551.579 : 551.585 : 53 : 63

RAINFALL AND WATER AVAILABILITY PERIODS FOR GRASSLAND ESTABLISHMENT IN JAISALMER REGION

Jaisalmer, located in Thar desert of western Rajasthan receives an annual rainfall of 188.1 mm of which 87 per cent of the rainfall occurs during the southwest monsoon season. The coefficient of variation of annual rainfall is 65.4 per cent. Ramana Rao et al. (1983) reported that the percentage of net sown area to the total area is only 4 per cent in the Jaisalmer district. The major problem in this area is establishment of grasslands and stabilization of shifting sand dunes. Therefore, the rainfall data recorded at Jaisalmer during the years 1901-80 were analysed to identify conditions favourable for establishment of grasslands with relatively less risks.

2. The annual rainfall was in deficit by more than 25 per cent of its normal in 36 out of 80 years compared to 23 out of 80 years with surplus of rainfall by more than 25 per cent of the normal value thereby indicating negatively skewed, distribution of annual rainfall.

3. The mean weekly rainfall and the percentage frequencies of occurrence of weekly rainfall of more than 0.0, 10.0 and 20.0 mm during different standard weeks of the southwest monsoon season are given in Table 1. The mean weekly rainfall is more than 10 mm and less than 18 mm from 27th to 36th week. If we consider that a week with probability of occurrence of rainfall of at least 10 mm is 50 per cent or more as a dependable week of getting rain, the rainfall is not dependable during any week even within the southwest monsoon season.

4. As the probabilities of occurrence of weekly rainfall during different weeks of the monsoon season are not helpful in identifying any period with assured rainfall, the conditional probabilities for a wet week followed by one and two wet weeks and also for a wet week followed by one, two and three dry weeks were computed using first order Markov Chain Model. For this purpose a week with rainfall of at least 10 mm was considered as a wet week as mean weekly rainfall during different weeks of the monsoon season is slightly more than 10 mm. The conditional probabilities thus obtained from 22nd to 41st week (28

TABLE 1

Percentage frequencies of occurrence of different amounts of weekly rainfall during southwest monsoon season at Jaisalmer (1901–1980)

Standard week No.	Date of commencement	Mean weekly rainfall (mm)	Percentage frequencies of occurrence of weekly rainfall (mm) of		
			0.0	10.0	20.0
23	4 Jun	1.7	16	4	4
24	11 Jun	3.4	20	8	5
25	18 Jun	3.0	20	9	6
26	25 Jun	7.3	26	16	7
27	2 Jul	10.8	47	29	19
28	9 Jul	15.7	50	39	26
29	16 Jul	11.4	50	29	23
30	23 Jul	15.4	54	38	25
31	30 Jul	12.9	46	37	21
32	6 Aug	12.7	44	31	21
33	13 Aug	17.9	44	26	16
34	20 Aug	15.1	50	39	25
35	27 Aug	15.5	42	34	20
36	3 Sep	10.0	34	19	15
37	10 Sep	6.8	22	13	16
38	17 Sep	1.6	14	6	2
39	24 Sep	1.7	19	8	3

May to 14 October) are given in Table 2. A perusal of the table suggests that, it is risky to sow grasses in the event of a wet week upto 24th week as the probabilities for the wet week followed by a wet week are very less. However, in the event of wet week occurring during 26th or 27th week, grasses can be sown as the probabilities of occurrence of a wet week followed by a wet week are as high as 70 to 75 per cent. The probabilities of occurrence of a wet week during 26th and 27th weeks are 16 and 30 per cent respectively. It is more risky to take up sowing of grasses from 28th week onwards, as the probabilities of occurrence of wet week followed by a dry week are higher.

The average rainfall for the rest of the year from 26th week onwards was found to be 150 mm and out

TABLE 2

Conditional probabilities (%) for wet weeks followed by dry and wet weeks at Jaisalmer

Standard week	Conditional probability (%)				
	W/1D	W/2D	W/3D	W/1W	W/2W
22	80.0	60.0	60.0	20.0	0.0
23	100.0	66.7	66.7	0.0	0.0
24	100.0	100.0	100.0	0.0	0.0
25	50.0	50.0	25.0	50.0	25.0
26	25.0	25.0	12.5	75.0	50.0
27	29.4	29.4	29.4	70.6	41.2
28	40.9	22.7	22.7	59.1	45.5
29	40.9	13.6	4.5	59.1	40.9
30	35.5	19.4	12.9	64.5	45.2
31	40.0	24.0	20.0	60.0	28.0
32	46.4	35.7	21.4	53.6	35.7
33	33.3	20.8	16.7	66.7	45.8
34	25.8	19.4	16.1	74.2	38.7
35	37.9	31.0	27.6	62.1	51.7
36	27.3	18.2	18.2	72.7	63.6
37	27.8	22.2	16.7	72.2	50.0
38	42.9	42.9	42.9	57.1	35.7
39	44.4	33.3	33.3	55.6	22.2
40	33.3	33.3	33.3	66.7	33.3
41	66.7	66.7	66.7	33.3	33.3

of 32 years when 26th and/or 27th week remained wet, the rainfall during the subsequent period was found to be more than 150 mm in 20 out of 32 years.

5. Weekly water balance computations were made for all the years 1901-80 using Thornthwate and Mathers' (1955) technique. The weekly potential evapotranspiration (PE) values were calculated using Penman's (1948) method. As the soils are sandy in Jaisalmer district, the water holding capacity of the soil was assumed as 110 mm. From the actual evapotranspiration values obtained from water balance computations, the weekly values of the ratio of actual evapotranspiration (AE) to the potential evapotranspiration (PE) were calculated weekwise. The values of
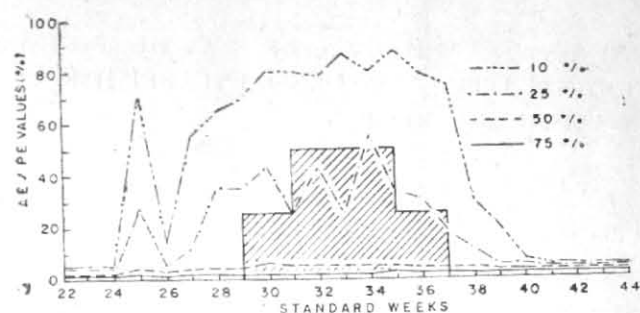

Fig. 1. Water availability (AE/PE) curve at different probabilities at Jaisalmer

AE/PE with probabilities of 25, 50 and 75 per cent were determined weekwise during the monsoon season and are shown in Fig. 1. Rao et al. (1984) studied the influence of water availability conditions on water and energy use efficiencies of some arid land grass species and showed that the minimum value of AE/PE required for assured survival and growth of grasses is around 0.25. From Fig. 1, it can be seen that the value of AE/PE will be about 0.25 from 27th week to 37th week (2 July to 16 September) with a probability of 25 per cent. Therefore, establishment of grasses over sand dunes is possible on the average once in four years only.

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