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Short Comminucation

Impact of rainfall variability and trend on rice yield in coastal Karnataka

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Climate variability is a key element influencing the agricultural and fishery productivity in coastal areas of Karnataka (Vinaya *et al.* 2017). Spatial and temporal variations of precipitation have large impacts on agricultural production. The coastal Karnataka exhibits a high longitudinal and temporal erraticism of rainfall, which is on the upwind side of the mount range and dense forest (flora) of Western Ghats. Typically, this region receives heavy precipitation due to orographic effect (Soman and Kumar, 1990). The interface of zone receives intense precipitation, and it decreases significantly as moves towards the central area. However, irrigated paddy in portions of south Karnataka and north-most districts of Kerala is likely to increase (Sneh, 2013).

The primary objective of this paper is to study the effects of rainfall variability on the rice production in the coastal Karnataka comprising Dakshina Kannada (12.87°N 74.88°E), Udupi (13.3389°N 74.7451°E) and Uttara Kannada (14.6°N 74.7°E) districts. The rainfall data (1980-2013) and rice production data (2001 to 2011) were collected from the Department of Agricultural Meteorology, University of Agricultural Sciences, Bengaluru. Rainfall data was analyzed as per four seasons monsoon season (June to September), post monsoon (October and November), winter (December to February) and summer season (March to May). Rice production (mean yield of coastal region comprising Dakshina Kannada, Udupi and Uttara Kannada districts) of the *kharif* season for eleven years data was analysed with rainfall data.

The trend analysis was done using the non-parametric statistical tests i.e. Mann-Kendall test and Sen's slope estimator on the seasonal and annual rainfall of all the three districts.

Variability and trends in rainfall

The annual rainfall in three districts varied between 3417.4 mm in Uttar Kannada to 4388.3 mm in Udupi districts. About 84-90 per cent of annual rainfall occurs during monsoon season (Table 1) in different districts. The variation in rainfall was maximum for Dakshina Kannada district in monsoon season. Post monsoon rains contribute 6.2 to 9.5 per cent to annual rainfall. Winter rainfall (December–February) accounts for only 0.2 to 0.6 per cent, while summer season contribute 2.5 to 5.5 per cent. The non-significant increasing trend is observed in winter, summer and post-monsoon of all the three districts, while monsoon rainfall shows an increasing trend in Uttara Kannada district (8.6 mm yr^{-1}). A non-significant decreasing trend in monsoon rainfall of Dakshina Kannada (-7.1 mm yr^{-1}) and Udupi district (-1.9 mm yr^{-1}) over the period of 1980 to 2013 was observed. Krishnakumar (2009) reported a significant decrease in southwest monsoon rainfall and an increase in the post-monsoon season. Rainfall during the post-monsoon season, which is vital in crop intensification shows rising but non-significant in Udupi and Uttar trend. The non-significant decreasing trend in Dakshina Kannada. Soman *et al.* (1988) also observed decreasing trend in the mean annual rainfall for stations in the Kerala.

Impact on rice yield

Fig. 1 shows that paddy production in coastal Karnataka region in relation to monsoon rainfall. Rainfall (the independent variable) explained approximately 23 per cent of the variations in the quantity of rice produced over the period. The correlation analysis shows that there is a weak linear association between rainfall amount and rice production. As rainfall distribution over time is essential with the appropriate amount of rain for better rice production and correlation, do not account the distribution with quantum. Besides, other environmental factors also play a vital role in integration way for crop performance. The period and timing of precipitation, as well as the total amount of summer monsoon rainfall, is important for rice cultivation (Gadgil *et al.* 2002).

Table 1: Seasonal rainfall variability in coastal Karnataka n=34

Districts	Season	Sen's slope(Q)	Average rainfall (mm)	Contribution to the total rainfall (%)
Dakshina Kannada	Winter	0.02	22.1	0.6
	Summer	1.73	209.6	5.5
	Monsoon	-7.1	3278.6	84.4
	Post-Monsoon	1.28	368.2	9.5
	Annual	-3.2	3878.6	-
Udupi	Winter	0.04	13.7	0.3
	Summer	1.29	140.4	3.2
	Monsoon	-1.86	3913.2	89.2
	Post-Monsoon	2.41	320.9	7.3
	Annual	4.9	4388.3	-
Uttara Kannada	Winter	0.00	7.9	0.2
	Summer	1.07	85.2	2.5
	Monsoon	8.59	3112.1	91.0
	Post-Monsoon	1.72	212.0	6.2
	Annual	13.0	3417.4	-

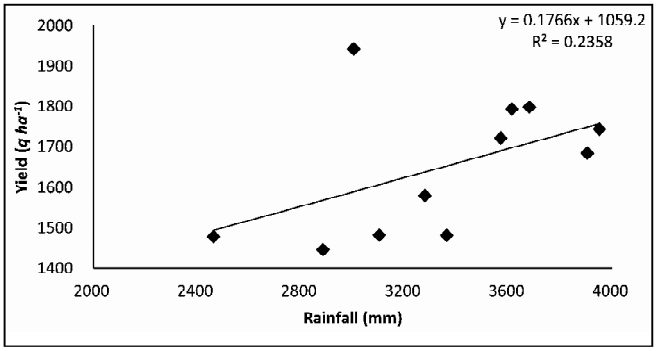

Fig 1: Mean yield of kharif rice and rainfall of costal Karnataka

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