagar and Amreli districts and crops withered in Balasinor taluka... all Kharif crops badly need rain in Gujarat State.

The commencement of agricultural drought shown by the drought index was very well substantiated by the above crop reports of the State. Withering of crops began to be reported immediately after the 29th week.

The drought continued through the whole period barring the weeks 33rd and 34th (13-26 August). Only at Bhuj, drought eased to some extent after 39th week (24-30 Sep). In reports appearing in newspapers in the middle of August, it was stated that in most of the districts of Gujarat, the Kharif crop was so badly damaged that even delayed rain would not save them.

7. Drought in Rajasthan

Agricultural drought index values of 4 stations, namely, Udaipur, Kota, Ajmer and Jaipur is shown in Fig. 6.

At Udaipur and Jaipur, drought was seen to commence from 29th week (16-22 July). At the other two stations drought commenced earlier. Weather and crop report issued by the Government of Rajasthan shows ;

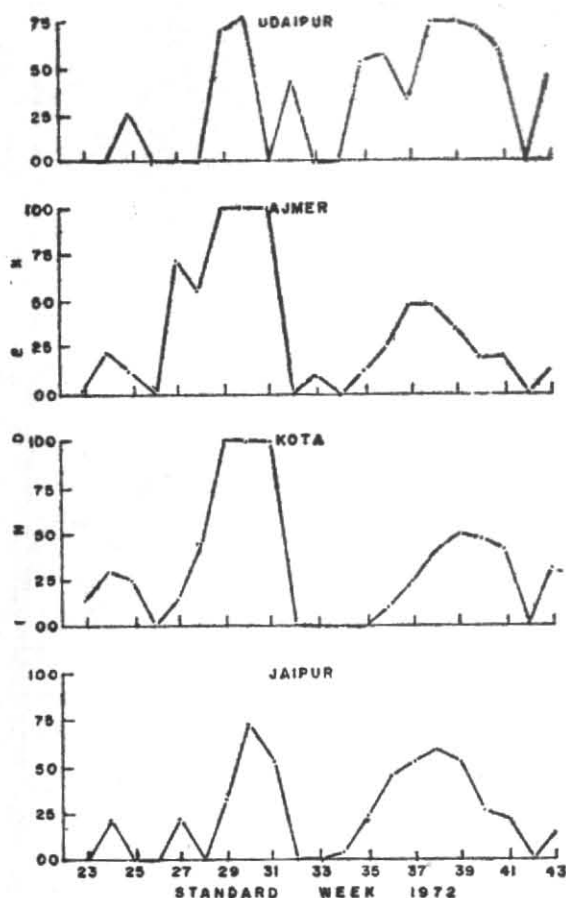


Fig. 6. Rajasthan

Agricultural drought index

For the week ending  
19 July 1972

Crop adversely affected for want  
of rains in the district of Churu.

For the week ending  
26 July 1972

Crops withering due to paucity of  
rains in the districts of (1)  
Alwari, (2) Barmer, (3) Bundi,  
(4) Chittor, (5) Churu, (6)  
Jaipur, (7) Jhalwar, (8) Jhun-  
jhunu, (9) Madhopur, (10) Si-  
kar and (11) Tonk.

The index has, therefore, brought out the commencement of drought very well as seen from the crop reports mentioned above.

In the 32nd week (6-12 August), drought condition abated temporarily over the State. The weather and crop report of the Rajasthan Government of the week ending 9 August 1972 mentioned 'crops improving' in 3 districts. This continued upto 34th (20-26 August)/36th week (3-9 September). In the weather and crop report of the week ending 30 August 1972, 'crops improving' was reported in 9 districts. Another drought spell commenced from about 35th week (27 Aug-2 Sep), which ended only in the 42nd week (15-21 October). According to the weather and crop report of the week ending 18 October 1972, all districts except one reported 'Kharif not satisfactory'.

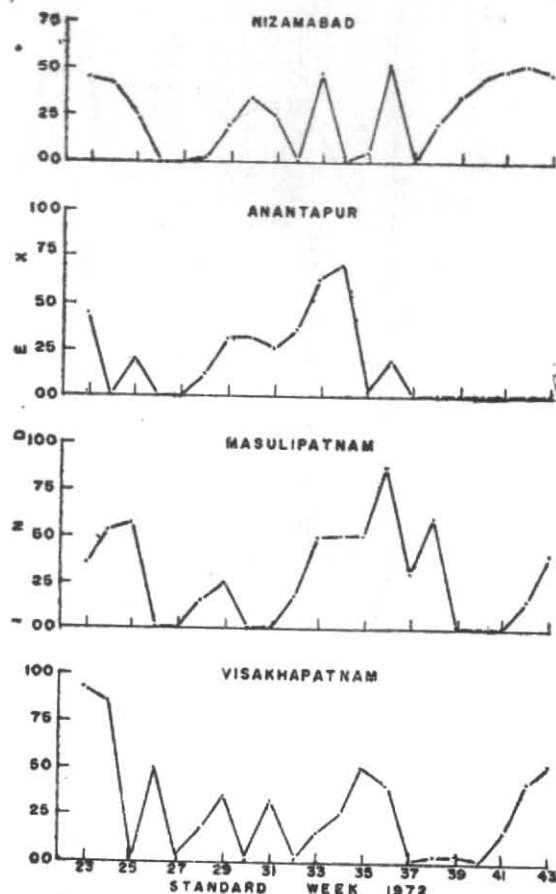


Fig. 7. Andhra Pradesh

#### 8. Drought in Andhra Pradesh

Agricultural drought index of 4 stations (Anantapur, Nizamabad, Masulipatnam and Visakhapatnam) is given in Fig. 7.

In Anantapur, drought commenced in the 28th week (9-15 July) and continued to 34th week (20-26 August). Thereafter, there was no drought. At Masulipatnam also the same feature was noted, only the drought commenced later by 4 weeks, i.e., in 32nd week (6-12 August), and continued to 38th week (17-23 September). At Nizamabad and Visakhapatnam, there were no prolonged periods of drought upto the middle of September, spells lasted only 2 to 3 weeks, interrupted by non-drought periods. But at these two places also after mid-September, drought condition began to be acute.

According to reports appearing in newspapers in the middle of August 1972, 19 of the 21 districts in Andhra Pradesh have been affected by drought and an estimated 40 per cent of the paddy seedbeds had withered due to lack of rain in July.

9. Drought in Mysore State

Agricultural drought index of 4 stations in Mysore State (Bellary, Raichur, Bijapur and Bidar) is shown in Fig. 8.

All the stations indicated commencement of drought from 28th week (9-15 July) and termination of drought occurred at most of the stations in 36th week (3-9 September). At Raichur, except for some abatement in 36th and 37th weeks (3-16 Sep), drought continued. At Bijapur also, drought conditions prevailed from the middle of September onwards.

Reports began to appear in newspapers from the end of July onwards about scarcity conditions in districts of Mysore State. According to such reports of 13 August 1972, parts of 9 of the 19 districts in Mysore State have been officially acknowledged as having been affected by severe drought. They were Bijapur, Gulbarga, Dharwar, Belgaum, Bellary, Raichur, Bidar, Kolar and Mysore, in parts of which crops have failed and the serious problem of fodder shortage has been experienced.

10. Palmer drought index

Monthly drought index values of the 1972 Kharif season were also computed by the Palmer technique for the months June to October. These values are given below :

Sub-division	Jun	Jul	Aug	Sep	Oct
Gujarat Region	-0.95	-1.07	-1.12	-1.80	-2.85
Saurashtra & Kutch	-0.72	-1.08	-2.24	-3.08	-3.53
Madhya Maharashtra	-1.27	-1.85	-2.38	-3.18	-4.12
Marathwada	-2.66	-4.05	-4.34	-5.04	-5.89
Coastal Andhra Pradesh	-2.84	-3.39	-4.38	-4.23	-2.79
Telangana	-3.60	-4.56	-5.27	-5.98	-6.19
Rayalaseema	0.69	-1.03	-2.31	-1.98	-2.23
Interior Mysore North	-2.60	-3.47	-4.47	-4.70	-5.30

It is seen that Palmer index values also indicate drought in those regions where aridity index anomaly shows drought. As observed in earlier studies also, Palmer index does not respond to short-term variations in weather as quickly as aridity index anomaly in identifying drought incidence and its severity.

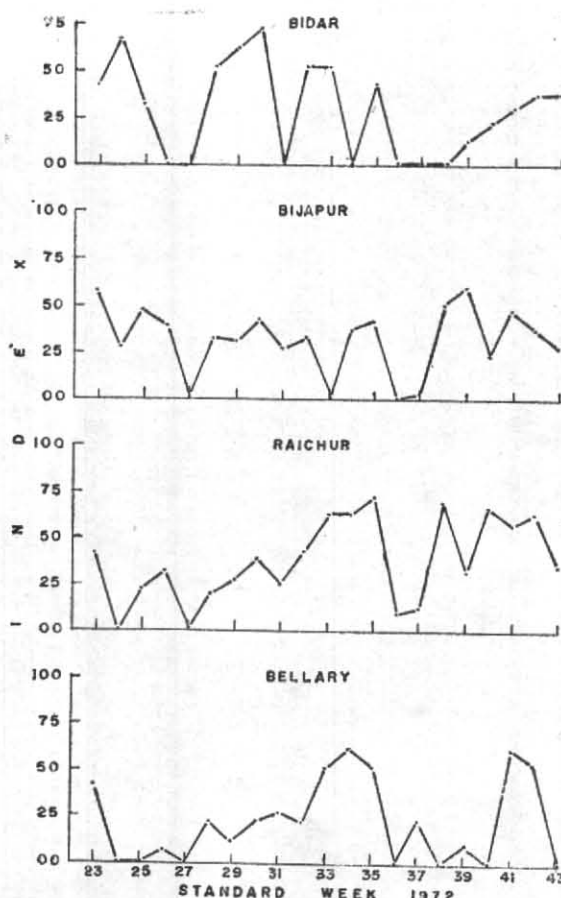


Fig. 8. Agricultural drought index—Mysore

11. Summary

Madhya Maharashtra and Marathwada areas experienced very severe drought conditions in 1972 Kharif season. Drought commenced here from the beginning of the season and continued throughout, easing of drought conditions occurring only for 2-3 weeks in September. In Gujarat, drought conditions commenced by the middle of July and continued for the season, with improvement for 1-2 weeks in the middle of August. The same feature was also observed in Rajasthan, but drought started here earlier and easing of drought conditions in August lasted longer (3-4 weeks). Parts of Interior Mysore, Rayalaseema and adjoining areas also experienced drought of varying length and intensity. Prolonged drought spell extending over almost the whole season and abating only for short periods hampered agricultural operations and caused crop withering over extensive areas of all these States resulting in poor Kharif crop yield.

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