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Rainfall analysis at district of Saraikela-Kharsawan, Jharkhand

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Abstract
The study was carried out at block level in Saraikela-Kharsawan district of Jharkhand to compare various parameters of rainfall distribution to describe the annual, seasonal, monthly distribution along with rainfall trends and seasonal variability. The rainfall data of all blocks for a period of 17 years (2001-2017) were collected from the District Agricultural Office of Saraikela-Kharsawan on a daily basis and rainfall were analysed with software (Weather cock V.1). All the blocks showed increasing rainfall trends except Kharsawan block showing decreasing trend of -3.7 mm/year and -8.1 mm/year annual and seasonal. The monsoon seasons received maximum rain (85-89%) and only 11-15% received in the remaining seasons. Rainfall variability in Coefficient Variation was greater in rabi season (118-157%) than that of kharif (18-39%).

Keywords: Rainfall trend, seasonal variability

Introduction
Saraikela-Kharsawan district of Jharkhand comes under VII Agroclimatic zone i.e. Eastern Plateau and Hill Region. The district is located under latitude from 22^0 29′26" to 23^0 09′34" N and longitude from 85^0 30′14" to 86^0 15′24" E and its elevation range from 178 m to 209 m above mean sea level. The district falls under sub-zone VI *i.e.* south eastern plateau zone among three agro-climatic subzones (Zone IV, V and VI) is rainfed having total geographical area of 2725 sq. km. The district is dominated by hilly ranges, valleys and plateau lands with a considerable area under forest. The valley land in the district provides suitable sites for agricultural use. The soils occurring in different landforms have been characterised during soil resource mapping of the state on 1:250,000 scale (Haldar *et al.* 1996) [1] and three soil orders namely Entisols, Inceptisols and Alfisols were observed in Saraikela-Kharsawan district. Major cereal crops in the district are paddy and maize; pulses consisting of gram, arhar, pea, moong, urad etc. Rainfed agriculture in India is practiced over 58 percent of cultivated areas and contributes 40 per cent of the country's food production (Prasad *et al.*, 2015) [5]. The rainfall is one of the important factors deciding success of rainfed agriculture of the particular agro-ecological region. The productivity of the rainfed area is very low and uncertain due to total dependency on monsoon as compared to irrigated area. 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 (Halikatti *et al*., 2010) [2]. The analysis of annual and seasonal distribution of rainfall is essential in selection of suitable crops and varieties to take appropriate mitigating measures. The rainfall variability analysis has found to be useful in deciding the cropping pattern (Prabhakar *et al.*, 2017) [4]. Similarly, the information on amount and intensity of rainfall during monsoon is very much useful for harvesting runoff. Also the crop development is severely affected if dry spell coincides with the sensitive phenological stages of the crop. It can be managed by closely monitoring seasonal conditions, suggesting contingent crops on a real time basis, adopting different farm level options like changing the sowing dates, adopting suitable crops/varieties and supplemental irrigation using micro irrigation with advance weather information.

Material and Method
The study was conducted in all 9 blocks (Chandil, Gamharia, Ichagarh, Kharsawan, Kuchai, Kukru, Nimdih, Rajnagar and Saraikela) of Saraikela-Kharsawan district of Jharkhand. Long-term rainfall data for a period of 17 years (2001-2017) of all blocks of the district were collected from the office of District Agricultural Office of Saraikela-Kharsawan on a daily basis. The detail analysis of rainfall were done using a software (Weather cock V 1.0)

developed by VUM Rao, AVMS Rao, GGSN Rao, T. Satyanarayana, N. Manikandan, B. Venkateswarlu of All India Coordinated Research Project on Agrometeorology, Central Research Institute for Dryland Agriculture Hyderabad, India.

Result and Discussion

Seasonal distribution

Available rainfall data nine blocks of Saraikela-Kharsawan for 17 years (2001-2017) were analysed and an average of 1066.5 mm annual rain was observed. The highest and lowest rainfall recorded in the blocks was Kuchai (1324.4 mm) and Nimdih (951.8 mm) respectively. No significant variations in total rainfall were observed. Its distribution among the four seasons (Monsoon, Post-monsoon, winter and summer) clearly indicate that 85.1 to 89.4 percent rainfall is concentrated in monsoon months and rest 10.6 to 14.9 percent within the other three seasons (Table 1). Under such circumstances the possibility of second crop is only for less water requiring crops with minimum, reduced tillage or under paira cropping.

Table 1: Rainfall distribution in blocks of Saraikela-Kharsawan

Block	Annual rain (mm)	Monsoon rain (mm)	Post monsoon rain (mm)	Winter rain (mm)	Summer rain (mm)
Chandil	1031.6	902.2 (87.4)	44.5 (4.3)	9.1 (0.8)	75.7 (7.3)
Gamharia	1142.3	972.7 (85.1)	72.6 (6.3)	8.1 (0.7)	88.7 (7.7)
Ichagarh	976.3	862.0 (88.2)	39.7 (4.1)	8.2 (0.8)	66.2 (6.7)
Kharsawan	1113.8	976.6 (87.6)	60.9 (5.4)	12.5 (1.1)	63.7 (5.7)
Kuchai	1324.4	1163.2 (87.8)	54.4 (4.1)	6.9 (0.5)	99.7 (7.5)
Kukru	976.3	862.0 (88.2)	39.7 (4.1)	8.2 (0.8)	66.2 (6.7)
Nimdih	951.8	822.9 (86.4)	43.2 (4.5)	7.9 (0.8)	78.0 (8.2)
Rajnagar	977.1	834.7 (85.4)	53.6 (5.4)	20.5 (2.1)	68.2 (6.9)
Saraikela	1105.2	943.7 (85.3)	62.0 (5.6)	16.1 (1.4)	83.3 (7.5)
Dist. Avg.	1066.5	926.6 (87.0)	52.2(4.8)	10.8(1)	76.6(7.1)

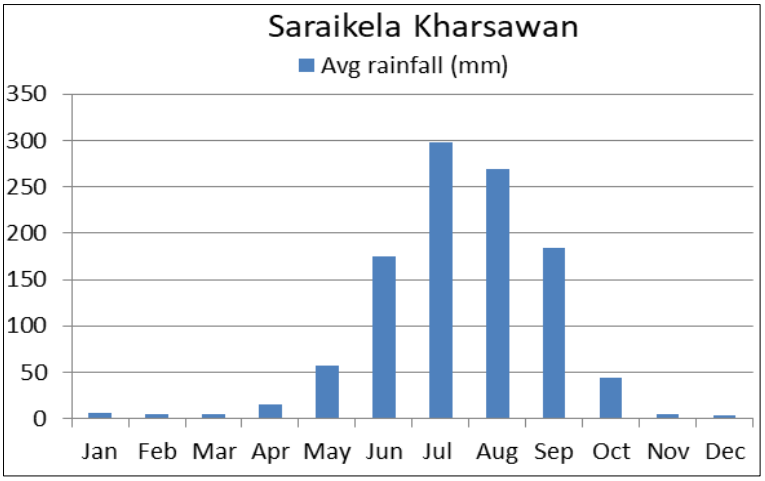

Fig 1: Month wise average rainfall of a district.

Monthly distribution

Monthly distribution of rainfall fluctuated from 225.2 to 377.9 mm during those 17 years. June received between 128.0 and 212.7 mm among the blocks. Not much fluctuation in rainfall was observed in September among the blocks. In all the blocks, rainfall fluctuated between 152.1 and 251.4 mm during September (Table 2). Similar distribution in rainfall among the monsoonal months have been reported by Mukherjee and Banerjee (2009) [3] in West Bengal. September rainfall virtually helps the maturity of crops and planning the succeeding rabi crops. Under such a situation if rain seizes, supplemental irrigation is essentially required and harvested water may support the crops to greater extent.

Table 2: Block wise monthly distribution of rainfall of Saraikela-Kharsawan.

Blocks	Monthly distribution of rainfall (mm).									Average
	Chandil	Gamharia	Ichagarh	Kharsawan	Kuchai	Kukru	Nimdih	Rajnagar	Saraikela	
Jan	5.6	4.0	5.1	6.3	3.3	5.1	4.1	8.2	7.8	5.5
Feb	3.4	4.2	3.2	6.2	3.6	3.2	3.4	12.3	8.2	5.3
Mar	4.1	2.5	3.0	5.2	6.1	3.0	8.3	3.2	9.7	5.0
Apr	10.0	19.2	12.6	12.9	14.8	12.6	15.0	21.3	17.4	15.1
May	61.	67.1	50.7	45.6	78.7	50.7	54.6	43.6	56.1	56.5
Jun	146.7	187.6	161.0	212.7	204.5	161.0	128.0	172.9	196.9	174.6
Jul	308.1	301.9	268.4	296.9	377.9	268.4	296.2	284.3	279.0	297.9
Aug	267.9	301.2	249.6	279.6	329.3	249.6	245.3	225.2	277.4	269.5
Sep	179.5	182.1	183.1	187.5	251.4	183.1	153.3	152.1	190.2	184.7
Oct	36.2	58.1	35.0	47.6	48.3	35.0	37.6	48.9	49.9	44.1
Nov	2.8	8.6	1.4	8.4	4.1	1.4	3.3	3.7	4.7	4.3
Dec	5.4	6.0	3.3	5.0	1.9	3.3	2.2	0.9	7.3	3.9

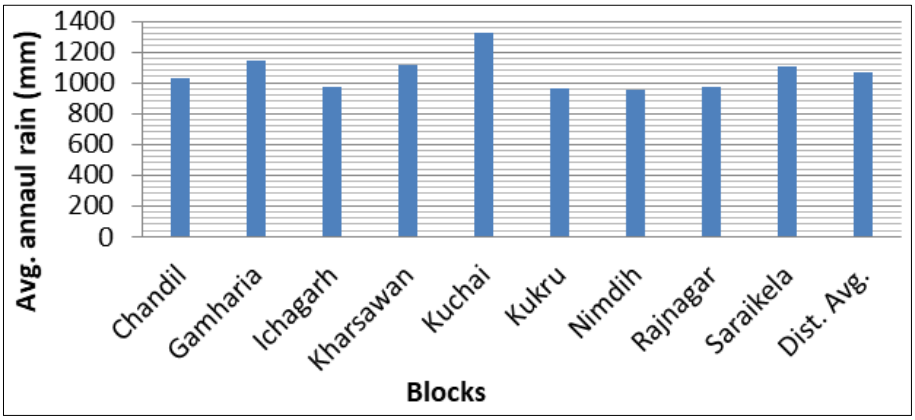

Fig 2: Block wise average rainfall

Rainfall trend

Generally, Saraikela-Kharsawan rain is more or less stable in current decades. Variations in the trend of rainfall have been observed in time and space. Trend analysis on total as well as monsoonal rain (Table 3) indicated variable trend both in annual and seasonal rain. Trend line equations developed from 17 years rainfall data showed variable trend within the blocks. Slightly decreasing trend was observed only in Kharsawan (-3.7 mm/yr). In Kharsawan it has decreased both for annual and seasonal rain. Most of the blocks (Gamharia, Saraikela, Kuchai, Nimdih, Chandil, Gamharia and Kukru) recorded an increasing trend of rainfall between 18.1 to 28.5 mm/yr. a slightly increasing trend (8.4 mm/yr) of rain was observed in Rajnagar.

Table 3: Rainfall trend in blocks of Saraikela-Kharsawan

Block	Annual rain equation	Monsoonal rain equation
Chandil	Y= 26.37x + 794.36	Y= 19.785x + 724.22
Gamharia	Y= 28.561x + 885.3	Y= 20.422x + 789
Ichagarh	Y= 24.475x + 756.02	Y= 18.393x + 696.52
Kharsawan	Y= -3.7037x + 1147.2	Y= -8.1297x + 1049.8
Kuchai	Y= 27.438x + 1077.5	Y= 19.01x + 992.15
Kukru	Y= 24.475x + 756.02	Y= 18.393x + 696.52
Nimdih	Y= 18.154x + 788.49	Y= 15.169x + 686.43
Rajnagar	Y= 8.3912x + 901.67	Y= 6.9054x + 772.63
Saraikela	Y= 28.181x + 851.63	Y= 23.597x + 731.35

Seasonal variability

Seasonal (kharif and rabi) variability of rainfall in terms of standard deviation (SD) and coefficient of variations (CV %) analysed for all 9 blocks of Saraikela-Kharsawan district shows less variability in Kharif (CV: 18.1 – 35.8%). During rabi season, the value of coefficient of variation was noticed in higher range and varied from 118.4 to 157.8 per cent. It is evident from the values of CV that rainfall during Kharif was rather more consistent and reliable than that of Rabi (Table 4). Values of standard deviation were more in kharif and exhibited more rainfall during the season. It also followed the results of the coefficient of variation among the blocks.

Table 4: Seasonal rainfall variability of Saraikela-Kharsawan

Blocks	Season	Av. Rain (mm)	% of total rain	SD	CV %
Chandil	Kharif	938.5	91.0	267.8	28.5
	Rabi	21.6	2.1	29.1	134.9
Gamharia	Kharif	1030.9	90.2	357.3	34.7
	Rabi	25.3	2.2	35.9	141.7
Ichagarh	Kharif	897.1	91.9	280.2	31.2
	Rabi	16.0	1.6	20.5	128.4
Kharsawan	Kharif	1024.3	92.0	185.8	18.1
	Rabi	31.1	2.8	36.8	118.4
Kuchai	Kharif	1211.6	91.5	274.0	22.6
	Rabi	19.2	1.5	26.1	135.8
Kukru	Kharif	897.1	91.9	280.2	31.2
	Rabi	16.0	1.6	20.5	128.4
Nimdih	Kharif	860.6	90.4	259.2	30.1
	Rabi	21.5	2.3	34.0	157.8
Rajnagar	Kharif	883.8	90.4	252.6	28.6
	Rabi	28.4	2.9	43.4	152.5
Saraikela	Kharif	883.8	90.5	316.6	35.8
	Rabi	28.1	2.9	37.1	132.2

Conclusion

An overall increasing trend in annual and seasonal rainfall was observed in all blocks except in Kharsawan where it has a slightly decreasing trend *i.e.* -3.7 mm/yr in annual and -8.1 mm/yr in seasonal rainfall. Slightly increasing trend (8.4 mm/yr in annual and 6.9 mm/yr in seasonal rain was noticed in Rajnagar whereas in rest of the blocks it has increased in between 15.2 to 28.5 mm/yr in annual as well as seasonal. Among the seasons, the monsoon received maximum rain (85-89%) and only 11-15% rain was received in the remaining three seasons (Post monsoon, Winter & Summer). Rainfall variability in terms of CV% was higher in rabi season (118-157%) than that of kharif (18-39%).

Reference

1. Haldar AK, Srivastava R, Thampi CJ, Sarkar D, Singh DS, Sehgal J, *et al*. Soils of Bihar for optimizing land use. NBSS Publ. 50b. (Soils of India Series), National Bureau of Soil Survey and Land Use Planning, Nagpur, India, pp. 70+4 sheets soil Map (1:500,000 scale), 1996.
2. Halikatti SI, Potdar MP, Hiremath SM, Dinesh Kumar, SP. Annual and seasonal rainfall variability at Dharwad, Karnataka, Journal of Agrometeorology. 2010;12(1):136-137.
3. Mukherjee A, Banerjee S. Rainfall and temperature trend analysis in the red and lateritic zone of West Bengal. Journal of Agrometeorology. 2009;11(2):196-200.
4. Prabhakar AK, Singh KK, Lohani AK, Chandniha SK. Long term rainfall variability assessment using modified Mann-Kendall test over Champua watershed, Odisha, Journal of Agrometeorology. 2017;19(3):288-289.
5. Prasad JVNS, Rao CS, Ravichandra K, Jyothi CN, Prasad Babu, MBB V, *et al*. Greenhouse gas fluxes from rainfed sorghum (*Sorghum bicolor*) and pigeonpea (Cajanus cajan) – Interactive effects of rainfall and temperature, Journal of Agrometeorology. 2015;17(1):17-22.