

LONG TERM VARIATIONS OF RAINFALL AT A FEW STATIONS IN BIHAR STATE

The climatological variations of mean annual and seasonal rainfall, their tendencies and decadal average are presented in Tables 1 & 2 for 3 stations in Bihar. For this purpose rainfall data for the period 1901-89 have been used for these three stations. The observatories at Bhagalpur and Gaya were at the same locations during the period of data while Ranchi observatory was first located in the compound of the Executive Engineer's office during 1901-55 and after that it was established at Ranchi aerodrome (the present location), from where rainfall data of the period 1956-89 have been used. The altitude of both the sites in Ranchi were nearly same but they were about 4 km apart. The main features are :

(a) The stations of Bihar plain, namely, Bhagalpur and Gaya, showed similar trend of climatological variations both for annual and seasonal rainfall. Climatological values of annual and seasonal rainfall decrease at both the stations during 1931-60 but increased during 1961-89. In contrast Ranchi recorded slow and steady fall of climatological annual rainfall from the period 1901-30 to 1961-89.

(b) The climatological annual (seasonal) rainfall at Bhagalpur rose significantly by 15 per cent (11%) during the period 1961-89.

(c) Except during 1981-89, the decadal mean annual and seasonal rainfall showed increase or de-

TABLE 1

Climatological variations of annual and seasonal rainfall (mm) at the stations

Year	Bhagalpur		Gaya		Ranchi	
	Annual	Seasonal	Annual	Seasonal	Annual	Seasonal
1901-30	1079.1	888.3	1204.1	1060.6	1495.6	1228.2
1931-60	1025.9	851.1	1109.2	969.6	1437.1	1145.5
1961-89	1178.2	948.2	1125.2	1002.8	1406.5	1150.1

crease at Bhagalpur during alternate decades, such variations were not seen at Gaya and Ranchi.

(d) The Fisher's Z test indicated that the difference in the variances of mean decadal annual rainfall from the long term variance were significant at 1 per cent level at Bhagalpur during 1931-40 and at Gaya during 1921-30 while the seasonal rainfall were significant at 1% level at Ranchi during 1931-40.

(e) The Cramer's test statistics t_k were significant at 95% level of significance on two occasions at Bhagalpur only during 1941-50 and 1981-89. The mean decadal annual rainfall were 21 per cent less during 1941-50 and 19 per cent more during 1981-89 with respect to long term mean (1901-89).

TABLE 2
Statistical parameters of annual and seasonal rainfall at Bhagalpur, Gaya and Ranchi during various decades

Decades	Decadal mean rainfall (mm)		Standard deviation (mm)		Fisher's Z-test parameters		Cramer's test statistics (<i>tk</i>)		Difference of decadal annual averages from long term (%)	
	Annual	Seasonal	Annual	Seasonal	Annual	Seasonal	Annual	Seasonal	Annual	Seasonal
(a) Bhagalpur										
1901-10	998.5	(823.7)	291.7	(278.7)	0.017	(0.078)	-0.994	(-0.849)	9.0	(8.2)
1911-20	1220.5	(1021.3)	194.5	(196.5)	*0.422	(0.271)	1.276	(1.460)	-11.2	(-13.7)
1921-30	1018.4	(820.0)	294.8	(302.1)	0.006	(0.158)	-0.793	(-0.883)	7.2	(8.7)
1931-40	1097.2	(910.1)	171.2	(186.1)	**0.550	(*0.326)	-0.188	(0.146)	1.6	(-1.4)
1941-50	870.9	(739.5)	270.0	(215.3)	0.094	(0.180)	-2.295†	(-1.859)	20.6	(17.6)
1951-60	1152.6	(911.2)	356.6	(173.1)	0.184	(*0.398)	0.543	(0.159)	-5.0	(-1.5)
1961-70	1052.4	(873.1)	238.0	(242.7)	0.220	(0.060)	-0.460	(-0.287)	4.1	(2.7)
1971-80	1188.1	(918.2)	351.2	(210.2)	0.169	(0.204)	0.963	(0.241)	-8.3	(-2.2)
1981-89	1309.2	(1058.2)	367.2	(367.4)	0.213	(0.213)	2.073†	(1.773)	-19.3	(-17.9)
(b) Gaya										
1901-10	1181.1	(1040.4)	311.3	(316.8)	0.150	(0.205)	0.376	(0.426)	-3.0	(-3.7)
1911-20	1266.1	(1113.2)	353.3	(337.9)	0.277	(0.269)	1.288	(1.240)	-10.4	(-11.0)
1921-30	1165.2	(1028.2)	150.6	(167.3)	**0.576	(*0.433)	0.211	(0.303)	-1.6	(-2.5)
1931-40	1102.9	(962.6)	224.2	(219.5)	0.178	(0.162)	-0.499	(-0.473)	3.8	(4.0)
1941-50	1183.7	(1025.9)	233.5	(209.4)	0.137	(0.209)	0.416	(0.272)	-3.2	(-2.3)
1951-60	1040.9	(920.4)	298.8	(293.8)	0.109	(0.129)	-1.172	(-0.443)	9.2	(8.2)
1961-70	1032.1	(907.8)	250.8	(232.2)	0.066	(0.106)	-1.291	(-1.112)	10.0	(9.5)
1971-80	1179.0	(1013.6)	262.8	(208.9)	0.019	(0.211)	0.359	(0.127)	-2.8	(-1.1)
1981-89	1164.5	(1004.6)	303.6	(325.0)	0.125	(0.230)	0.194	(0.020)	-1.5	(-0.2)
(c) Ranchi										
1901-10	1438.8	(1187.3)	161.3	(190.4)	0.412	(0.177)	-0.082	(0.166)	0.5	(-1.0)
1911-20	1465.4	(1184.1)	331.2	(250.0)	0.308	(0.096)	0.238	(0.114)	-1.4	(-0.8)
1921-30	1586.3	(1315.9)	248.0	(298.4)	0.018	(0.273)	1.733	(1.953)	-9.8	(-12.0)
1931-40	1392.0	(1090.8)	208.7	(119.9)	0.154	(*0.639)	-0.664	(-1.149)	3.7	(7.1)
1941-50	1600.0	(1286.1)	191.1	(246.7)	0.242	(0.082)	1.940	(1.455)	-10.7	(-9.5)
1951-60	1318.8	(1059.8)	234.1	(203.9)	0.010	(0.108)	-1.563	(-1.533)	5.7	(9.8)
1961-70	1376.2	(1140.3)	259.5	(209.7)	0.009	(0.080)	-0.845	(-0.460)	4.8	(2.9)
1971-80	1473.9	(1193.8)	282.2	(267.1)	0.147	(0.162)	0.347	(0.245)	-2.0	(-1.6)
1981-89	1346.0	(1112.3)	125.8	(152.9)	0.018	(*0.396)	-1.266	(-0.848)	6.9	(5.3)

* Significant for 5 % points,

** Significant for 1% points,

† At 95% level of significance

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