Research Notes

Agro-meteorological planning for sustainable agricultural development at Denkanikottai taluk

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Crop productivity has increased in the past four decades. The reason being use of improved seeds, fertilizers and sustainable agro-techniques. For maintaining food production in line with increasing population our agricultural research should integrate with the long-term technical policies. Dryland agriculture contributes 44 per cent of total food production in India. Food production from dryland agriculture is always uncertain owing to larger temporal and spatial variation in rainfall. In this context the climatological data of a locality become inevitable to provide necessary information to minimise risk and maximise the productivity to the extent possible. Fixing of proper growing season on the basis of moisture availability index (MAI), based on the past climatological data, will be much helpful to select suitable crop varieties and their time of sowing for a given area. Considering this, an attempt was made to identify growing season for dryland tract (accounting more than 80% of the area) of Denkanikottai taluk. Weekly rainfall data of Denkanikottai was collected from the Assistant Director of Agriculture Office, Denkanikottai fo 30 years (1971-2000). The geographic location of this region is 12°31' N latitude and 77°47' E longitude with an altitude of 750 metres above mean sea level. The soils are red calcareous with less undulating topography. Initial probability (IP) was worked out as per the procedure adopted by Balasubramanian *et al.* (1996) for 52 meteorological standard weeks by using the following simple equation after arranging the data of a particular week across 30 years in descending order and presented in Table 1.

$$IP = (N \times P) / 100$$

Where, IP = Initial probability for 50%
N = Number of rainfall years
P = Probability required

The 50% assured weekly rainfall was considered to workout initial probability as it would give valid conclusion for the agricultural operations in low rainfall areas (Hargreaves, 1974; Sarkar and Biswas, 1988).

The conditional probability (CP) for receiving 10, 20 and 30 mm of rainfall was worked out using the following formula and presented in Table 1. The conditional probability of receiving 10 or 20 or 30 mm of rainfall in any particular week will be of very useful for efficient crop planning and proper management of field operations [Balasubramanian *et al.* (1996) Parasuraman and Suresh (2002)].

$$CP = X - Y / SD$$

Where X = Mean rainfall of the week
Y = 10, 20 and 30 mm
SD = Standard deviation of the week

Moisture availability index (MAI) was worked out using the following MAI equation as suggested by Sarkar and Biswas (1988) and Balasubramanian *et al.* (1996).

$$MAI = \text{Weekly assured rainfall 50\% / PET}$$
(Potential Evapotranspiration)

The PET data for arriving MAI for Denkanikottai taluk was worked out as per the report of Rao *et al.* (1971). MAI range between 0.3 and 0.7 was assumed to be sufficient for supporting normal dryland crops from sowing to harvest and accordingly the possible cropping season has been drawn for Denkanikottai taluk. The initial probability of rainfall furnished in table 1 indicated that standard weeks from 21, 22 and 37 to 45 received rainfall more than 20mm with 50 per cent probability. It indicated that crop growth would not suffer during September to November. The highest rainfall of 58.2mm

Table 1. Probability rainfall and moisture availability index (MAI) of Denkanikottai taluk of north western agroclimatic zone of Tamil Nadu

Std. weeks	Month & Date	Mean rainfall (mm)	PET (mm)	50% Initial probability (mm)	Conditional probability			MAI
					10mm	20mm	30mm	
1.	Jan 1-7	0.2	24.8	0	0	0	0	0
2.	8-14	0.8	24.8	0	0	0	0	0
3.	15-21	0.7	24.8	0	1	0	0	0
4.	22-28	0.0	24.8	0	50	50	50	0
5.	29-4	0.0	31.2	0	50	50	50	0
6.	Feb 5-11	1.1	31.2	0	1	0	0	0
7.	12-18	1.9	31.2	0	14	1	0	0
8.	19-25	3.5	31.2	0	30	10	2	0
9.	26-4	2.4	32.4	0	12	0	0	0
10.	Mar 5-11	1.6	32.4	0	0	0	0	0
11.	12-18	0.8	32.4	0	7	0	0	0
12.	19-25	2.7	32.4	0	6	0	0	0
13.	26-1	5.7	32.4	0	36	11	2	0
14.	Apr 2-8	4.6	43.5	0	28	5	0	0
15.	9-15	7.4	43.5	0	43	21	8	0
16.	16-22	10.3	43.5	4.8	51	23	7	0.11
17.	23-29	18.1	43.5	3.6	63	42	23	0.08
18.	30-6	23.3	36.8	12.4	65	52	41	0.34
19.	May 7-13	25.6	36.8	12	67	55	43	0.33
20.	14-20	39.4	36.8	12.4	72	65	57	0.34
21.	21-27	33.2	36.8	24.9	79.0	69	57	0.68
22.	28-3	31.1	36.8	20.2	78	67	55	0.55
23.	June 4-10	29.3	42.2	15.4	66	58	50	0.36
24.	11-17	13.4	42.2	7.4	57	38	22	0.18
25.	18-24	9.6	42.2	2.7	49	25	8	0.06
26.	25-1	8.0	42.2	1.6	46	20	6	0.03
27.	July 2-8	20.5	41.8	9	61	50	38	0.21
28.	9-15	17.3	41.8	4.5	61	47	33	0.11
29.	16-22	18.0	41.8	5.4	58	48	37	0.13
30.	23-29	19.9	41.8	10	69	52	36	0.24
31.	30.5	29.0	32	9	66	50	33	0.28
32	Aug 6-12	16.0	32	11.2	63	39	19	0.35
33	13-19	32.8	32	13	63	57	50	0.41
34	20-26	29.3	32	13.6	68	58	9	0.43
35	27-2	21.0	32	12	68	52	36	0.38
36	Sep 3-9	33.0	37.8	13.8	70	63	55	0.37
37	10-16	47.4	37.8	28.3	75	69	56	0.75
38	17-23	61.8	37.8	35.4	81	77	72	0.94
39	24-30	68.4	37.8	58.2	85	79	73	1.54
40	Oct 1-7	64.4	28.6	37.6	76	1	65	1.31
41.	8-14	38.4	28.6	25.2	78	68	58	0.88
42.	15-21	30.2	28.6	14.4	72	61	48	0.50
43.	22-28	46.1	28.6	20.1	71	56	53	0.70
44.	29-4	37.7	24.2	22.2	75	67	59	0.92

Std. weeks	Month & Date	Mean rainfall (mm)	PET (mm)	50% Initial probability (mm)	Conditional probability			MAI
					10mm	20mm	30mm	
45.	Nov 5-11	24.9	24.2	20.6	76	61	45	0.85
46.	12-18	23.8	24.2	2	66	56	45	0.08
47.	19-25	21.3	24.2	2.8	58	45	32	0.12
48.	26-2	7.8	24.2	0	45	24	10	0
49.	Dec 3-9	16.3	24.5	1.8	58	48	37	0.07
50.	10-16	10.6	24.5	0	50	32	17	0
51.	17-23	3.5	24.5	0	23	3	0	0
52.	24-31	3.4	24.5	0	20	2	0	0

was recorded in 39th standard week (Sep.24 to 30). Conditional probability of receiving 10 or 20 or 30mm of rainfall in any particular week will be of very useful for efficient crop planning and proper management of field operations. The standard weeks 18 to 23, 27, 30, 31, 33 to 39, 41 to 46 had 20mm of rainfall with probability of more than 50 per cent. Similarly the standard weeks 20 to 23 (14th May to 10th June, 36 to 44 (3rd Sep.to 4th Nov.) had 30mm of rainfall with a probability of more than 50 per cent.

The data on moisture availability index (MAI) as presented in Table 1 revealed that there were two peaks, one was starting from 18th standard week (42 days) in 30th April to 10th June, and a second peak from 32nd standard week and extended upto 45th standard week (98 days or 14 weeks) i.e. 6th August to 11th November. The rainfall received during first peak of summer and early southwest monsoon season will be utilized for summer ploughing and field preparation for sowing of crops. Based on this groundnut is one of the most important crop being cultivated in these area with inter, border and strip crops of castor, redgram, sorghum and mustard from June 15th to July 15th depending upon the onset of the monsoon. Finger millet is the next predominant dryland crop sown between July 15th to Aug 15th with Niger, Mustard, Sorghum, Lab Lab, Cowpea and Castor as inter, border or mixed crop. Horse gram will be

sown immediately after the harvest of first season crop with available residual moisture at the end of October and dew will take care of the crop during November and December months. Parasuraman and Suresh (2002) suggested similar type of crop programme for Paiyur region.

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