WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

A Study Rainfall Pattern of Kolhapur District Based on Statistical Methods

Prakash S. Chougule[1], Kishor V. Gaikwad[2], Smt. Sharmili S. Patil[3], Smt. Sonam. A. Amate[4], Smt. Anjali S. Bhosale[5], Smt. Gitanajali. A. Gadhari[6], Miss. Gayatri N. Pawar[7]

Associate Professor[1], Rajarshi Chhatrapati Shahu College, Kolhapur (MS), India
Assistant Professor[2,3,4,5,6], Rajarshi Chhatrapati Shahu College, Kolhapur (MS), India
Research Student[7], Rajarshi Chhatrapati Shahu College, Kolhapur (MS), India

ABSTRACT:

Rainfall is an important factor that needs serious attention as Indian agriculture is drastically affected due to change in rainfall pattern. Understanding of rainfall trend is an important tool for future of agriculture. In the present study we used regression analysis techniques for the construction of predication model and the rain fall is uniformly distributed or not over the geographical region of Kolhapur district . our study shows rain fall is not uniformly spread over the geographical region of Kolhapur district and the slope parameter estimate regression model in the predication model play an important role for future prediction of future rain fall.

KEY WORDS: Graphical Representation, Small Test, Level of significance.

INTRODUCTION:

Rainfall is a key part of hydrological cycle and alteration of its pattern directly affect the water resources ,Islamet.al (2012). The changing pattern of rainfall in consequence of climate change is now concerning issues to water resource managers and hydrologists. Gajbhiye, Set.al . (2015). Srivastava et al. (2014). and Islam et al. (2012). reported that the changes of rainfall quantities and frequencies directly changing the stream flow pattern and its demand, spatiotemporal allocation of run-of, ground water reserves and soil moisture. Consequently, these changes showed the widespread consequences on the water resource, environment, terrestrial ecosystem, ocean, bio-diversity, agricultural and food security. The drought and food like hazardous events can be occurred frequently because of the extreme changes of rainfall trend Srivastava, P. et.al. (2015). Gupta et al. (2014). documented that the amount of soil moisture for crop production is totally determined by the amount of rainfall. The monsoon rainfall plays a vital role for agriculture in India. The rainfall received in an area is one of the determining factors for the socio-economic activities including agriculture, forestry and bio-diversity, water resources management, industry and tourism of the region. The changes in rainfall pattern may cause heavy floods in some areas while other areas may experience frequent droughts (IPCC, 2007). Due to the possible effects of climate change on rainfall pattern, analysis of rainfall characteristics and its long term variability has got special attention worldwide in recent years. Trend analysis of rainfall is the primary tool to understand its temporal variations. There are several studies in India on the rainfall variability and long term trends (Parthasarathy and Dhar, 1975; Mooley and Parthasarathy, 1984; Sarkar and Thapliyal, 1988; Soman et al., 1988; Thapliyal and Kulshresthra, 1991; Guhathakurta and Rajeevan, 2008; rishnakumar et al., 2009; Kumar et al., 2010; Bhatla and Tripathi, 2014). Most of these studies investigated the trends in annual and seasonal rainfall series on the country scale or in regional scales. Studies of Mooley and Parthasarathy (1984), Sarkar and Thapliyal (1988), and Thapliyal and Kulshresthra (1991) have concluded that there is no significant trend in average annual rainfall of the country. Kumar et al. (2010) have reported no significant trend for annual, seasonal and monthly rainfall over India. Similarly, there are studies those focused mainly on the trends in intensity of daily rainfall. For example, Rakhecha and Soman (1994), Sen Roy and Balling (2004), Joshi and Rajeevan (2006), Goswami et al. (2006) and Guhathakurta et al. (2010) have studied the trend in extreme rainfall. Prakash S Chougule et al (2021).A study trends of rainfall pattern of Maharashtra state based on statistical tools. In this study we study the pattern of rain fall in Kolhapur district by using statistical methods.

Objective:

- To compare pattern of taluka wise rain fall in Kolhapur district.
- To study the total rain fall of all talukas is same or not.
- To check rainfall is not uniformly distributed over the no of talukas

- To study which place in Kolhapur district has highest rainfall.
- Study the average to rain fall in Kolhapur district.

Method of data collection:

Various method of collecting data are employed by social scientist. There are two methods of data collection which are primary data and secondary data. The secondary data was taken from internet and the website is www.maharain.com which is as shown in the following table.

Taluka	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Hatkangle	364.1	742	1334	1609.6	921	987.7	984	1082	737	791
Shirol	404	617	1050	958	676.4	500.2	766	565	272	467
Panhala	1290	1948	2540	2735	2649.4	1863	1498.2	1473	1405	1384
Shahuwadi	1620.6	2249	3450	3097.2	2344	1867	1945	1968	1819	1823
Radhanagari	2834	3510	5227	5471	4601	3684	5155	3000.9	4405	3072
Bavda	4689	5482.2	6912.6	7304	6272.7	6207	4759.2	6177.8	7077	5878
Karveer	541	1027	1743	1397.7	1036.9	1087.2	900.7	898	912.4	734
Kagal	442.2	824.4	1607.8	1313.9	839.2	779.4	891.3	823	836	569
Gadhinglaj	650	863	1559	1256	955	1079.9	1042.4	1242	1012	616
Bhudargad	1277.4	1509	2758.4	2326	1688	1624	1730.4	1749	1680	1309.2
Ajara	1274.3	1462.8	2973.4	2781	2196.7	1743.1	1967.2	2133	2130	1408.6
Chandgad	2054	2462.4	3502.4	3593	3219	2872.5	2733.1	2752	3277	2602
Total	17440.6	22696.8	34657.6	33842.4	27399.3	24295	24372.5	23863.7	25562.4	20653.8
Average	1453.4	1891.4	2888.1	2820.2	2283.3	2024.6	2031	1988.6	2130.2	1721.2

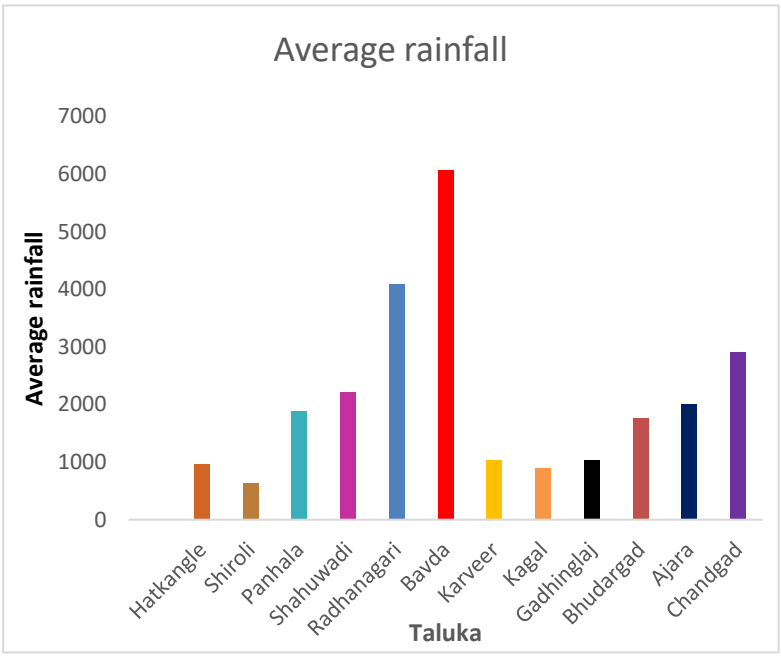
Software used:

MS-EXCEL

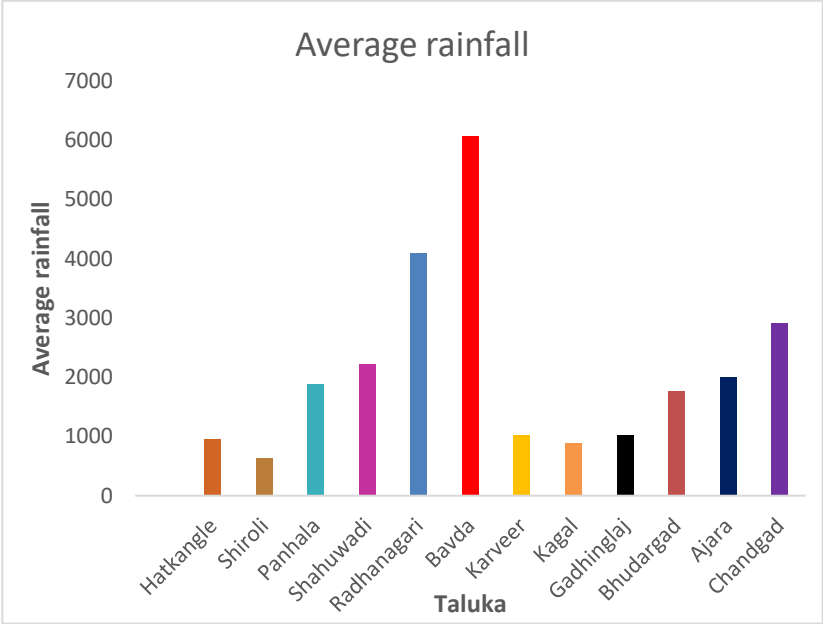
MS-WORD

Graphical Representation:

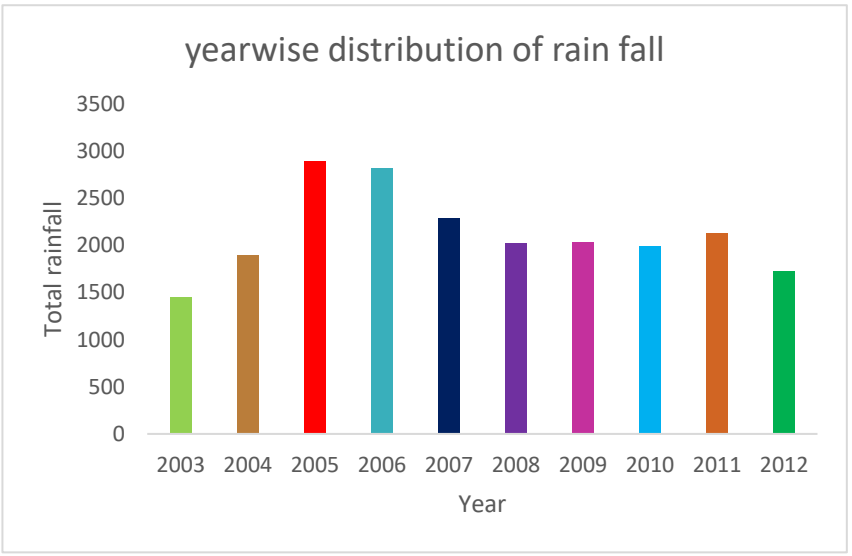
Taluka	Average rainfall
Hatkangle	955.24
Shirol	627.56
Panhala	1878.56
Shahuwadi	2218.28
Radhanagari	4095.99
Bavda	6075.95
Karveer	1027.79
Kagal	892.62
Gadhinglaj	1027.53
Bhudargad	1765.14
Ajara	2007.01
Chandgad	2906.74



Taluka	Average rainfall
Hatkangle	955.24
Shiroli	627.56
Panhala	1878.56
Shahuwadi	2218.28
Radhanagari	4095.99
Bavda	6075.95
Karveer	1027.79
Kagal	892.62
Gadhinglaj	1027.53
Bhudargad	1765.14
Ajara	2007.01
Chandgad	2906.74



Year	Average
2003	1453.4
2004	1891.4
2005	2888.1
2006	2820.2
2007	2283.3
2008	2024.6
2009	2031
2010	1988.6
2011	2130.2
2012	1721.2



Analysis Part:

a) Formation of predication model for rainfall:

Year(t)	Average rainfall (Y)	X = t – 2007	X^2	XY
2003	1453.4	-4	16	-5813.6
2004	1891.4	-3	9	-5674.2
2005	2888.1	-2	4	-5776.2
2006	2820.2	-1	1	-2820.2
2007(a)	2283.3	0	0	0
2008	2024.6	1	1	2024.6
2009	2031	2	4	4062
2010	1988.6	3	9	5965.8
2011	2130.2	4	16	8520.8
2012	1721.2	5	25	8606
Totals	21232	5	85	9095

Predication model for rainfall using regression techniques is given as,

Y= a+ bx

$a = \overline{Y} = \frac{\sum Yi}{n} = \frac{21232}{10} = 2123.2$

$b = \frac{\sum XY}{\sum X^2} = \frac{9095}{85} = 107$

y= a + bx

= 2123.2+107(x)

Future predicated value for next year 2013 for x = 6

Y = 2123.2+107(x)

Y = 2123.2+107(6)

= 2765.2

Past predicated value for the year 2002 for x = -3

Y = 2123.2++107(x)

Y = 2123.2++107(-3)

Y = 1802.2

b) Chi-square test for goodness of fit.

Ho: Discrete uniform distribution is good fit for given data. v/s

H1: Discrete uniform distribution is not good fit for given data.

Observation table:

Year	Total rain fall	pi	$ei = N * Pi$	$\frac{Oi^2}{ei}$
2003	17440.6	0.1	25478.37	11938.54
2004	22696.8	0.1	25478.37	20218.9
2005	34657.6	0.1	25478.37	47143.88
2006	33842.4	0.1	25478.37	44952.17
2007	27399.3	0.1	25478.37	29465.06
2008	24295	0.1	25478.37	23166.59
2009	24372.5	0.1	25478.37	23314.63
2010	23863.7	0.1	25478.37	22351.36
2011	25562.4	0.1	25478.37	25646.71
2012	20653.4	0.1	25478.37	16742.16
	254783.7			264940

Calculation: Under H_o

$\chi^2_{cal} = \sum\left(\frac{Oi^2}{ei}\right) - N$

$\chi^2_{cal} = 264940 - 254783.7$

$\chi^2_{cal} = 10156.3$

$\chi^2_{table} = \chi^2_9 5\% = 16.91898$

$\chi^2_{cal} > \chi^2_{table}$

c) chi-square test for goodness of fit.

Ho: Rainfall is uniformly distributed over different talukas. v/s

H1: Rainfall is not uniformly distributed over different talukas

Observation table:

Taluka	Total rainfall	pi	$ei = N * Pi$	$\frac{Oi^2}{ei}$
Hatkangale	9552.4	0.08	21232.01	4297.68
Shiroli	6275.6	0.08	21232.01	1854.90
Panhala	18785.6	0.08	21232.01	16621.07
Shahuwadi	22182.8	0.08	21232.01	23176.17
Radhanagari	40959.9	0.08	21232.01	79018.12
Bavada	60759.5	0.08	21232.01	173875.10
Karveer	10277.9	0.08	21232.01	4975.28
Kagal	8926.2	0.08	21232.01	3752.69
Gadhinglaj	10275.3	0.08	21232.01	4972.77
Bhudargad	17651.4	0.08	21232.01	14674.63
Ajara	20070.1	0.08	21232.01	18971.78
Chandgad	29067.4	0.08	21232.01	39794.34
	254784.1			385984.50

Calculation: Under H_o

$\chi^2_{cal} = \sum\left(\frac{Oi^2}{ei}\right) - N$

$\chi^2_{cal} = 385984.50 - 254784.1$

$\chi^2_{cal} = 131200.40$

$\chi^2_{table} = \chi^2_{11} 5\% = 19.67514$

$\chi^2_{cal} > \chi^2_{table}$

Overall conclusion:

- Total rainfall in Bavada is more than other.
- Shirol Taluka has minimum rain fall as compared to other.
- In 2005 has high rain fall and 2003 has minimum rainfall.
- No any two years have same rainfall.
- Discrete uniform distribution is not good for given rain fall data.
- Rainfall is not uniformly distributed over the different talukas.
- The slope parameter estimate regression model in the predication model play an vital role for future prediction of future rain fall.

REFRENCES:

1. Islam, T., Rico-Ramirez, M. A., Han, D. & Srivastava, P. K. A Joss–Waldvogel disdrometer derived rainfall estimation study by collocated tipping bucket and rapid response rain gauges. Atmospheric Science Letters 13, 139–150 (2012).

2. Gajbhiye, S., Meshram, C., Singh, S. K., Srivastava, P. K. & Islam, T. Precipitation trend analysis of Sindh River basin, India, from 102-year record (1901–2002). Atmospheric Science Letters 17(1), 71–77 (2015).

3. Srivastava, P. K., Han, D., Rico-Ramirez, M. A. & Islam, T. Sensitivity and uncertainty analysis of mesoscale model downscaled hydro-meteorological variables for discharge prediction. Hydrological Processes 28, 4419–4432 (2014).

4. Islam, T., Rico-Ramirez, M. A., Han, D., Srivastava, P. K. & Ishak, A. M. Performance evaluation of the TRMM precipitation estimation using ground-based radars from the GPM validation network. Journal of Atmospheric and Solar-Terrestrial Physics 77, 194–208 (2012).

5. Srivastava, P. K., Mehta, A., Gupta, M., Singh, S. K. & Islam, T. Assessing impact of climate change on Mundra mangrove forest ecosystem, Gulf of Kutch, western coast of India: a synergistic evaluation using remote sensing. Teoretical and Applied Climatology 120(3–4), 685–700 (2015).

6. Gupta, M., Srivastava, P. K., Islam, T. & Ishak, A. M. B. Evaluation of TRMM rainfall for soil moisture prediction in a subtropical climate. Environmental Earth Sciences 71, 4421–4431 (2014).

7. Bhatla R and Tripathi A (2014). The Study of Rainfall and Temperature Variability over Varanasi. International Journal of Earth and Atmospheric Science, 1(2): 90-94.

2. Das PJ and Goswami DC (2003). Long-term variability ofrainfall over northeast India. Indian Journal of Landscape Systems and Ecological Studies, 26(1): 1- 20.

3. Das S, Bhattacharjee K, Shaw SO, Pathak HG and Patowary B (2011). Characteristic pattern and recent trend in rainfall over Guwahat. Proceedings of "Water for Cities: responding to the Urban Challenges", Guwahati, May 30, 2011.

4. Deka RL, Mahanta C, Pathak H, Nath KK and Das S (2013). Trends and fluctuations of rainfall regime in the Brahmaputra and Barak basins of Assam, India. Theoretical and Applied Climatology, 114(1-2): 61-71. Forecaster's Guide; India Meteorological Department, p1- 148.

5. Goswami BN, Venugopal V, Sengupta D, Madhusoodanam MS and Xavier PK (2006). Increasing trends of extreme rain events over India in a warming environment. Current Science, 314: 1442- 1445.

6. Guhathakurta P, Menon P, Mazumdar AB andSreejith OP (2010). Changes in extreme rainfall events and flood risk in India during the last century. Research Report No: 3/2010, National Climate Centre, India MeteorologicalDepartment, Pune

7. Guhathakurta P and Rajeevan M (2008). Trends in the rainfall pattern over India. International Journal of Climatology, 28: 1453-1469.

8. Prakash S Chougule, Suresh V.Patil , Prasad V. Shinde Powar Pratiksha S. (2021)A study trends of rainfall pattern of maharashtra state based on statistical tools ,EPRA International Journal of Agriculture and Rural Economic Research: 9(1) :16-24