Original Research Article

Annual, Seasonal and Monthly Rainfall Variability at Dharwad in Karnataka

ABSTRACT

Rainfall is one of the important weather factors deciding the economy, food habits, industries and work force of the area. Distribution of rainfall throughout the year further decides cropping pattern, variety to be cultivated and duration of the crop and management practices for efficient rainfall utility. In this regard 51 year past rainfall data (1970-2020) of Dharwad district of Karnataka was collected from main agricultural research station (MARS), UAS, Dharwad for analysing seasonal, annual and monthly variabilities. From the analysis we found that the rainfall varied in the range of 417 to 1316 mm with the average of 748 mm and with the variation of 22 %. Five years moving rainfall average showed declining trend. July month recorded highest average rainfall of 136 mm with the lowest variation (39 %). Though January month recorded lowest rainfall (one mm), the highest variation was observed in February. Southwest (Jun-Sept), Northeast (Oct-Dec), Winter (Jan-Feb) and Post monsoon (March-May) contributed 65 %, 19 %, 1% and 15 %, respectively of the annual rainfall of Dharwad district. The lowest variation in rainfall over the years was observed in Southwest monsoon (27 %) while winter season showed highest variation. Farmers can be advised to take long durated crops like Cotton and Maize in *kharif* because of nearly even distributed rainfall for the months from June- October and early sowing in case of *rabi* to harness the more moisture for better yield. Summer sowing should be avoided because of more uncertainty in rainfall.

Key words: *Rainfall, Seasons, Variability, Distribution and Monsoon.*

INTRODUCTION

Rainfall is one of the most important elements affecting agricultural production stability, which is dependent on the onset and dispersion of the Southwest monsoon. The onset of the monsoon and the distribution of rainfall vary from year to year. Crop production activities are governed by time of occurrence and spatial variability. Climate variability, such as precipitation affects crop growth stages and, as a result, effects agricultural yield. During the crop season, variations in seasonal rainfall timing make it difficult for farmers to choose the best time to sow crop seeds and apply agricultural inputs.

Dharwad is situated in Karnataka's Northern Transition Zone (Zone-8 according to NARP classification) at a latitude of 15^0 25′ N and a longitude of 75^0 07′ E, at an altitude of 678 m above mean sea level. The bimodal rainfall distribution shown by the normal rainfall distribution indicated a first peak in July and a second peak in October (Halikatti et al., 2010). The amount of yearly and seasonal rainfall received and its unpredictability has a direct impact on crop success or failure because of its positive or negative effect on crop growth and output. As a result, studying the variability of annual and seasonal rainfall is critical for choosing acceptable crops and implementing appropriate mitigation measures based on rainfall features. Hence, annual and seasonal rainfall data from the Main Agricultural Research Station (MARS), University of Agricultural Sciences, Dharwad, were examined for their variability and dependability over a 51 year period from 1970 to 2020.

MATERIALS AND METHODOLOGY

The annual and seasonal rainfall data of Dharwad district (Fig 1) for the period between 1970 to 2020 (51 years) at Main Agricultural Research Station (MARS), University of Agricultural Sciences, Dharwad were studied for their variability and dependability. Seasonal analysis was divided into Southwest (June- September), Northeast (October- December), Winter (January-February), Pre-monsoon (March- May) and monthly average. Further, five year moving average was calculated to know the trend of rainfall for the 51 years.

RESULTS and DISCUSSION

Monthly rainfall

Average monthly rainfall ranges from one mm to 136 mm for the period of 1970 to 2020. The highest average monthly rainfall was 136 mm and it's CV of 38.5 % in the month of July followed by September, June and August with 122 mm,115 mm and 114 mm, respectively (Fig 2). Hence certain moisture conservation measures could be taken which could be used in next season.

Lowest average monthly rainfall was one mm in the month of January with CV of 268 %. August month showed highest variation in the rainfall with the CV of 61 % followed by September (48 %), June (45 %) and July (38.5 %), respectively (Table 1).

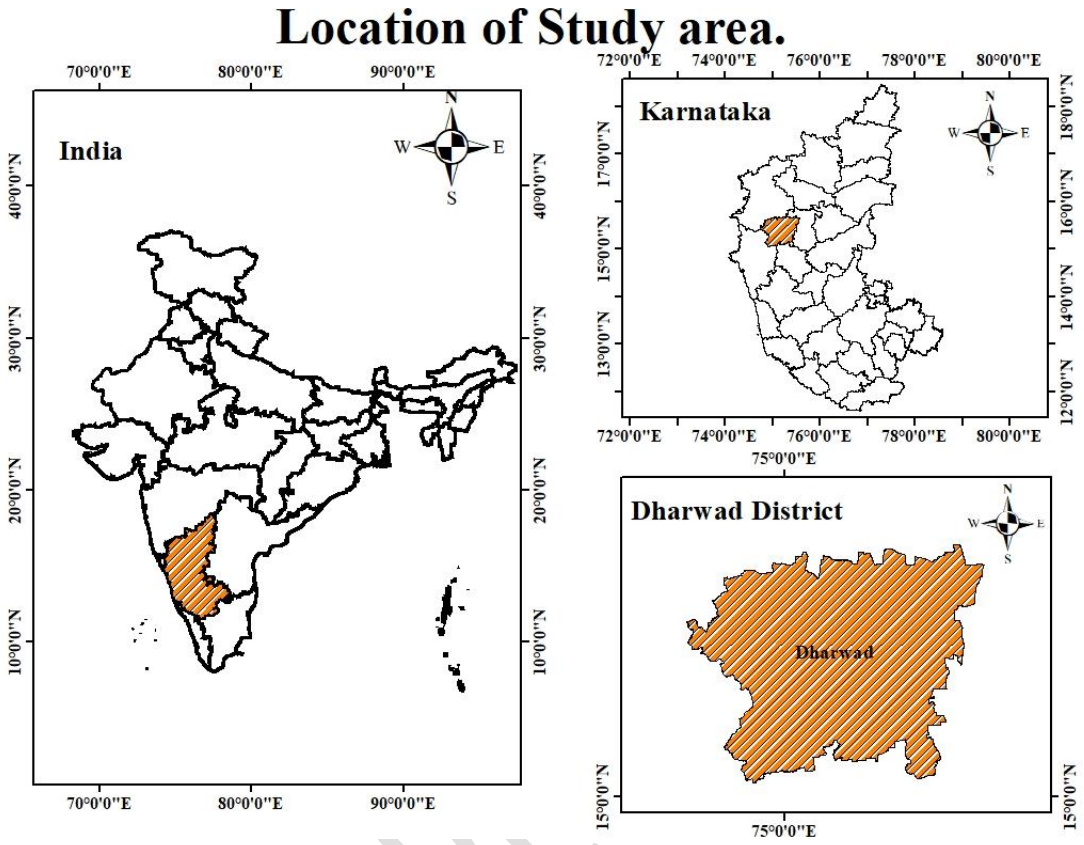

Fig. 1: Spatial map of Dharwad district of Karnataka

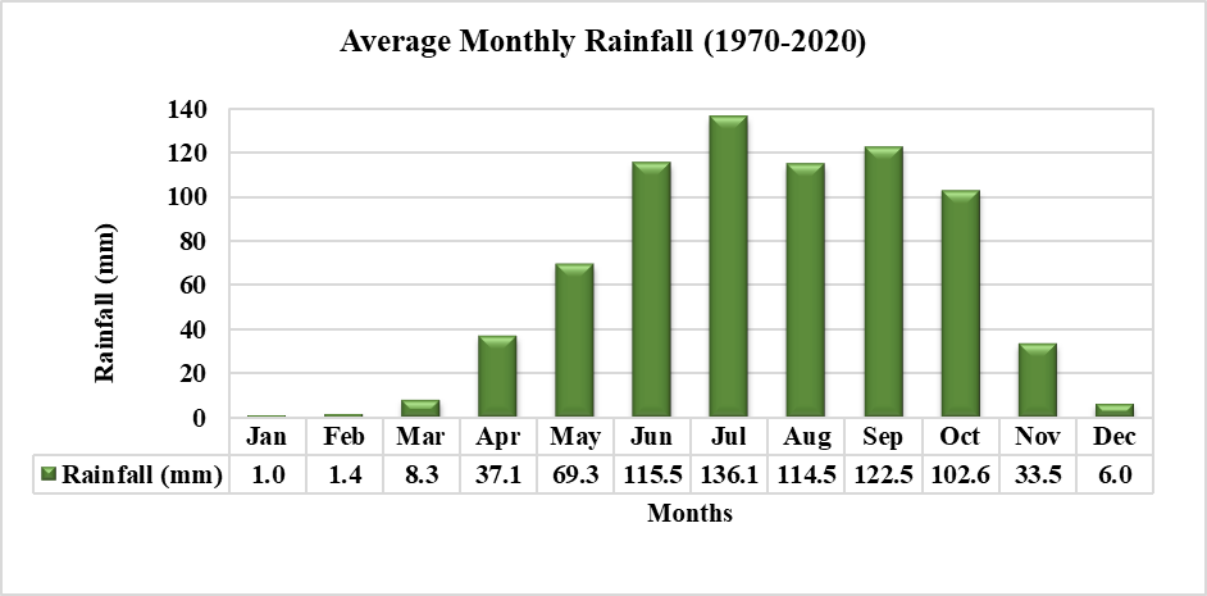

Fig. 2: Average monthly rainfall of Dharwad district 1970-2020

Table 1: Average monthly and seasonal rainfall from 1970 to 2020 of Dharwad district of Karnataka

MONTHS & SEASONS	MEAN (mm)	SD (mm)	CV (%)
January	1.0	2.7	268.9
February	1.4	3.9	274.6
March	8.3	17.5	211.3
April	37.1	22.0	59.3
May	69.3	42.5	61.3
June	115.5	52.0	45.0
July	136.1	52.5	38.5
August	114.5	70.0	61.1
September	122.5	58.9	48.1
October	102.6	58.6	57.1
November	33.5	38.7	115.7
December	6.0	11.6	192.9
Annual	**747.7**	166.5	**22.3**
Southwest	**488.6**	133.7	**27.4**
Northeast	**142.1**	69.9	**49.2**
Winter	**2.4**	5.0	**205.1**
Pre-monsoon	**114.6**	51.6	**45.0**

Seasonal rainfall

Mean rainfall during south west (SW) monsoon season (June to September) is 488.5 mm which accounts for 65% of annual rainfall, with an average of 36 rainy days with the standard deviation (SD) of 134 mm. The highest rainfall was recorded in the month of July with 331.2 mm (Fig 3). During north-east monsoon period (October to December) the mean rainfall is 142 mm which accounts for 19% of annual rainfall with an average of 8 rainy days with the standard deviation (SD) of 70 mm. The highest rainfall was recorded in the month of October with 323.2 mm. Mean rainfall during pre-monsoon period (March to May) is 114.5 mm which accounts for 15% of annual rainfall and had the standard deviation (SD) of 52 mm (Table 1). This pre monsoon shower is used for land preparation activities. Mean rainfall during winter (Jan-Feb) is 1.2 mm.

Both south west and north east monsoon are dependable with coefficient of variation (CV) of 27 and 49 percent respectively. Since considerable amount of rainfall is received during both south west and north east monsoon (bimodal), farmers are advised to extend the cropping period up tos December.

Annual rainfall

The mean annual rainfall is 747.73 mm spread over in 51 rainy days with standard deviation (SD) of 166.5 mm and coefficient of variation (CV) 22.2 per cent (Table 1). Decreasing trend of annual rainfall with five years moving average was observed over the period between 1970 and 2020 (Fig 4).

Similarly, Sahu (2008) reported annual and seasonal variability of climate in South Saurastra 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.

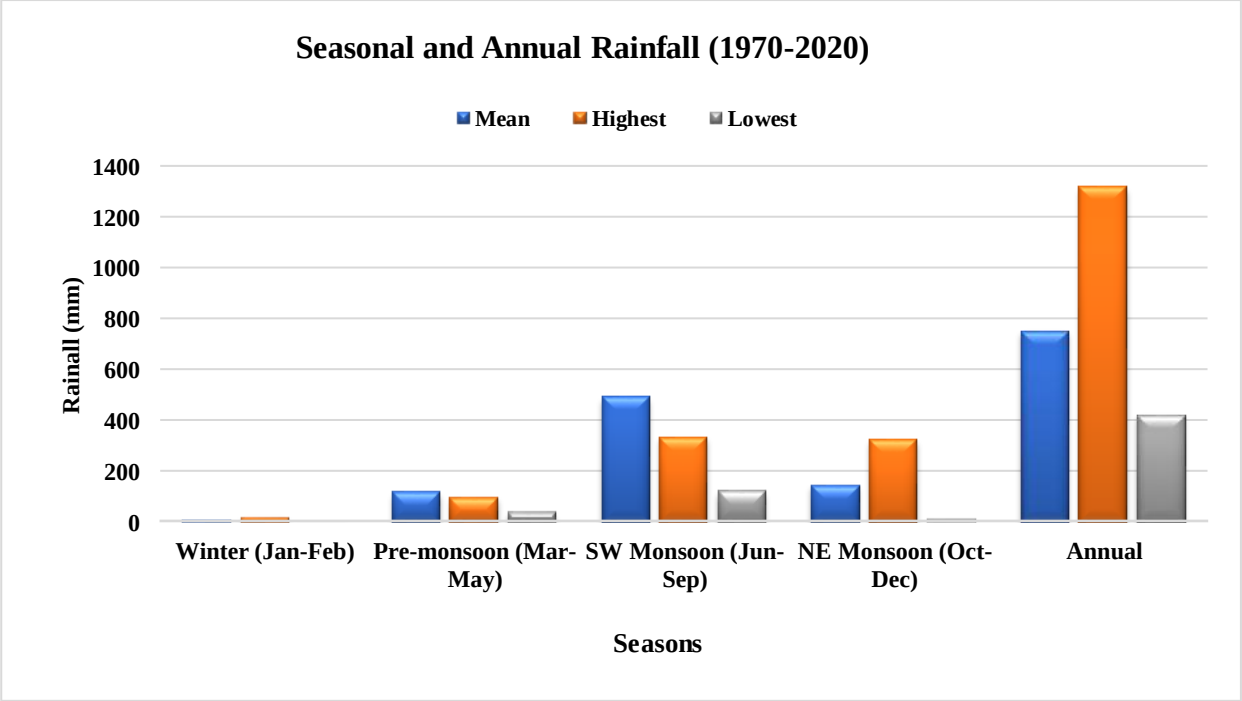

Fig 3: Seasonal and annual rainfall variability of Dharwad district from 1980-2020.

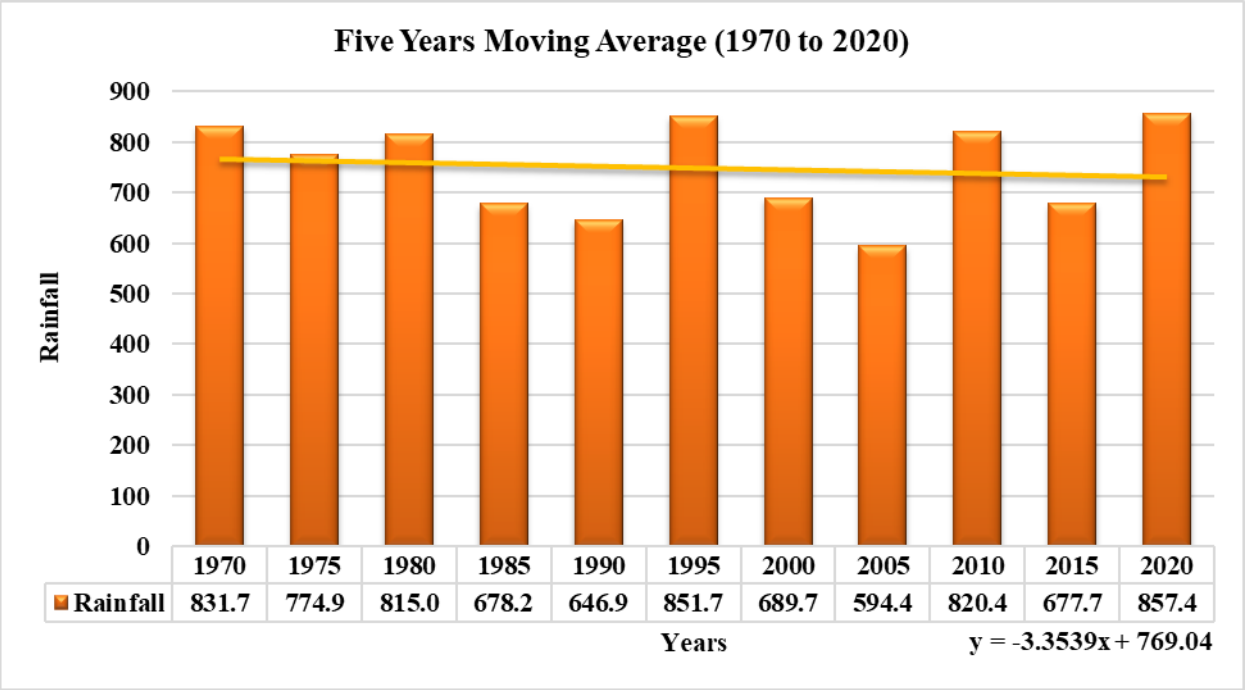

Fig 4: Five years moving average rainfall from 1970 to 2020 of Dharwad district of Karnataka

CONCLUSION

The seasonal distribution of rainfall and its pattern are changing over time. Cropping patterns of study area may be replaced with some other cash crops since it follows bimodal rainfall distribution. Integrated farming system (IFS) is also encouraged in order to improve the economic efficiency of the farmers. Development of moisture conservation techniques is also essential.

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