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Weekly rainfall probability analysis of dry farming tract of Tamilnadu

B. C. BISWAS, N. N. KHAMBETE and S. S. MONDAL

Meteorological Office, Pune

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सार — तमिलनाडु के 103 स्थानों का साप्ताहिक वर्षा का अपूर्ण गामाबंटन मॉडल द्वारा समंजन करके 10 से 90 प्रतिशत तक विभिन्न प्रायिकता सारों में होने वाली न्यूनतम संभावित वर्षा को ज्ञात किया गया। इसका उपयोग करके तमिलनाडु के शुष्क खेती वाले क्षेत्र का विभिन्न समांगी वर्षा क्षेत्रों में सीमांकन किया गया हैं। इस विश्लेषण से चार समांगी वर्षा क्षेत्र ज्ञात किये गये हैं। विभिन्न प्रायिकता स्तरों में होने वाली न्यूनतम संभावित वर्षा के प्रमुख अभिलक्षणों का विवेचन किया है। राज्य के सूखा प्रवण क्षेत्र तथा महत्तम संभावित वर्षाक्षेत्र को भी ज्ञात किया गया। राज्य के विभिन्न भागों में संभावित फसल की स्थूल रूप से पहचान कराने के लिये इस शोधपत्र में प्रस्तुत तालिका और आकृतियां उपयुक्त होंगी।

ABSTRACT. Week by week assured rainfall at different probability levels 90-10% has been computed for 103 stations of Tamilnadu by fitting incomplete Gamma distribution model. This assured rainfall has been used to demarcate the dry farming tract of Tamilnadu into various homogeneous rainfall zones. The analysis has brought out 4 homogeneous rainfall pattern zones. Important features noticed in assured rainfall distribution at different probability levels have been discussed. The drought prone area and a high assured rainfall pattern zone of this State have also been identified. The table and diagrams presented in this paper should be found useful for identifying broad crop prospects in different areas of the State.

1. Introduction

'Dry Farming Tract' is defined as an area where the annual rainfall is between 40 and 100 cm. Agricultural production depends mainly on the distribution of adequate amount of rainfall during the various phases of crop growth and development. As in practice we do not have full details of the distribution needed for each crop, attempt is made to study probable rainfall in short periods of a week and its distribution in space.

Studies of this type have been made earlier for the dry farming tracts of India (Sarker *et al.* 1982) considering one station in each district. Talukawise data have been used for identifying homogeneous rainfall pattern zones (Biswas & Khambete 1979 for Maharashtra; Biswas and Basarkar 1982 for Gujarat; Biswas *et al.* 1982 for Rajasthan; Mondal *et al.* 1983 for Andhra Pradesh and Khambete and Kanade 1985 for Karnataka). An attempt has been made in this paper to delineate into different rainfall pattern zones, the dry farming tract of the State of Tamilnadu on the basis of weekly probabilistic rainfall.

2. Method

In estimating probability, two different methods may be tried, *viz.*, (*i*) past frequencies are directly taken to delimit future expectations and (*ii*) a theoretical distribution may be fitted to available data and probable frequency may be found out from such a distribution. Frequency distribution of weekly rainfall is highly skew and includes a number of zero values also. Thom (1966) suggested the fitting of Gamma distribution to data like rainfall having zero lower bound. Mooley (1973) studied Asian summer monsoon rainfall by fitting Gamma distribution on monthly rainfall total.

In the present study rainfall probabilities are computed by fitting Gamma distribution to weekly totals. It is given by :

$$G(X) = q + p\ F(X) \tag{1}$$

where, $F(X)$ is the Gamma distribution function, q is the probability of zero precipitation and $p = 1 - q$.

The distribution function $F(X)$ of the two-parameter Gamma distribution is :

$$F(X) = \int_0^x \frac{x^{\gamma-1}\, e^{-(x/\beta)}}{\beta^{\gamma}\ \overline{|\gamma}}\, dx \text{ where, } x, \gamma, \beta > 0 \tag{2}$$

$$F(X) = 0 \text{ when } x \leqslant 0 \tag{3}$$

γ, β are shape and scale parameters respectively of the distribution and $\overline{|\gamma}$ is the Gamma function of γ. The distribution is bounded at the left side by zero. $G(X)$ is the probability of rain $< X$.

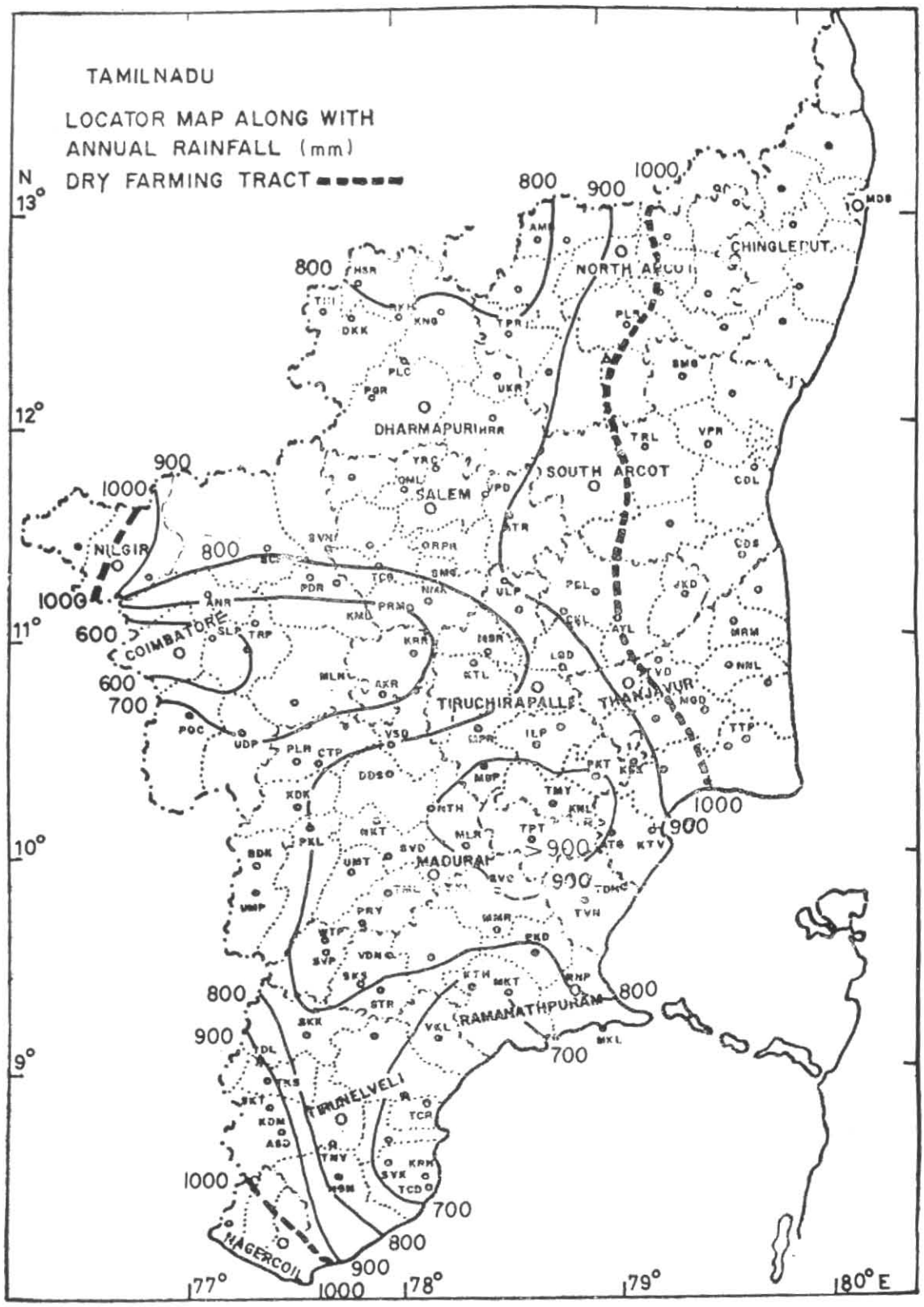


Fig. 1. Locator map alongwith annual rainfall (mm)

To obtain the rainfall probabilities the two parameters γ and β of the Gamma distribution have to be estimated from the observed data. Thom (1958) has shown that the maximum likelihood estimates are efficient, consistant and jointly sufficient. We have used this method.

To test the fit of the Gamma distribution to the data under consideration a variance ratio test suggested by Cochran (1954) has been applied. The test statistic is :

$$\chi_v^2 = \frac{\sum_{i=1}^{n} (X_i - \bar{X})^2}{\hat{\beta}^2 \hat{\gamma}} \qquad (4)$$

n being the number of occasions of non-zero rainfall, $\bar{X}$ the arithmetic mean of the non-zero rainfall amounts, $\hat{\beta}$ and $\hat{\gamma}$ likelihood estimtes of β and γ respectively, $v=(n-1)$ being the degrees of freedom. The significance of χ_v^2 is to be seen referring to the 'Ch'-square' table for v degrees of freedom at 5% level of significance. The test was satisfied in 95% of the cases.

The following equation has been solved on the computer by iteration process for X when $P_z=0.10, 0.20, \ldots, 0.90$ respectively utilising the procedure given in detail by Mooley (1973), where, $Z=x/\hat{\beta}$

$$P_z = 1 - \left(q + P \int_0^Z \frac{z^{\hat{\gamma}-1} e^{-z}}{\Gamma\hat{\gamma}} dz \right) \qquad (5)$$

The amounts calculated at 10% to 90% probability levels are designated as Assured Rainfall (AR) here onwards. For each station, graphs have been prepared showing for each week, the AR values for the nine probability levels, *viz.*, 10%, 20%, ..., 90%. An examination of these figures for different stations shows that there are one or more high peaks in AR. On the basis of the amplitudes of the maxima and the positions of the peaks in the annual march of time, the patterns are classified. Similar rainfall patterns are grouped together to form homogeneous rainfall pattern zones.

3. Data

More than 80% of the area of Tamilnadu State in India comes under the dry farming tract. Weekly rainfall data of 103 stations spread over 14 districts covered by this area (Fig. 1) have been used for this study. These stations are having data of more than 50 years. AR values have been computed for the probability levels 10% to 90% but values at 50% level only are given in Table 1, due to space limitations. The calendar dates relating to the standard weeks are given in Table 2 (the entire data have been kept in India Met. Dep.)

4. Discussion and results

Almost all parts of Tamilnadu are obstructed by the Westerns Ghats from the full force of the rain bearing winds of the southwest monsoon. There is, therefore, not much rainfall over the region in SW monsoon which sets in normally in the 22nd week (21 May-3 June). With the retreat of the southwest monsoon, the northeast monsoon sets in over Tamilnadu in October. During the northeast monsoon season, taken to be covered by the months of October to December, the rainfall is 60% of the annual total in a narrow coastal strip and 30 to 50% in the interior, the decrease being towards the west. Rainfall peak is in October in the interior districts and in November in the coastal region.

4.1. *Spatial distribution of weekly AR*

Isohyetal analysis of AR values has been carried out for all the weeks for different probability levels. Due to space limitations prominent features of spatial distribution of AR from isohyetal analysis of four weeks representative of rainy months are described below :

30*th week* (23-29 *July*) (*Fig.* 2 *a*) — In the week, AR increases from southeast to northwest at all the levels. The amount ranges to 20 mm at 30% level but is less than 10 mm or almost negligible over large areas at 30% level, excluding hill stations.

38*th week* (17-23 *September*) (*Fig.* 2 *b*) — Even in the third week of September, assured rainfall at 50% level is almost negligible south of Lat. 10° N. In areas north of Lat. 11°N, AR at 50% level exceeds 20 mm reaching 50 mm in small pockets of Salem district.

42*nd week* (15-21 *October*) (*Fig.* 2 *c*) — With the establishment of the northeast monsoon AR amounts are higher. AR at 50% level is generally more than 20 mm and over the western-half, it amounts to 30 to 50 mm. The range is 50-80 mm at 30% level.

44*th week* (29 *October*-4 *November*) (*Fig.* 2 *d*) — In this week AR amount decreases north of Lat. 10°N and is 70-80 mm in the south, reducing to 30-40 mm in the north at 30% level. AR at 50% level is 30 to 50 mm south of Lat. 10°N and less than 30 mm elsewhere. At 70% level, it is 20 mm in the south and negligible to the north of Lat. 10°N.

Assured rainfall gradually decreases from north to south after 46th week and becomes practically zero in 50th week (10-16 December). This is readily seen from Table 1.

4.2. *Demarcation of zones with significant features*

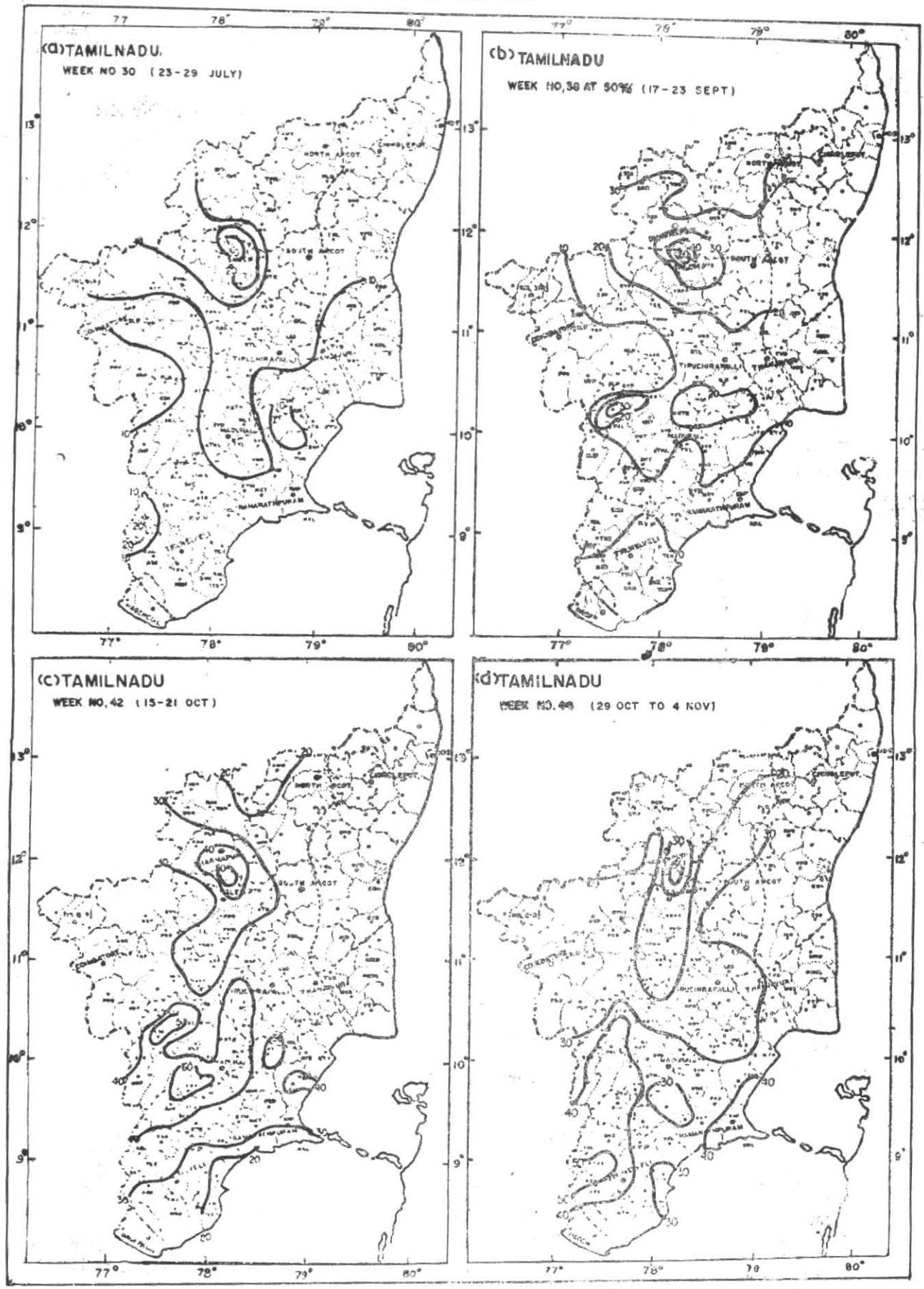
A critical examination of graphs of weekly AR for all the 103 stations in 14 districts of Tamilnadu suggests that they could be grouped into four following significant zones :

Group I (A_1) : One major peak in northeast monsoon (44/45th week) and a minor peak in pre-monsoon period (14-17th week).

Group II (A_2) : One major peak in mid-October (42nd week) and a minor peak in May (19-20th week).

Group III (A_3) : One major peak in October (41-42nd week) and a minor peak in May (20-21st week) and another at the end of August to early September (35th week).

Group IV (A_4) : One major peak in northeast monsoon (October, *i.e.*, 42-43rd week).



Figs. 2(a-d). Assured rainfall (mm) at 50 per cent level : (a) 30th week (23-29 Jul), (b) 38th week (17-23 Sep), (c) 42nd week (15-21 Oct) and (d) 44th week (29 Oct-4 Nov)

TABLE 1

Assured weekly precipitation (mm) at 50% probability level

Station	Week No. 14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	43	50	52
Coimbatore district																				
Mulanur (MLN)	—	3	6	7	—	—	—	—	—	—	—	—	—	17	36	25	14	—	—	—
Tiruppur (TRP)	—	7	8	16	3	—	—	—	—	—	1	—	10	20	32	27	13	4	—	—
Annur (ANR)	—	7	11	16	2	—	—	—	—	4	4	—	9	22	39	33	13	1	—	—
Gobichettipalayam (GCP)	—	4	5	15	12	1	—	3	2	6	9	8	16	22	39	29	12	3	—	—
Sulur (SLR)	—	3	5	13	—	—	—	—	—	—	—	—	2	13	30	25	8	2	—	—
Kodumudi (KMD)	—	—	—	12	—	—	—	—	—	—	5	—	9	18	26	18	9	3	—	—
Perundurai (PDR)	—	1	7	13	7	—	1	2	—	6	8	7	15	24	31	23	13	3	—	—
Bhavani (BVN)	—	1	8	18	11	2	—	6	5	10	12	9	19	26	35	23	14	3	—	—
Salem district																				
Yercaud (YRC)	3	12	15	27	24	26	29	33	36	38	51	34	50	39	51	40	27	14	—	—
Sendamangalam (SMG)	—	—	4	20	11	1	—	5	2	20	21	6	25	32	31	18	10	4	—	—
Paramathi (PRM)	—	—	4	14	15	—	—	—	—	3	7	—	14	24	30	17	8	—	—	—
Namakkal (NMK)	—	—	6	21	10	—	2	—	5	14	16	7	18	27	32	19	7	2	—	—
Valappady (VPD)	—	—	5	18	15	4	4	10	8	17	21	7	20	25	31	26	11	2	—	—
Attur (ATR)	—	—	3	18	13	2	2	8	8	12	23	10	25	28	42	25	21	7	—	—
Tiruchengode (TCG)	—	4	7	17	9	1	1	1	6	10	16	9	14	25	29	19	14	7	—	—
Salem (SLM)	—	8	7	21	14	16	12	14	15	27	30	19	23	30	31	17	8	2	—	—
Rasipuram (RPR)	—	2	4	18	17	9	5	12	17	20	22	14	22	28	30	20	9	—	—	—
Omalur (OML)	—	3	5	21	17	13	7	13	13	21	21	20	23	30	30	20	11	—	—	—
Dharmapuri district																				
Pennagaram (PGR)	—	7	10	27	20	4	3	5	9	5	10	9	27	31	29	17	4	1	—	—
Palacode (PLC)	—	1	4	23	20	2	—	5	4	4	13	11	32	36	25	20	10	—	—	—
Harur (HRR)	—	—	2	16	13	3	—	6	4	7	11	11	25	27	23	23	11	7	—	—
Uthankarai (UKL)	—	—	3	16	12	2	1	9	2	5	15	12	30	30	28	16	9	3	—	—
Krishnagiri (KNG)	—	2	8	22	21	4	1	5	3	6	10	8	32	31	22	14	9	—	—	—
Rayakota (RKH)	—	—	5	24	21	—	—	3	2	4	2	7	23	27	35	18	9	—	—	—
Hosur (HSR)	—	5	8	20	23	5	4	10	7	10	15	10	23	32	27	15	5	—	—	—
Denkanikota (DKK)	—	10	13	27	19	5	3	11	10	13	14	12	28	37	27	16	6	1	—	—
Thalli (THI)	—	9	13	31	21	8	9	14	15	16	19	16	32	32	25	13	1	—	—	—
North Arcot district																				
Tirupattur (TPR)	—	4	6	16	17	6	4	9	8	14	15	17	27	32	21	16	7	—	—	—
Arni (ARN)	—	—	—	5	11	4	4	12	9	17	26	21	31	25	30	25	15	6	—	—
Ambur (AMB)	—	—	—	11	13	5	1	5	3	9	11	13	25	21	19	16	10	3	—	—
Tirunelveli district																				
Shenkottah (SKT)	16	10	4	—	4	25	30	24	24	10	10	5	4	11	40	49	32	22	7	—
Tiruchendur (TCD)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	13	32	25	32	6	3
Tirunelveli (TNV)	7	6	—	—	—	—	—	—	—	—	—	—	—	4	29	43	25	18	3	3
Srivaikuntam (SVK)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	27	34	25	18	—	—
Kiranur (KRN)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12	24	27	24	—	—
Nanguneri (NGN)	3	—	—	2	—	1	—	—	—	—	—	—	—	5	27	37	27	20	5	—
Ambasundram (ASD)	7	2	3	—	—	—	2	1	—	—	—	—	—	2	28	45	38	29	7	7
Kadayam (KDM)	6	5	—	—	—	2	2	—	4	—	—	—	—	4	35	53	34	27	13	—
Tenkasi (TKS)	17	8	8	—	—	14	11	9	11	1	—	—	2	6	38	50	41	27	—	3
Kadayanallur (KDL)	3	5	—	—	—	—	—	—	—	—	—	—	—	—	33	44	31	22	—	—
Sankarankoil (SKK)	12	10	7	3	—	—	—	—	—	—	—	—	—	7	31	42	24	9	2	—
Tuticorin (TCK)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17	29	17	17	—	—
Vilathikulam (VKL)	—	3	—	—	—	—	—	—	—	—	—	—	5	13	34	35	22	15	—	—

TABLE 1 (*contd*)

Assured weekly precipitation (mm) at 50% probability level

Station	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52
Ramanathapuram district																				
Sattur (STR)	4	1	3	2	—	—	—	—	—	—	—	—	2	16	37	35	21	10	—	—
Virudhunagar (VDN)	—	3	2	10	9	—	—	—	—	—	1	7	10	18	40	30	10	8	—	—
Sivakasi (SKS)	—	10	5	8	4	—	—	—	—	—	—	—	3	14	40	39	33	10	—	—
Srivilliputtur (SVP)	7	4	5	4	1	—	—	—	—	—	—	—	7	17	47	47	30	11	—	—
Watrap (WTP)	7	7	5	6	2	—	—	—	—	—	—	—	6	22	52	44	38	18	—	—
Tiruppatur (TPT)	—	1	—	8	7	4	4	10	10	24	20	18	19	20	30	28	16	13	—	—
Kamudhi (KTN)	—	4	—	—	—	—	—	—	—	2	6	—	7	12	38	29	16	6	—	—
Mudukulattur (MKT)	—	—	—	—	—	—	—	—	—	—	—	—	10	12	33	36	25	15	—	—
Ramanathapuram (RNP)	—	—	—	—	—	—	—	—	—	—	—	—	3	8	35	47	29	38	4	—
Morekulam (MKL)	—	—	—	—	—	—	—	—	—	—	—	—	1	—	29	47	30	31	6	—
Pamban (PBN)	2	—	—	—	—	—	—	—	—	—	—	—	—	—	34	49	47	42	15	12
Paramakudi (PKD)	—	3	—	—	—	—	—	—	—	6	7	2	7	12	33	35	22	13	2	—
Manamadurai (MMK)	—	—	—	—	—	—	—	—	—	3	9	3	10	12	26	38	18	7	—	—
Sivaganga (SVG)	—	3	—	10	2	—	—	2	—	15	11	7	16	17	39	31	19	11	3	—
Tiruvadnai (TVN)	—	—	—	—	—	—	—	—	—	2	3	—	12	11	47	38	24	25	—	—
Theethandathanam (TDH)	2	—	—	—	—	—	—	—	—	2	2	—	6	7	36	36	26	32	4	—
Madurai district																				
Kodaikanal (KDK)	16	23	23	27	23	16	17	21	19	22	27	23	32	27	51	41	27	28	7	5
Tallakulam (TKN)	—	6	1	3	7	—	—	3	2	12	9	12	6	17	44	33	16	3	1	—
Palani (PLN)	—	—	5	8	4	—	—	—	—	—	—	—	2	13	36	28	19	8	—	—
Chatrapati (CTP)	—	2	10	12	10	—	—	—	—	—	—	—	5	20	48	45	24	13	—	—
Vedasandur (VSD)	—	2	4	9	5	—	—	—	—	—	—	—	5	26	34	21	14	10	—	—
Dindigul (DDG)	—	2	4	8	8	3	2	2	—	6	4	6	17	22	37	26	23	11	—	—
Nilakottai (NKT)	4	6	7	13	5	—	—	—	—	—	2	5	14	25	32	30	16	8	—	—
Periyakulam (PKN)	8	14	9	8	4	—	1	1	1	2	2	4	11	17	36	40	20	7	—	—
Bodinayakkanur (BDK)	8	13	9	6	4	2	2	4	3	2	3	—	6	14	38	42	21	11	—	—
Uthamapalayam (UMP)	—	8	7	6	1	4	6	6	8	5	4	2	2	15	40	35	19	4	—	—
Usilampetti (UMT)	—	1	3	15	3	—	—	—	—	—	—	6	15	24	51	42	25	9	—	—
Tirumangalam (TML)	—	5	1	10	7	—	—	—	—	8	9	12	13	20	44	36	20	10	—	—
Peraiyur (PRY)	—	9	8	9	7	—	—	—	—	2	—	3	13	32	50	38	17	12	—	—
Sholavandan (SVD)	—	4	4	9	2	—	—	—	—	1	6	5	11	18	37	35	16	7	—	—
Melur (MLR)	—	—	2	9	9	—	1	4	2	12	12	17	19	24	40	33	16	11	—	—
Madurai (MDR)	—	5	3	8	5	1	—	3	—	8	12	12	12	18	42	31	19	9	—	—
Natham (NTH)	—	—	3	10	11	2	3	4	4	15	16	19	20	25	48	34	14	8	—	—
Tanjore district																				
Tanjore	—	—	—	—	—	—	—	—	—	15	13	12	13	20	31	29	20	19	5	—
Kattumavadi (KTV)	—	—	—	—	—	—	—	3	5	6	6	3	10	9	32	31	26	28	5	—
Arantangi (ATG)	—	—	—	—	—	5	5	4	9	16	14	9	17	19	38	28	20	22	6	—
Tiruvadi (TVD)	—	—	—	—	—	—	—	—	—	6	11	7	12	24	38	30	21	21	6	—

TABLE 1 (*contd*)

Assured weekly precipitation (mm) at 50% probability level

Station	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52
Tiruchirapalli district																				
Tirumayam (TMY)	—	—	—	3	3	3	6	10	10	19	21	16	21	20	33	29	17	15	—	—
Pudukkottai (PKT)	—	1	—	4	4	8	4	11	7	16	23	15	20	20	34	27	19	15	3	—
Kulattur (KLT)	—	—	—	8	3	—	—	2	—	5	15	15	17	25	36	25	15	13	—	—
Keelanilai (KLL)	—	—	—	—	—	5	2	3	7	14	12	5	11	18	36	25	14	18	2	—
Karambekkudi (KBK)	—	—	—	—	—	6	—	9	8	10	15	11	13	10	31	31	18	24	3	—
Tiruchirapalli (TCP)	—	—	—	11	7	2	—	—	—	3	7	9	18	22	36	25	19	12	2	—
Uppiliyapuram (ULP)	—	—	—	13	10	—	—	5	5	11	11	7	20	29	32	31	15	10	—	—
Perambalur (PBL)	—	—	—	15	11	—	—	2	1	11	13	9	19	25	35	31	19	14	—	—
Musiri (MSR)	—	—	—	6	3	—	—	—	—	—	3	2	13	21	35	27	12	9	—	—
Manapparai (MPR)	—	—	—	3	7	—	—	—	—	—	—	9	13	27	43	27	16	13	—	—
Lalgudi (LGD)	—	—	—	5	7	—	—	—	—	—	7	8	16	22	35	28	24	14	2	—
Kulittalai (KTL)	—	—	—	9	4	—	—	—	—	—	4	5	13	24	38	27	15	11	—	—
Karur (KRR)	—	—	—	13	2	—	—	—	—	2	6	3	12	22	27	20	7	5	—	—
Jayankondam (JKD)	—	—	—	—	2	2	—	3	5	17	24	14	21	26	39	36	30	25	6	—
Illuppur (ILP)	—	—	—	10	—	4	—	—	—	10	14	12	15	22	31	30	11	10	—	—
Chettikulam (CKL)	—	—	—	12	6	—	—	—	—	6	9	10	25	24	39	27	22	9	—	—
Aravakurichi (AKR)	—	—	—	8	—	—	—	—	—	—	—	—	—	14	29	20	8	8	—	—
Ariyalur (AVL)	—	—	—	7	9	—	—	—	—	11	19	16	18	27	33	31	26	14	3	—
Marungapuri (MGP)	—	—	—	9	7	—	—	—	—	4	11	9	22	28	41	25	13	12	—	—

TABLE 2

The standard weeks

Week. No.	Dates	Week. No.	Dates
1	1-7 Jan	27	2-8 Jul
2	8-14	28	9-15
3	15-21	29	16-22
4	22-28	30	23-29
5	29-4 Feb	31	30-5 Aug
6	5-11 Feb	32	6-12 Aug
7	12-18	33	13-19
8	19-25	34	20-26
9	26-4* Mar	35	27-2 Sep
10	5-11 Mar	36	3-9 Sep
11	12-18	37	10-16
12	19-25	38	17-23
13	26-1 Apr	39	24-30
14	2-8 Apr	40	1-7 Oct
15	9-15	41	8-14
16	16-22	42	15-21
17	23-29	43	22-28
18	30-6 May	44	29-4 Nov
19	7-13 May	45	5-11 Nov
20	14-20	46	12-18
21	21-27	47	19-25
22	28-3 Jun	48	26-2 Dec
23	4-10 Jun	49	3-9 Dec
24	11-17	50	10-16
25	18-24	51	17-23
26	25-1 Jul	52	24-31**

*In leap year the week No. 9 will be 26 February to 4 March *i.e.*, 8 days instead of 7.

**Last week will have 8 days, 24 to 31 December.

Areas with similar AR graphs have been grouped together to form homogeneous rainfall pattern zones. These zones are shown as A_1, A_2, A_3 and A_4 in Fig. 3. The geographical extent and variation in AR amounts in each of the four zones are discussed below :

Zone A_1—This zone includes Tirunelveli and most of adjoining Ramanathapuram district. A typical pattern of AR for this area is given for Kadayanallur in Fig. 4(a). The major peak observed in 44-45th week with AR 65-75 mm at 30% level and 45-50 mm at 50% level (Table 1). A secondary peak is observed during 14-15th week (2-15 April). This is mainly due to pre-monsoon thunderstorm activity. AR from 10th to 17th week is of the order of 15-20 mm at 30% level.

Zone A_2—Fig. 4(b) for Usilumpatti in Madurai district depicts the AR pattern of this zone. The AR peak is observed during 42nd week (15-21 October) with a secondary peak during pre-monsoon period especially 19th/20th week (7-20 May). This zone comprises of Coimbatore district, parts of Madurai, Tiruchirapally and Dharampuri districts. This zone gets during pre-monsoon period AR of the order of 4 to 20 mm at 50% level and 10-40 mm at 30% probability level. After 31st week AR generally increases towards the north. It remains almost steady during 33rd and 36th week, 15-20 mm at 50% level. Assured rainfall starts increasing from 37th week and the major peak is attained in the 42nd week. At this peak, assured rainfall is of the order of 80 mm, 50 mm and 25 mm at 30%, 50% and 70% probability levels respectively. An examination of spatial distribution of AR in various weeks shows that the values are less in this zone than that of the other zones.

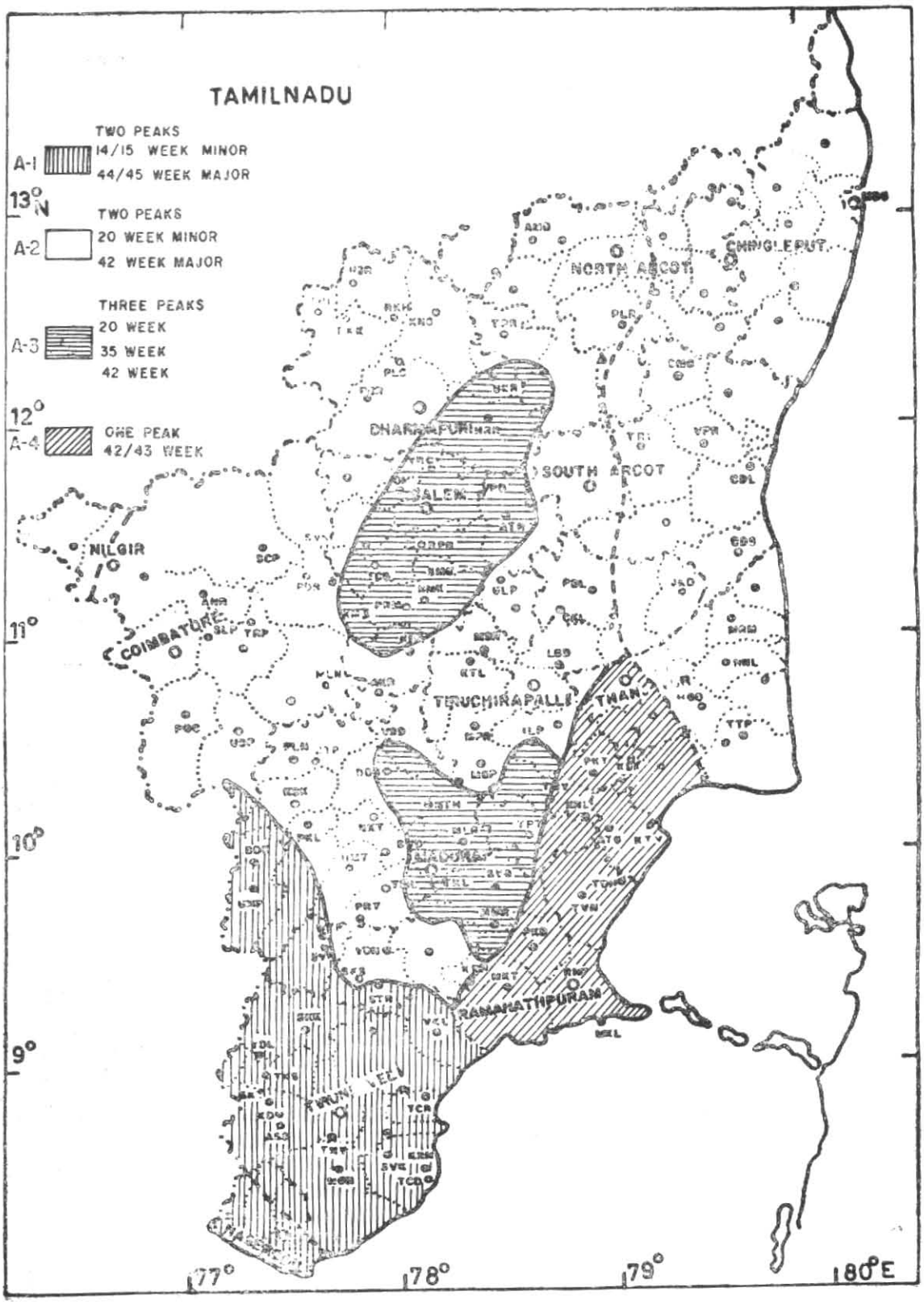
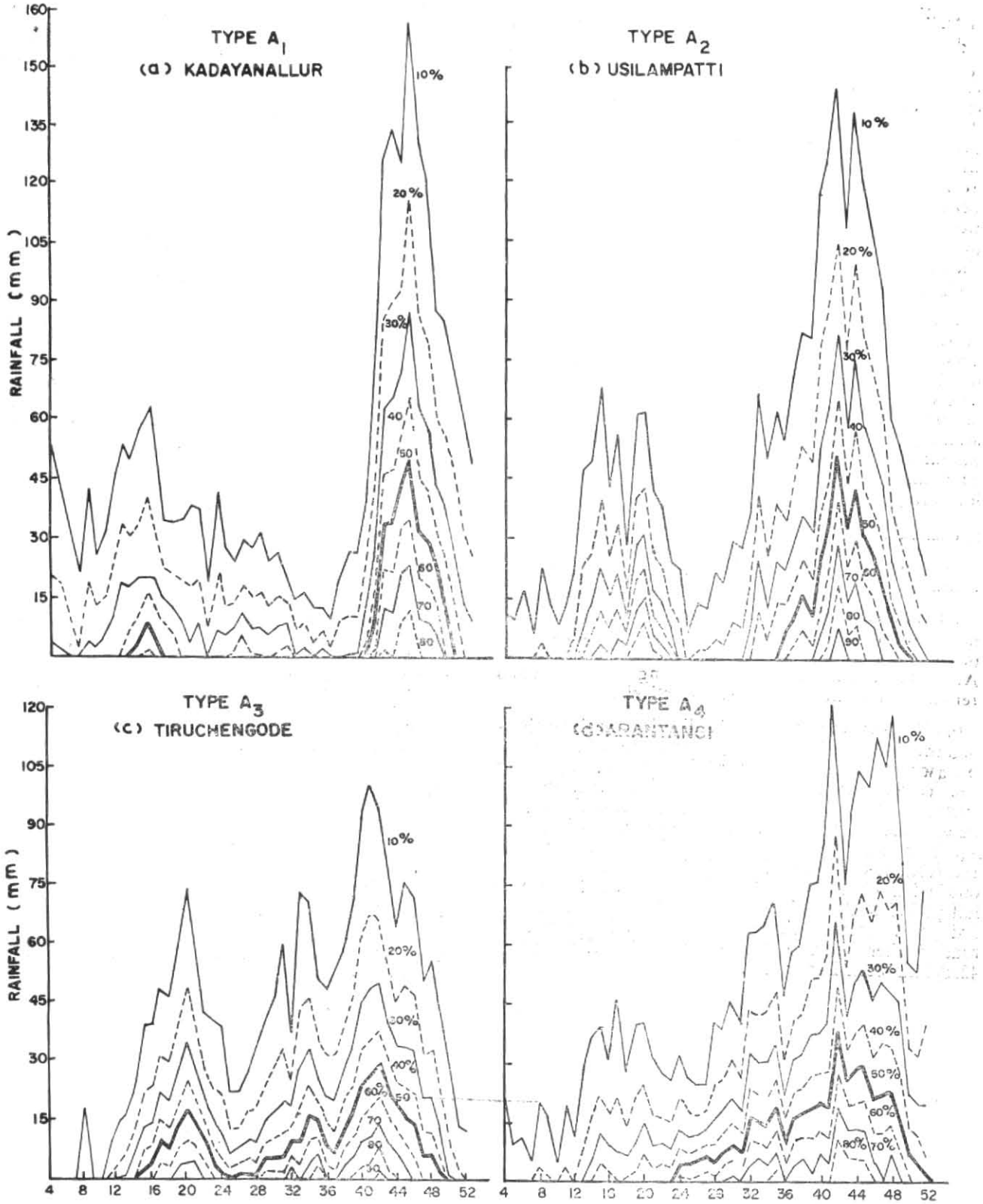


Fig. 3. Assured rainfall pattern zones



Figs. 4(a-d). Assured rainfall : (a) Kodayanallur (Type A_1), (b) Usilampatti (Type A_2), (c) Tiruchengode (Type A_3) and (d) Arantangi (Type A_4)

Zone A_3—This area consists of parts of Madurai and Salem districts. Tiruchengode (Fig. 4c) depicts a typical rainfall pattern for this area. One major and two minor peaks are found in this zone. One is in the 20th/21st week (14-27 May), second in the 35th week (27 Aug-2 Sep) and third one in the 41st/42nd week (8-21 October). Assured rainfall is of the order of 20-25 mm during April-May at 30% level. A minor peak is observed in 35th week (27 Aug-2 Sep) when the weekly assured rainfall is 25-30 mm at 30% and 10-15 mm at 50% probability levels. The lull period between second and third peaks is hardly one to two weeks. The major peak is observed in 41st/42nd week (8-21 October) when the weekly assured rainfall is of the order of 50-53 mm, 30-35 mm and 15-16 mm at 30%, 50% and 70% levels respectively.

Zone A_4—Assured rainfall pattern of this zone is represented by Arantangi (Fig. 4d) in Tanjore district. This zone includes Tanjore district and adjoining parts of Ramanathapuram and south Arcot districts. AR here varies between 10 & 50 mm from 30th to 40th week at 50% level. It starts increasing from 40th week and attains peak during 42nd/43rd week (15-28 Oct) assured rainfall from 41st to 48th week is of the order of 40-45, 20-25 and 10-15 mm at 30%, 50% and 70% probability levels respectively.

5. Conclusions/Summary

Some of the important results are briefly mentioned below :

(*i*) Assured rainfall normally increases from south to north from 20th week (14-20 May) to 23rd week (4-10 June) and north to south from 32nd week (6-12 August) to 41st week (8-14 Oct) during the advance and retreat of southwest monsoon respectively.

(*ii*) Dry farming areas of Tamilnadu could be classfied into four significant AR pattern zones. In zone A_1 a major peak at 44th/45th week is noted. A very minor peak is found around 16th week and assured rainfall from 30th to 38th week is very low. Main peak in 42nd week and minor one in 20th week are observed in zone A_2. Two minor peaks are found in zone A_3—one in 16th/17th week, second in 33rd/34th week and a major one in 42nd/43rd week. A duration of one to two weeks lull period in AR values is observed between 2nd and 3rd peak. In zone A_4, rainfall activity is more than that of other zones. One peak can be identified during 43rd/44th week in zone A_1.

(*iii*) A peak in rainfall activity is observed during 42nd-44th week (15 Oct-4 Nov) throughout the dry farming tract of the State.

(*iv*) These assured rainfall amounts may serve as a basic input for agricultural planning. Along with the information on soils these should be helpful in deciding the type of crops and cropping pattern and also to adjust crop duration according to moisture regime which should help increase agricultural production and stabilise the same at higher levels.

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