

## INFLUENCE OF RAINFALL ON CROPPING SYSTEMS IN DRYLANDS OF PENNAGARAM TALUK OF DHARMAPURI DISTRICT

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Rainfall data for 37 years (1947-'83) relating to Pennagaram taluk in Dharmapuri district of Tamil Nadu have analysed and interpreted in terms of coefficient of variation and dependability. The traditional cropping systems now in vogue are discussed. Improved cropping systems based on the information on rainfall pattern have been proposed for increased rainfall use efficiency and income to dryland farmers.

In dry farming tracts cropping situations are largely decided by the rainfall pattern. The amount and distribution of rainfall mainly determine the choice of a particular cropping system and cultivation practices of component crops. Scientific information on the quantum and distribution of rainfall would enable the farmers to modify or adjust the cropping system to utilise the actual moisture available for profitable crop production. The rainfall data of Pennagaram taluk located in Dharmapuri district of Northwestern zone of Tamil Nadu have been taken for study and analysed as per the procedure followed by Kulandaivelu *et al.*, (1979 and 1980). The Pennagaram taluk is situated 12° 08' N latitude, 77° 52' E longitude with an altitude of 533 metres (M. S. L.). This taluk is bounded by Dharmapuri in east, Palacode in north, Mettur taluk in south and Karnataka state in west.

### MATERIALS AND METHODS

The daily rainfall data pertaining to a period of 37 years (1947-'83) have been collected from the revenue records and were statistically analysed.

### RESULTS AND DISCUSSION

#### *Annual and Seasonal rainfall*

The mean annual rainfall is 863mm received in 49.8 rainy days (Table 1). The coefficient of variation of annual rainfall is 28 per cent and its dependability is fairly high. Out of 37 years the annual rainfall is normal in 1948, '49, '51, '54, '55, '56, '59, '60, '61, '62, '63, '64, '67, '68, '69, '73, '74, '75, '77 and '79 (+ or -20 per cent to the mean annual rainfall). The annual rainfall is in excess in 1947, '53, '58, '66, '71, '72, '81 and 1983. The excess is due to increased amount of rainfall received during south, west monsoon in 1947 and '58, summer, southwest and northeast monsoon in 1953 and '71, summer and northeast monsoon in 1981, southwest and northeast monsoon in 1966, '72 and '83. The rainfall is deficit (-20 per cent to 60 per cent) in the years 1950, '52, '57, '65, '70, '76, '78, '80 and '82. The deficit is caused by the below normal quantum rainfall received during summer, southwest and northeast in 1965 and '82, summer and southwest monsoon in 1950, '57, and '78, southwest monsoon in 1952 and '70, southwest and northeast in 1980. During 1976, the rain gauge

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did not function from January to June and so the minimum rainfall recorded.

The southwest and northeast monsoons contribute 379.1 and 291.7 mm of mean rainfall respectively accounting 43.9 and 33.7 per cent of the annual rainfall. The summer showers are more assured and account for 20.4 per cent of the total annual rain. Among the four seasons, the southwest monsoon highly dependable closely followed by northeast monsoon period. The quantum and distribution of rainfall during summer, southwest and northeast monsoon period is quite normal and offer ample scope for double or triple cropping in dry lands with suitable modification of cultivars and technologies.

#### Monthly Rainfall

The distribution of monthly rainfall follows a bi-modal sequency. October received the maximum rainfall of 181.9 mm followed by September (159.1mm). Rainfall received during may(116.7mm) in summer, August (88.8 mm) in southwest monsoon and October (181.9mm) in northeast monsoon period is relatively less variable and more dependable (Table. 1) as compared to other months. The distribution of rainy days follows same trend as that of rainfall.

#### Weekly Rainfall

The mean weekly rainfall, coefficient of variation and rainy days are given in Table. 3. The data indicate the high intensity of rainfall during the standard weeks of 18th to 22nd and 29th to 47th week which corresponds, the months of May and July to November. As the coefficient of variation is less, the dependability is more in 38th standard week followed

by 39th to 50th and 30th to 36th week. As the quantum of rainfall is more with relatively less variation during the weeks of May and July to November, it indicate the possibility of raising two to three crops successfully during the above period. The rainfall received in the weeks of 1st to 17th, 23rd to 28th 51st to 52nd standard weeks is meagre with larger variation than the other weeks. The rainy days follow the similar trend of rainfall.

#### Existing Crop Pattern

In summer, on receipt of first shower farmers prepare the field and keep it ready for sowing. On the receipt of the second shower in the month of April, the gingelly (*Sesamum indicum*) is sown and harvested between the last week of July to second week of August. Following gingelly, a second crop of horsegram (*Macrotyloma uniflora*) is sown in the first week of September which is harvested in the last week of December.

The dry groundnut (*Arachis hypogea*) crop is sown in major area from the last week of June to July second week and harvested in the month of September. Immediately after the harvest, the horsegram is sown during the last week of September and harvested during December/January.

#### *Flausine coracana*

*Ragi* forms the second major single crop and sown in the month of July. It is harvested in the month of November, Castor, Sorghum, Redgram and Lablab are sown as intercrops.

*Samai* (*Panicum miliare*) and sorghum (*sorghum vulgare*) are sown when the receipt of rainfall is delayed

Table 1 : Seasonal, Annual Rainfall and Rainy days

Year	Winter		Summer		Southwest monsoon		Northeast monsoon		Annual	
	Rain-fall (mm)	Rainy days	Rain-fall (mm)	Rainy days	Rain-fall (mm)	Rainy days	Rain-fall (mm)	Rainy days	Rain-fall (mm)	Rainy days
1947	30.0	3	209.0	10	766.1	31	342.8	18	1347.9	62
1948	21.8	2	152.8	9	273.4	24	281.0	19	729.0	54
1949	3.8	1	227.8	14	480.3	38	314.3	20	1026.2	73
1950	26.4	3	78.1	6	296.8	25	242.1	15	643.4	49
1951	—	—	348.9	16	295.0	21	222.8	12	866.7	59
1952	8.9	1	170.9	7	168.8	11	309.6	16	658.2	35
1953	18.8	1	270.5	16	468.1	25	433.2	18	1190.6	60
1954	23.2	3	216.7	18	192.7	13	296.2	20	728.8	54
1955	34.8	3	291.9	18	190.5	16	251.6	13	768.8	50
1956	4.3	1	119.6	11	227.0	16	509.0	27	859.9	55
1957	—	—	124.4	11	158.4	16	305.3	20	588.1	47
1958	27.9	2	180.4	15	777.0	26	187.2	11	1172.5	54
1959	42.8	2	94.2	7	295.2	23	320.0	20	752.2	52
1960	—	—	191.7	13	308.9	13	212.2	14	712.8	40
1961	106.8	6	125.6	4	407.0	36	236.1	15	875.5	61
1962	22.0	2	248.8	11	295.6	19	326.6	19	893.0	51
1963	—	—	94.0	6	400.9	20	364.2	15	859.1	41
1964	—	—	102.4	10	552.5	27	301.3	21	956.2	58
1965	2.3	—	133.2	8	249.5	17	115.1	9	500.1	34
1966	—	—	168.9	7	825.3	27	539.3	27	1533.5	61
1967	28.2	2	138.9	8	376.4	23	356.2	13	899.7	46
1968	—	—	277.2	14	264.0	19	251.9	19	793.1	52
1969	—	—	183.0	11	297.0	13	424.8	21	904.8	45
1970	17.6	2	162.2	10	153.2	19	308.7	18	641.7	48
1971	78.0	2	296.4	17	520.9	17	320.0	13	1215.3	49
1972	—	—	156.5	7	469.3	20	415.7	20	1041.5	47
1973	—	—	144.2	8	474.4	24	143.6	11	762.2	43
1974	8.4	1	97.6	7	553.8	28	183.4	11	843.2	47
1975	—	—	251.4	11	422.2	29	291.9	19	965.5	59
1976	—	—	—	—	242.6	15	174.2	10	416.8	25
1977	—	—	203.0	16	298.6	20	275.2	15	776.8	51
1978	8.2	1	95.3	6	151.5	11	311.0	18	566.0	36
1979	112.5	3	58.6	4	568.8	29	192.1	17	932.0	53
1980	—	—	331.9	11	142.7	15	202.7	11	677.3	37
1981	—	—	281.9	19	509.5	28	272.4	19	1063.8	66
1982	—	—	143.2	8	161.3	11	227.4	18	531.9	37
1983	—	—	129.8	9	791.2	34	333.6	11	1254.6	54
Mean	17.0	1.11	175.7	1.38	379.1	21.70	291.7	16.56	863.5	49.76
CV%	144.5		92.9		74.9		15.9		28.2	
% on annual rainfall	2.0		20.4		43.9		33.7			



beyond July. Sorghum is raised as single crop with intercrops and *samai* usually followed by horsegram.

#### Proposed Crop Pattern

The analysis of rainfall showed that there is continuous and dependable precipitation from the 16th standard week (Apr. 16th) to 50th standard week (Dec. 16th). It indicates the congenial weather (rainfall) for raising the dryland crops successfully during the above period. By utilizing the rainfall more effectively, the present cropping pattern can be modified by increase the cropping efficiency and also by crop substitution. The following are the cropping systems proposed to increase the net income per unit area and increase the rainfall use efficiency.

1. For summer sowing of gingelly, rainfall during the middle of April to May (16th to 22nd week) is dependable. The early sown gingelly comes to harvest during the middle

of July (29th week). After the harvest the groundnut or *samai* sowing is taken up in the month of July and harvested in the last week of September to second week of October. The horsegram can be sown immediately after the harvest of groundnut of *samai*. By adopting the above cropping system the cropping intensity in the double cropped drylands is increased from 200 per cent to 300 per cent.

2. in places where groundnut is sown in early July and harvested in the month of September. Cowpea can be sown as second crop instead of horsegram. The research evidences have shown that sowing of cowpea during the month of September was more remunerative and under late sown condition horsegram is more suitable (Gopalaswamy and Narayanan; 1935).
3. in areas where *ragi* is raised as single crop the medium duration

Table. 2 Mean monthly rainfall, C. V., and rainy days

Months	Rainfall mm	C.V. %	Per cent Over annual rainfall	Rainy days
January	7.9	155.7	0.91	0.51
February	9.1	149.5	1.05	0.51
March	20.2	124.3	2.34	0.92
April	38.8	89.1	4.49	2.73
May	116.7	46.3	13.52	6.73
June	48.0	66.8	5.56	3.49
July	83.3	63.7	9.64	5.78
August	88.8	57.2	10.28	5.16
September	159.1	67.6	18.42	7.27
October	181.9	58.2	21.06	9.73
November	78.1	64.2	9.04	4.89
December	31.8	78.3	3.68	1.95

Table 3. Mean Weekly Rainfall, C. V. and Rainy days

Standard week	Month and date	Rainfall mm	C. V. %	Rainy days	Standard week	Month and date	Rainfall mm	C. V. %	Rainy days
1.	Jan. 1-7	2.68	86.8	0.19	27.	Jul. 2-8	13.69	82.9	1.27
2.	8-14	1.52	110.5	0.13	28.	9-15	20.22	81.9	1.05
3.	15-21	1.28	116.5	0.11	29.	16-22	15.52	80.7	1.11
4.	22-28	0.52	138.1	0.03	30.	23-29	23.59	78.7	1.45
5.	Feb. 29-4	3.03	148.3	0.11	31.	Aug. 30-5	16.44	77.4	1.11
6.	5-11	0.16	164.8	0.03	32.	6-12	11.16	77.0	0.84
7.	12-18	1.14	168.0	0.08	33.	13-19	15.01	76.7	1.08
8.	19-25	2.61	154.5	0.24	34.	20-26	25.96	75.8	1.32
9.	26-4	3.17	140.5	0.24	35.	27-2	22.42	73.9	1.30
10.	Mar. 5-11	4.56	153.6	0.22	36.	Sept. 3-9	20.85	73.0	1.09
11.	12-18	2.58	150.1	0.11	37.	10-16	52.39	80.4	2.03
12.	19-25	3.18	121.0	0.19	38.	17-23	52.34	33.9	2.38
13.	26-1	8.02	117.4	0.30	39.	24-30	28.46	48.2	1.54
14.	Apr. 2-8	8.16	100.8	0.41	40.	Oct. 1-7	47.03	42.7	2.32
15.	9-15	7.95	98.7	0.43	41.	8-14	43.69	40.2	2.35
16.	16-22	12.04	89.3	0.97	42.	15-21	40.52	37.6	2.27
17.	23-29	9.30	82.7	0.76	43.	22-28	36.88	39.2	2.11
18.	May 30-6	22.17	90.5	1.22	44.	Nov. 29-4	25.33	42.6	1.43
19.	7-13	20.78	88.6	1.24	45.	5-11	20.31	40.2	1.38
20.	14-20	34.68	95.8	1.83	46.	12-18	15.25	47.6	0.86
21.	21-27	25.00	90.6	1.49	47.	19-25	18.91	55.4	1.10
22.	28-3	26.57	85.7	1.35	48.	26-2	9.75	67.3	0.65
23.	June 4-10	11.94	83.7	0.97	49.	Dec. 3-9	11.54	69.4	0.63
24.	11-17	15.50	81.8	0.86	50.	10-16	9.04	72.5	0.59
25.	18-24	8.01	83.6	0.54	51.	17-23	3.11	168.4	0.19
26.	25-1	5.84	85.2	0.70	52.	24-31	2.25	152.2	0.22

varieties like Indaf.6/Paiyur. 1 could be sown followed by a second crop of horsegram.

4. In the fields where *samai* is harvested in the month of September, a second crop of cowpea, can be sown as in groundnut areas.
5. In the lands where long duration sorghum is sown, short duration sorghum viz., Co.24/Co.21 could be sown during September. This could be preceded by a pulse crop like cowpea during June/July.

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