

Annual and seasonal rainfall variability at Dharwad, Karnataka*

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The annual and seasonal rainfall received and its variability directly influences the success or failure of crops through its beneficial or adverse effect on growth and yield. Therefore, the study of variability of annual and seasonal rainfall is essential in selection of suitable crops and to take appropriate mitigating measures based on rainfall characteristics. The annual and seasonal rainfall data for the period between 1974 to 2009 for 36 years at Main Agricultural Research Station (MARS), University of Agricultural Sciences, Dharwad were studied for their variability and dependability. Dharwad is located in the Northern Transition Zone of Karnataka (Zone-8, as per NARP classification) at a latitude of 15° 25' N and longitude 75° 07' E with an altitude of 678 m above the mean sea level. The normal rainfall distribution indicated bimodal distribution of rainfall with a first peak in July and the second in October.

The rainfall of 36 years (Table 1) ranged from 178.0 to 1081.1 mm with a mean of 714.0 mm. The standard deviation (SD), was higher (208.6) with a coefficient of variation of 29.2% indicating higher variability and lesser dependability. During better rainfall years 1974 to 1998 (25 years) mean rainfall was higher (735.3 mm) with a lower SD (134.47) and CV (18.08%). During the bad years in Karnataka, the rainfall during 1999 to 2004 (6 years) was meagre ranging from 178.0 to 602.1 mm with a mean of only 406.5 mm and SD of 159.76 with a very high CV of 39.3% which indicated very high rainfall variation and occurrence of droughts. On the contrary during last five years (2005-09) the annual rainfall was high ranging from 862.6 to 1081.1 mm with a mean of 979.9 mm and a very low SD (85.79) and CV (6.68%) indicating least

variability and more dependability.

The seasonal rainfall variability (Table 2) during the last 16 years (1994-2009) indicated that pre-monsoon season rains were deficit in 10 years (19.7 to 69.7%) and excess in six years (20.7 to 44.1%) as against the normal rainfall of 136.0 mm. During the months of South-West Monsoon (SWM) season (June to September), the rainfall ranged from the lowest 72.3 mm in 2003 to the highest 788 mm in 2007 as against the normal SWM rainfall of 457.7 mm. Rainfall was deficit continuously from 1999 (53.2%) to 2003 (84.2%) indicating severe drought like conditions. Drought intensity was classified as per IMD [Normal (N) rainfall mean \pm 10%; Slight Drought (-11 to -25% of N); Moderate Drought (-26 to -49%) and Severe Drought (-50% & above)]. Rainfall was more than 30% of normal from 2005 onwards till date indicating excess rainfall. The post-monsoon season rainfall (October to December) after 1998 continuously till 2008 was deficit upto 89.9% in 2001 indicating reduced rainfall compared to normal in post-monsoon season which may affect the *rabi* crops. The annual rainfall was normal during six years (1994 to 1998 and 2006), while excess during 2005 and 2007 to 2009 (21.6 to 41.9%) and continuously six years severe deficit (upto 76.6%) from 1999 to 2004 of which two years moderate drought (1999-2000), three years severe drought continuously (2001-2003) and one year slight drought (2004). Similarly, Sahu (2008) reported annual and seasonal variability of climate in South Saurashtra Agroclimatic Zone. Parmar *et al.* (2005) and Krishnakumar and Prasad Rao (2008) reported rainfall variability in Gujarat and Kerala state, respectively. Sheoran *et al.* (2008) observed weekly rainfall variability in lower foothills of Punjab.

The rainfall pattern and seasonal distribution is changing over time. This information is helpful in the preparation and modification of cropping plans and management practice to cope up with aberrant weather for enhancing the productivity of agricultural and allied sectors more so in rainfed areas.

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Table 1: Annual rainfall (mm) variability between 1974-2009 at Main Agricultural Research Station, Dharwad

Period	Range	Mean	S. D.	CV (%)
I. 1974-2009	178.0-1081.0	714	208.6	29.2
II. 1974-1998	547.0-1047.0	735.3	134.5	18.1
III. 1999-2004	178.0-602.1	406.5	159.8	39.3
IV. 2005-2009	862.6-1081.1	979.9	85.5	6.7

*Papers presented at and reviewed for proceeding of national seminar on "Agrometeorology-Needs, Approaches and Linkages for Rural Development" held at CCSHAU, Hisar during 26-27 November 2009.

Table 2: Seasonal rainfall (mm) variability during 1994 to 2009 at Main Agricultural Research Station, Dharwad

Seasons	Normal	1994	1995	1996	1997	1998	1999*	2000*	2001*	2002*	2003*	2004*	2005#	2006	2007#	2008#	2009#
I. Pre-monsoon (Jan-May)	136	91.6	82.4	83.8	179.9	41.2	47.5	89.5	75.2	187.6	55.1	85.2	109.2	173.5	164.2	196	173.4
Deviation (%)	-	-32.6	-39.4	-38.4	32.3	-69.7	-65.1	-34.2	-44.7	(63 a)	-59.5	-37.1	-19.7	27.6	20.7	44.1	27.4
II. SW Monsoon (June-Sept)	457.7	523.9	499.9	430.8	409.8	549.9	214.2	358.4	177.3	130.2	72.3	451.4	774.5	595.1	788.1	598	702.8
Deviation (%)	-	14.5	9.2	-5.9	-10.5	20.2	-53.2	-21.7	-61.3	-71.6	-84.2	-1.4	69.2	30.0	72.2	30.7	53.5
III. Post-monsoon (Oct-Dec)	168.4	169.2	208.5	168	205.3	138.3	160.7	91.3	17.0	110.6	50.6	65.2	127.4	94.0	128.8	132.6	186.4
Deviation (%)	-	0.5	23.5	0.6	21.9	-17.9	-4.6	-45.8	-89.9	-34.3	-70.1	-61.3	-24.3	-44.2	-23.5	-21.3	10.6
IV. Yearly total	762.1	784.8	790.8	682.6	795	729.4	423.7*	539.2*	269.5*	428.4*	178.0*	602.1*	1011.1	862.6	1081.1	926.8	1062.4
Deviation (%)	-	3.0	3.8	-10.4	4.3	4.3	-44	-29.2	-64.6	-43.8	-76.6	-21.0	32.7	13.2	41.9	21.6	39.4
Category	-	N	N	N	N	N	MD	M	SD	MD	S	SLD	E	N	E	E	E

*Deficit rainfall years, #Excess rainfall years, N-Normal (Mean±10%), E-Excess, D-Deficit.

Drought intensity (IMD), SLD-Slight drought (-11 to -25%), MD-Moderate drought (-26 to -49%), S-Severe drought (-50% & above).

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