

STUDY OF RAINFALL AND EVAPO-TRANSPIRATION ON DRY CROPS OF KOVILPATTI REGION

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Recorded rainfall of 30 years from 1953 to 1982 was analysed and ET was worked out for dryland crops, and the results indicated that there is assured rainfall in every year with 75 per cent probable rainfall of 617 mm. It is evident to observe that 55 per cent of total rainfall was received during North East monsoon period. Assured rainfall was also observed during April, May, August, September, October and November with a CV value of 71, 80, 89, 64, 57 and 72% respectively. The weekly analysis indicated assured rainfall during 16, 17, 18, 32, 35, 37, to 47 and 49 standard meteorological weeks. The worked out ET was 778.16 mm for Cotton, 422.38 mm for sorghum, 370.38 mm for Bajra and 255.65 mm for sunflower. It was observed that ET was found reduced as sowing was delayed.

Rainfall, the quantity and most important of all, its distribution decide the cropping pattern of a tract. Study of rainfall alongwith soil type of a region will precisely pave the way to fix the suitable cropping pattern. The modification of agronomic practices to be followed for maximum production mostly depend on rainfall distribution. The study of rainfall pattern and its analysis is attempted for Kovilpatti black soils.

MATERIALS AND METHODS

Recorded rainfall of 30 years from 1953 to 1982 were taken up for this analysis. Per cent co-efficient of variation was worked out for yearly, seasonal, monthly and weekly rainfall. The 75% probability rainfall was also worked out for annual, seasonal and monthly rainfall. ET was worked out as per the method suggested by Bla-

ney and Criddle (1950) and thereupon ET of dryland crops have been worked out.

RESULTS AND DISCUSSION

The mean annual, seasonal, monthly and weekly rainfall with co-efficient of variation values and rainy days are presented in Tables 1 and 2. The analysis indicates that the mean rainfall of an year is 751 mm in 43 rainy days with CV value of 26%. The lower CV value indicates assured receipt of rainfall in every year. The 75% probable rainfall of this centre is 617 mm. When the total rainfall was analysed for seasonal distribution, it could be seen that 55% of total rainfall was contributed by North East Monsoon (NEM) with CV value of 39%. The mean quantity of rainfall received during North East Monsoon period is 413 mm in 22 rainy days. The contribution of

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Table 1 Mean Rainfall (mm)

S. No.	Particulars	Mean Rainfall (mm)	Rainy days	Co-efficient of variation (per cent)	75 percent probable rainfall (mm)
1.	Year	751	43.0	26	617.0
2.	<i>Seasonal</i>				
	Cold weather period	32	1.8	144	2.0
	Hot weather period	163	10.3	44	109.0
	South west monsoon	143	9.1	50	87.0
	North East monsoon	413	21.9	39	110.4
3.	<i>Monthly</i>				
	January	18	0.9	252	0
	February	15	0.9	166	0
	March	24	2.0	121	3.6
	April	73	4.5	71	46.0
	May	67	4.0	80	31.8
	June	19	1.0	134	0
	July	24	1.5	53	1.5
	August	34	2.4	89	7.5
	September	67	4.2	64	42.4
	October	181	9.4	57	103.1
	November	167	8.3	72	91.8
	December	65	4.0	101	15.7

Table 2. Mean rainfall (mm) in standard weeks

Period	Standard week No.	Mean rainfall (mm)	Co-efficient of variation (percentage)
April	16-22	16.4	128
	23-29	17.1	98
30 May	6	18.3	129
August	27-Sept. 2	11.4	133
	3-9	10.7	187
	10-16	13.7	116
	17-23	22.9	145
	24-30	17.2	131
	1-7	22.3	120
Oct.	8-14	36.1	111
	15-21	58.1	125
	22-28	46.3	82
	29-Nov. 4	55.8	85
29-Nov.	5-11	46.6	126
	12-18	35.2	146
	19-25	34.2	117
	26-Dec. 2	20.4	154
3-9	23.7	151	

South West Monsoon (SWM) and Hot Weather period (HWP) to total rainfall was 19 and 22% respectively with CV value of 50 and 44% respectively. The mean amount of rainfall received are 143 mm (7 rainy days) and 163 mm (10 rainy days) respectively during SWM and HWP. The contribution of rainfall by Cold Weather Period (CWP) was uncertain, since the CV value was 144% with a mean rainfall of 32 mm in 2 rainy days. The percentage of contribution to total rainfall was 4.30%. Hence, assured rainfall could be seen at this tract during Hot Weather Period and North East Monsoon. Hence, summer rains could be effectively used for summer ploughing and North East Monsoon rain could be used for sowing dry crops.

The monthly rainfall analysis indicates that assured rainfall could be expected during April, May, August, September, October and November with a mean rainfall of 72 mm (4), 67 mm (4), 34 mm (2), 67 mm (4), 181 mm (9) and 167 mm (8) respectively with a CV value of 71, 80, 89, 64, 57 and 72 per cent respectively for the above months.

The weekly analysis indicates that the standard weeks of 16, 17, 18, 32, 35, 37 to 47 and 49 would receive a mean rainfall of 20 mm with CV value less than 150 per cent indicating assured weeks for the receipt of rainfall. So cropping programme can be adjusted within these assured weeks.

Onset of monsoon

From the rainfall data of the past 30 years, it was noticed that in 16 out of 30 years, the onset of North East Monsoon was found to be in

first week of October, and for 12 years it was in second week of October, one year it was third week of October and one year in the first week of November. It could also be seen that out of 30 years, September month had recorded more than 50 mm rainfall in 5 rainy days in 19 years. So pre-monsoon sowing of sorghum or cotton can be taken up at this tract during the month of September with high probability of success.

Crop water requirement

Crop water requirement for cotton sorghum, *bajra*, and sunflower were worked out. Normally farmers used to sow cotton and sorghum at the onset of monsoon during the first week of October. If the onset of monsoon is delayed to 15th October, sowing of *bajra* is taken up instead of cotton and sorghum. In the case of late onset of monsoon by first week of November the choice is for sunflower.

Cotton

The total evapotranspiration (ET) of the crop is 778 mm as against the effective rainfall (ER) of 144 mm resulting in deficit. Since vast area is under rainfed, this deficit could not be met by irrigation except by supplemental irrigation from farm ponds. There was deficit of moisture from November onwards (Table 3). There was high evapotranspiration for state III, where peak flowering and boll development are noticed (vide Table 4). Hence to conserve soil moisture, frequent dust mulching is to be carried out.

Sorghum, Bajra, sunflower

The total evapotranspiration of the sorghum crop is 422 mm and the maxi-

Table 3. Crop water requirement (mm)

	Cotton			Sorghum		
	ET	ER	WR	ET	ER	WR
October	64.05	66.96	—	91.5	66.96	24.54
November	120.00	66.96	53.04	130.0	66.96	63.04
January	185.85	—	185.85	64.90	—	64.00
February	155.56	—	156.56	—	—	—
March	122.85	—	122.85	—	—	—

	Bajra			Sunflower		
	ET	ER	WR	ET	ER	WR
December	129.85	10.08	119.05	135.98	10.8	125.18
October	32.0	66.96	—	—	—	—
November	125.0	66.96	58.04	75.0	66.96	80.40
December	147.0	10.80	136.20	112.21	10.80	101.41
January	66.38	—	66.38	68.44	—	68.44
February	—	—	—	—	—	—
March	—	—	—	—	—	—

Date of sowing of crops

ET = Evapotranspiration
ER = Effective rainfall
WR = Water requirement

Cotton : October first day
Sorghum : October first day
Bajra : October, 15th
Sunflower : November first day

Table 4. Crop evapotranspiration

Crop	Stage	Days	Duration	ET (mm)	Total ET (mm)
Cotton	I	30	Oct. 1 - Oct. 30	64.05	778.16
	II	50	Oct. 31 - Dec. 19	198.40	
	III	55	Dec. 20 - Feb. 12	333.38	
	IV	45	Feb. 13 - Mar. 29	182.33	
Sorghum	I	20	Oct. 1 - Oct. 20	42.72	422.38
	II	30	Oct. 21 - Nov. 19	128.80	
	III	35	Nov. 20 - Dec. 24	172.50	
	IV	25	Dec. 25 - Jan. 18	78.38	
Bajra	I	15	Oct. 17 - Oct. 31	32.00	370.38
	II	25	Nov. 1 - Nov. 25	100.00	
	III	40	Nov. 26 - Jan. 4	201.50	
	IV	25	Jan. 5 - Jan. 29	36.88	
Sunflower	I	20	Nov. 1 - Nov. 20	35.00	255.65
	II	35	Nov. 21 - Dec. 25	138.00	
	III	25	Dec. 26 - Jan. 19	82.65	

num was found to be in stage III. The same trend was noticed in the *Bajra* crop also, which had a total evapotranspiration of 370 mm. With regard to sunflower, high evapotranspiration was recorded under stage II with a total evapotranspiration of 256 mm.

Considering the analysis of rainfall pattern and crop evapotranspiration, the following are the conclusions and suggestions:

summer ploughing should be given to the black cotton soil to increase the water holding capacity of the soil.

pre-monsoon sowing of cotton and sorghum could be taken up during September.

agronomic manipulations like frequent dust mulching should be given from November month onwards for all crops to reduce the evaporation.

antitranspirant chemicals can be sprayed to reduce transpiration rate of crops as

well as topping of cotton at optimum growth.

growing drought tolerant varieties of cotton like Karunganni will save the crop from the drought.

assured summer shower is recorded of this tract. Since the soil is also found to be under workable condition at this period, a short duration pulse crop can be grown with the advantage of summer showers.

since September month is found to have rainfall, pulse can be grown during the first part of the season (September 15 - November 20) and thereafter sunflower or horsegram can be grown.

REFERENCE

- BLANEY and CRIDDLE (1950) Determining water requirements in irrigated areas from climatological and irrigation data. USDA soil Conser. Service Tech, paper. 96

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