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Short communication

Rainfall characteristics, and crop planning with reference to rice in Konkan

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Rainfall variability is a major factor influencing the agricultural productivity and sustainability in the tropics (Virmani, 1994). The development of improved crop production technology in rainfed areas to increase food production requires quantitative understanding of the temporal variation of rainfall during crop growth. Weekly rainfall data as well as monthly rainfall data are very useful for determining (i) date of start (ii) date of cessation (iii) Length of the rainy season, which is a prerequisite for planning cropping system. Rainfed rice is one of the most important crops grown during kharif season in the Konkan region of Maharashtra. The productivity is largely influenced by the rainfall distribution and its intensity during the monsoon season. Keeping in view the importance of rainfall variability the present study was undertaken to assess the changes in rainfall distribution during crop phenophases useful to develop suitable crop planning and for management against extreme events of rainfall causing partial or complete crop losses.

Analysis of daily historical rainfall data was carried out to study the rainfall variability. Daily rainfall data of last 34 years were collected from the Agromet observatory, Department of Agronomy (17° 46' N to 73 ° 12'E, 250 m MSL) for the period of 1972-2005 and analyzed to study rainfall distribution pattern over rice crop period. The onset and cessation of monsoon rain were also computed for evaluation of length of the crop-growing season. The major crops grown in Konkan region during kharif season are Rice, Finger millet, Niger and vegetables like Ridge gourd, Bitter gourd, Okra, Cucumber, Bottle gourd and Snake gourd etc., while crops viz. Cowpea, Dolichos bean, Mustard and Groundnut are grown in rabi season. The data were analyzed for rainfall deficit/excess pattern, rainfall characteristics in terms start and cessation trend and for extremely high rainfall events during the study period.

Rainfall deficit and rice

The rainfall deficit analysis of the Konkan region revealed that there was no severe deficit of rainfall during 34 years (Table 1). About 50 % of the years were normal rainfall years and 88 % of the years received normal to above normal rainfall. The rainfed rice cultivation in *kharif* season is the most suitable cropping proposition as 88% of the years indicated adequate to surplus rainfall during the crop season. The data (Table 1) also indicated that, 32 % of the years are surplus rainfall years and 9 % are highly surplus rainfall years. The extremely high rainfall during seedling or maturity may cause partial or total crop loss due to long period of flooding and crop submergence. Similarly, incessant rainfall during flowering may lead to washing of pollen and increased number of unfilled grains and heavy yield loss.

Annual rainfall distribution

The historical rainfall data of 34 years (1972-2005) indicated that the region received normal annual

Table 1: Rainfall deficit pattern

Criterion (From Normal)	Scale	No. of years	% of the years
Less than – 0.59	Severe deficit	Nil	0
– 0.19 to – 0.59	Moderately deficit	4	12
– 0.59 to + 0.19	Normal	16	47
+ 0.19 to + 0.59	Surplus	11	32
More than + 0.59	Highly Surplus	3	9
Total		34	100

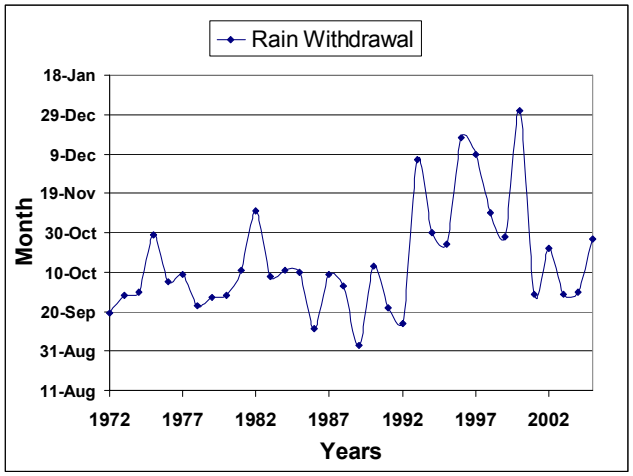


Fig. 1: Trend of rainfall start and withdrawal at Dapoli during 1972-2005

rainfall of 3476.74 mm. The annual rainfall ranged from 2409.4 mm (2001) to 5134.3 mm (1975) in 110 days. The lowest and the highest rainfall between 1972-2005 in relation to commencement and cessation of rainfall indicated that the lowest rainfall years have delayed commencement and early withdrawal of monsoon. Rainfall of severe deficit never occurred while that of moderately deficit was 12%. Similarly, the chances of rainfall being moderately surplus (32%) were fairly high and highly surplus years (9%) were also substantial during the 34 years.

Characteristics of rainy season

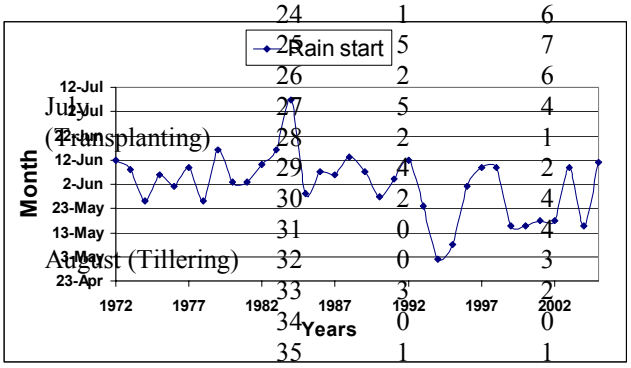
Data on the commencement, withdrawal and duration of rainy season and it's variability at Dapoli location are presented in Table 2. The weekly rainfall data revealed that the normal week of start of rainy season has been 24 MW (11-17 June). Normal week of withdrawal of rainy season was 40 MW (1-7 October). Normal duration of rainy season is 17 weeks (119 days)

Table 2: Characterization of the rainy season at Dapoli

Particulars	Week No.	Date
Mean week of start	24	11-17 June
Earliest week of start	21	21-27 May
Delayed week of start	29	16-22 July
Mean week of cessation	40	1-7 Oct.
Earliest week of cessation	36	3-9 Sept.
Delayed week of cessation	43	22-29 Oct.
Mean length Duration	17 weeks	119 (days)
Highest	19 weeks	133 (days)
Lowest	15 weeks	105 (days)

Table 3: Frequency of weekly rainfall between 250-300 and above 500 mm

Month (Rice Phenology)	Met weeks	Frequency of weekly rainfall	
		250-300 mm	> 500 mm
June (Seedling)	22	1	0
	23	0	1
	24	1	6
	25	5	7
July (Transplanting)	26	2	6
	27	5	4
	28	2	1
	29	4	2
	30	2	4
	31	0	4
August (Tillering)	32	0	3
	33	3	2
	34	0	0
	35	1	1
September (Flowering	36	4	0
	37	0	0
	38	2	0
	39	1	0
October (Maturity)	40	0	0
	41	0	0



and the highest and the lowest length of rainy season was 19 (133 days) and 15 weeks (105 days), respectively. This shows very small variation in the length of rainy season and is fairly useful for deciding crops and cropping enterprises.

Trend of commencement and withdrawal

The commencement and withdrawal of monsoon

over 34 years indicated increased early starts and delayed withdrawal trend of monsoon (Fig. 1.). Early start has always favorable effect on performance of rice but delayed withdrawal may damage the crop of rice at maturity due to continuous flooding, lodging, submergence and sprouting of seeds and delayed harvest leading to heavy yield losses often totally. In fact, in Konkan region the crop losses of rice are often by high extremes of rainfall than due to low extremes or deficit.

Extreme events of high rainfall

The frequency analysis of very high rainfall events (> 500 mm/week) (Table 3) revealed that during the period from 1972-2005 the torrential rainfall events were more frequent in 25 MW(18th June to 24th June) followed by 24 MW(11th June to 17th June) indicating that the period from 24 to 26 MW could be considered for recurrence of such extreme events for forewarning to farmers Similarly, the next extremely high rainfall event frequency usually seen in 30 to 32 MW (23rd July to 12th August), coincides with end of transplanting of rice and may influence the late-planted crop due to submergence.

Thirdly, continuous showers during flowering and pollination especially during morning hours leads to reduced grain filling and yield loss. In this regard the 36 (3rd September to 9th September) and 37 MW (10th September to 16th September) having higher frequency of occurrence of rainfall between 250 to 300 mm may be damaging to early rice varieties (Table 3).

Crop planning

Rainfed rice is the main crop grown during the wet season in this region. Because of good monsoon showers farmers can start the sowing of rice nursery during late May to early June (21-22 MW) as rain received during this period is sufficient for land preparations and sowing of rice crop in nursery (Saha and Biswas, 2004). However, the transplanting of rice crop should be completed before middle of July because heavy rains generally start from 29 MW and continue upto 33-35 MW. Heavy rainfall (> 60 mm), generally occurs during 27-31 MW (July-September) in this region, providing opportunity to harvest a portion of the excess rain water which can be utilized either for life saving irrigation during the years of early withdrawal of monsoon rain or it can be utilized for raising a second short duration crop like groundnut, sunflower, cowpea, leafy vegetables, watermelon and mustard during the winter season with limited irrigation.

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