EUROPEAN ACADEMIC RESEARCH
Vol. II, Issue 7/ October 2014

Impact Factor: 3.1 (UIF)
DRJI Value: 5.9 (B+)

ISSN 2286-4822
www.euacademic.org

Investigation of Rainfall Trend in Jorhat Town, Assam, India

MAYURAKSHI BHUYAN BARUAH
Department of Geography
North-Eastern Hill University
Mawlai, Umshing, Mawkynroh, Shillong, Meghalaya
India

Abstract:

Rainfall is the prime source of all water. Jorhat experiences the predominant influence of the south-west tropical monsoon which reigns from June to October with occasional winter showers. Pre-monsoon rain also occurs during April and May with occasional thunder and hailstorm and sometimes it rains from cyclones as well (Anonymous, 2002). Low-pressure areas forming over the Bay of Bengal also causes rainfall over this region. The analysis of rainfall is important as it is the sole source of water for running a Municipality at Jorhat with more than one billion population. Most of the consumable water is collected from surface source of river Bhogdoi. The uncertainty or variability and concentration of rainfall to few months increase the possibility of water scarcity in dry periods. The nature of the variability and extent to concentration is analyzed to understand the causes of water scarcity. Hence, the change in rainfall has been focus of study of a number of scientists as it influences man and environment both. The present study is an attempt to highlight whether rainfall in Jorhat town has been increasing or decreasing over the years (1958-2007) through an analysis of rainfall trends in the area.

Key words: Rainfall, Jorhat, Trend, Rainfall Variability, Seasonal

Introduction

Rainfall is the prime source of all water on land. A part of the rain water sinks into the ground to form groundwater, some part of it evaporates back into the atmosphere, and some run off to form streams and rivers which flow ultimately into the sea. Some of the water in the soil is taken up by the plants and is evaporated in turn by the leaves. These events are spoken of as "water cycle" (Park, 1997). Jorhat experiences the predominant influence of the south-west tropical monsoon which reigns from June to October with occasional winter showers. Pre-monsoon rain also occurs during April and May with occasional thunder and hailstorm and sometimes it rains from cyclones as well (Anonymous, 2002). Low-pressure areas forming over the Bay of Bengal also causes rainfall over this region. The analysis of rainfall is important as it is the sole source of water for running a Municipality at Jorhat with more than one billion population. Most of the consumable water is collected from surface source of river Bhogdoi. The uncertainty or variability and concentration of rainfall to few months increase the possibility of water scarcity in dry periods. The nature of the variability and extent to concentration is analyzed to understand the causes of water scarcity. Hence, the change in rainfall has been focus of study of a number of scientists as it influences man and environment both. The present study is an attempt to highlight whether rainfall in Jorhat town has been increasing or decreasing over the years (1958-2007) through an analysis of rainfall trends in the area.

Study Area

Jorhat town (94°12´E longitude and 26°44´N latitude) is situated in the piedmont zone of the Karbi Anglong Hills on the southern bank of Brahmaputra River (Fig.1). The town has an area of 9.20 sq km (Anonymous, 2003). It comprises of 19

municipal wards with a population of 1,47,651 persons and 11,812 households (Census, 2011). The *Bhogdoi* River passes through the town while there are many other streams such as *Tocklai, Tarajan*, and *Jahkharijan* etc. which flow in and around Jorhat town. The average annual rainfall is 2044.99 mm (Bhuyan and Husain, 2014).

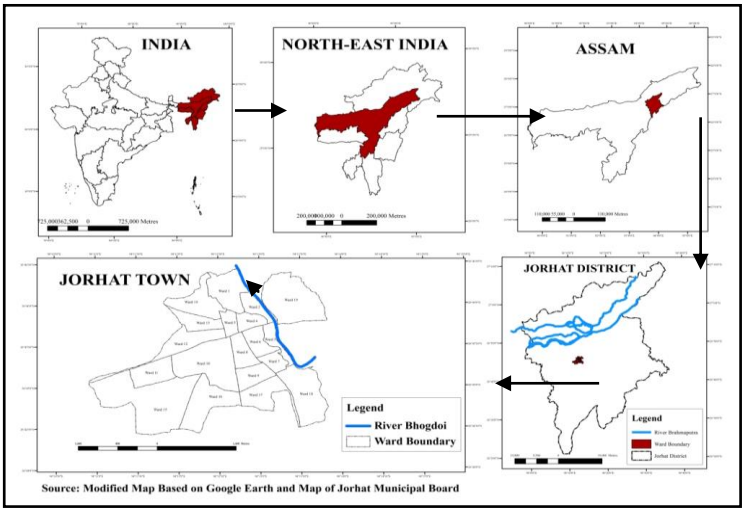

Fig. 1: The Study Area

Data Base and Methodology

The present study is based on secondary data collected from Tocklai Experimental Station, Jorhat. This study is an attempt to highlight whether rainfall in Jorhat town has been increasing or decreasing over the years (1958-2007) through an analysis of rainfall trends in the area. In the present study, two different statistical techniques have been used to ascertain the trend in rainfall in Jorhat town. These are moving average (or running mean) and least square method. It is difficult to discuss any trend on actual annual rainfall graph as such. To determine rainfall variability the coefficient of variation has been employed.

Results and Discussion

Discussion on mean annual rainfall, decadal rainfall variability and seasonal rainfall variability has been discussed in the following lines-

Mean Annual Rainfall

Jorhat town receives an adequate amount of rainfall during the monsoon. The mean annual rainfall is calculated to about 198.76 cm per annum. During summer monsoon, it receives about 126.34 cm, while during winter season it is around 15.95 cm. The general character of the periodical distribution of the rainfall tends to be more or less similar each year though there are some variations in their occurrences from year to year. However, the same general characteristics ordinarily prevail for any given month. The maximum and minimum rainfalls occur at distinct periods. The character of the mean monthly rainfall distribution varies widely ranging 1.91 cm in January to 25.50 cm in May. The highest amount of monthly rainfall of 73.15 cm was recorded in the month of August in 1963, which was 37 per cent of the total annual rainfall. It is observed that although the variability is high during the particular months, the rainfall is more or less stable throughout the year as a whole, which is an important aspect while making planning for the utilization of water resources of the study area. The highest annual rainfall was recorded in 1977, which was 270.77 cm, while the lowest was recorded in 2001, i.e., 139.44. The average annual rainfall of a given place is very useful for planning of water supply schemes at that place because it directly gives an idea of the probable amount of water that may be available at that place.

Generally, the rainfall starts from the month of late April and ends in the mid of October. In other words, precipitation is heavy in summer normally from the month of

May to September, and lasts until mid October. At least 82 per cent of the total annual rainfall occurs from May to October. The rainfall that takes place during December to April contributes only 18 per cent of the total annual rainfall. January receives the least amount of rainfall with an average of 1.91cm or 0.96 per cent of the annual rainfall.

The rainfall patterns show great deal of variations from year to year and it is not easily possible to observe any trend of increasing or decreasing rainfall. Still, an increasing trend of rainfall is visible especially in 1977. The actual and 5 year moving average graph depicts 10 year cycle for the recurrence of the peak amount of rainfall (Fig. 1).To highlight the trend of rainfall (1958-2007), the least square method has been adopted. Since, the data were found to be non linear in character, the second degree parabola of least square analysis has been used. To obtain the trend line using second degree parabola, the following formula has been used:

$Yc=a+bx+cx^2$.....Equation 1

Where, Yc= Trend value

X= Variable

a= Computed trend figure of the Y variable

b= Slope of the trend line

c= Rate of change in the slope

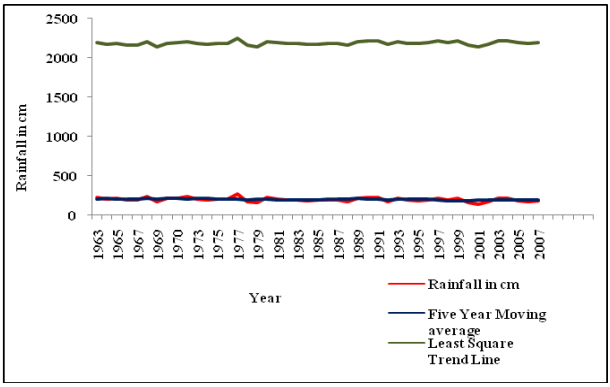

Fig. 1: Trend of Annual Rainfall (cm) in Jorhat Town

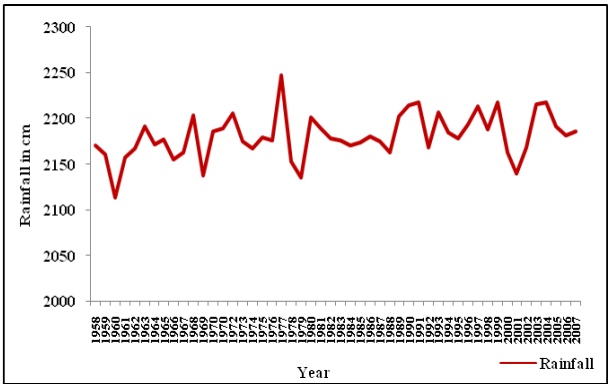

Fig. 2: Trend of Annual Rainfall in Jorhat Town (1958-2007)

The Figure 2 shows annual rainfall trend by least square method in Jorhat town in which a negative trend is visible. The highest amount of rainfall received in 1977 but after that the trend shows the negative direction which is very close to the shortage of water in Jorhat town.

Decadal Rainfall Variability

There are numerous methods in practice ranging from simple time series approach by excel to highly complex modes. However, the focus is to develop commonly understandable method which could be adopted easily to tackle this complex issue. For the core study, the method being utilized is coefficient of variability of rainfall, in percentage. The following mathematical relationship is used to calculate the coefficient of variability of rainfall:

$C.V.=SD/R\times100$

Where, *SD*, Monthly standard deviation

R, Monthly Rainfall average (Camerlengo and Somchit, 2000)

Table 1: Decadal Rainfall Variability (cm) in Jorhat Town (1958 -2007)

Decades	Total	Average	Standard Deviation	Coefficient of Variation
1958-1967	2007.01	167.25	148.48	88.78
1968-1977	2146.98	178.92	145.77	81.47
1978-1987	1913.00	159.42	135.86	85.22
1988-1997	2021.76	168.48	133.27	79.10
1998-2007	1849.06	154.09	122.05	79.21

(Source: Rainfall in Jorhat 1958-2007)

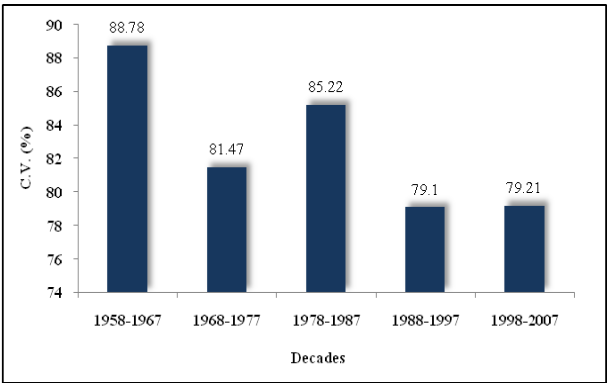

Fig. 3: Decadal Rainfall Variability (cm) in Jorhat Town

From the Figure 3, it can be observed that rainfall variability coefficient (C.V.) in the first decade of the study was 88.78 per cent and then the percentage of variability coefficient decreased to 81.47 per cent and suddenly increased to 85.22 per cent during 1978-1987. After this decade, the percentage of variability coefficient gradually decreased till the last decades. However, the highest value of variability coefficient was recorded in the first decade, i.e. 88.78 per cent during 1958-1967 (Table 1).

Seasonal Variability of Rainfall

Jorhat town experiences the south-west tropical monsoon and as such it follows the rhythm of monsoon characteristics by concentration of rainfall during summer season and decreasing

trend in winter season. The monsoon rainfall starts from the month of June and continues till the later part of September.

Table 2: Seasonal Variability of Rainfall (cm) in Jorhat Town (1958-2007)

Seasons	Months	Total	Average	Maxi -mum	Mini -mum	Standard Deviation	Coefficient of Variation
Winter	Jan	95.69	1.91	5.63	0	1.49	77.65
	Feb	198.05	3.96	13.06	0	2.81	71.03
Pre-monsoon	Mar	320.74	6.41	20.74	0.18	4.46	69.49
	Apr	957.58	19.15	44.32	1.93	9.38	48.99
	May	1275.21	25.50	62.56	8.92	11.15	43.73
Monsoon	Jun	1506.69	30.13	49.73	8.53	9.05	30.02
	Jul	1911.08	38.22	64.31	17.75	10.07	26.35
	Aug	1670.05	33.40	73.15	18.06	10.26	30.72
	Sep	1229	24.58	41.38	11.25	8.08	32.86
Post-monsoon	Oct	590.63	11.81	26.63	2.83	6.89	58.32
	Nov	116.85	2.34	8.2	0	2.06	88.36
	Dec	66.24	1.32	6.38	0	1.51	114.15
Total		**9937.81**	**198.7562**	**416.09**	**69.45**	**77.21**	**691.67**

(Source: Rainfall in Jorhat 1958-2007)

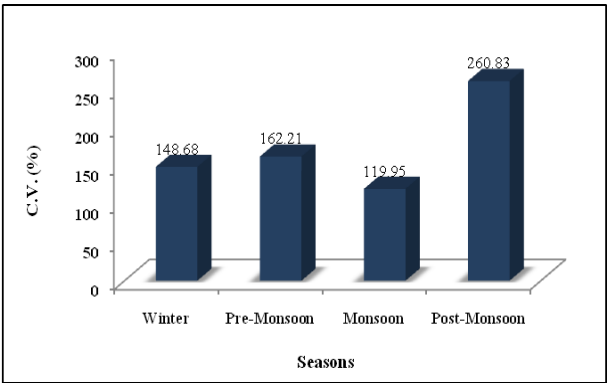

Fig. 4: Seasonal Variability of Rainfall (cm) (1958-2007) in Jorhat Town

The Figure 4 shows that the rainfall variation is high in post-monsoon and pre-monsoon seasons as compared to the winter and monsoon season. Due to higher contribution of post-monsoon rainfall variability, qualitative and quantitative prediction is difficult for forecasts. High variable behaviour of rainfall poses challenges for water deficiency situation in the

town and it increases socio-economic sufferings of the residents (Table 2).

Conclusion

Past analysis of rainfall data has shown a slightly decreasing trend of rainfall variability in Jorhat town, Assam. The purpose of the present study was to investigate and analyze the variability in rainfall occurred in the past times. Rainfall variability coefficient is utilized to highlight the trend from 1958-2007. It was revealed in the study that the post monsoon period has suffered throughout the years in terms of rainfall variability. High variable behaviour of rainfall poses challenges for water deficiency situation in the town and it increases socio-economic sufferings of the residents. The decadal analysis of rainfall variability showed that the highest value of variability coefficient has been observed during the first decade of the study i.e. 1958-67.The results obtained in this study may help investigating the future scenario of rainfall in the region but more detailed and area specific study is still required. It is foreseen from the increasing trend of rainfall variability over temporal scale that climate variability will be more serious challenge then climate change. It will be easier to adopt climate changes in terms of changing rainfall regime but climate variability embedded with extreme (wet/dry) precipitation episodes will be hard to manage by practitioners.

REFERENCES

Anonymous, "State Water Policy of Assam (Draft)", Assam Science Technology & Environment Council, Government of Assam, Guwahati, 2002, P.2.

Anonymous, "Status Report on Jorhat Town", Jorhat Municipal Board, Jorhat, 2003.

Bhuyan, M. and Husain, Z., "Spatio-Temporal Variation of Scarcity of Water for Domestic Consumption: A Case Study of Jorhat Town, Assam", *International* Journal of Earth Sciences and Engineering, 7 (2014): 128-134.

Camerlengo, A. L. and Somchit, N., "Monthly and Annual Rainfall Variability in Peninsular Malaysia", Pertanika J. Sci. & Technol, 8(2000): 73 – 83.

Park, K., *Textbook of Preventive and Social Medicine*, (Jabalpur: M/s Banarsidas Bhanot Publishers, 1997).