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Spatio-Temporal Assessment of Rainfall Variation in Nanded District

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Abstract:

Variation in rainfall across time and space is linked to a variety of activities, including agricultural, industrial, hydrological, geo-hydrological, engineering, and energy generation.Rainfall variation is carried out for 16 stations which are spatially well distributed over study region. The rainfall data of respective stations for 31 years is collected and processes as per requirement of study. The statistical analysis is carried out by using IDW (Inverse Distance Weightage) method of Interpolation Technique of Arc GIS software. The variation is analyzed annual, seasonal and monthly time scale. The maps are prepared to display the spatial variation of rainfall in Nanded district.

Kyewords: Rainfall, Variation, seasons

Introduction:

Rainfall is amongst the most popular climatic variables to take into account while assessing variability. Especially in subtropical or tropical climates. Climatic variability assessment in equatorial regions Rainfall, temperature, humidity, and other variables cloudiness caused by solar insolation, different use of irradiance can substantially improve one's knowledge of Changes in the climate. Rainfall is a common occurrence. Considered, evaluated, and finally integrated with a knowledge base in agriculture that culminates in a realistic assessment of production, food security, and distribution. In addition, rainfall patterns are erratic. May also cause natural calamities such as floods, fires, and earthquakes. Drought, erosion, landslides, and salinity are all factors to consider. The recording and comprehension of variation Trend analysis throughout time can be quite useful in implementing appropriate adaptation or mitigation strategies.Shinde K.B et.al. (2019), analyzed station wise rainfall distribution and its variation over Latur district.

The variation in rainfall over a place and time is not only related to primary activity i.e. agriculture but also in Hydrology, Geohydrology, Industry, Engineering, electricity generation etc. Change in rainfall has considerable effect on water and agricultural sectors of Asia and Pacific region (Cruze et al 2007). The rainfall variation and frequency is analyzed for Dharmapuri district by Rajaramet. al (2016).

Objective:

The main objective of this research is to understand the regional and timely variation of rainfall over the district of Nanded.

Data and Methodology:

Primary and secondary data were employed in this investigation. The major information gathered during the field tour and observations. Secondary data on agricultural and climatic issues was acquired from numerous government reports, documents, and other sources from relevant departments and offices. Websites were used to get the rest of the essential information.

Rainfall Variation through Coefficient of Variation:

Coefficient of Variation is one of the widely used method to analysis of statistical variation of geographical phenomena over a time. In the present study the rainfall variation is assessed using this method.

$$CV=\sigma/\bar{X}*100$$

Whereas, CV= Coefficient of Variation
σ = Standard deviation
$\bar{X}$ = Long term mean of data.

Annual Variation of Rainfall:

The variation of long term average annual rainfall is varies from 21.3% at Jamb (BK) to 48.1% at Sarkhani station. The variation of rainfall is grouped in to three classes i.e. below 30 %, 30 to 40% and 40 and above. There are two stations namely Jamb (BK) and Limboti are observed with 21.1% and 25.5% respectively. It represents less variation than the other region of district, covers Western Loha and Kandhartalukas in the south western part of district. The stations Mukhed, Kandhar, Kinwat, Degloor, Umri, Lohgaon, Nanded, Shivani, Kesrali and Billoli are observed the variation is between 30 to 40%.

These stations covers 60% area over South Kinwat, eastern Himayatnagar, Bhokar, Umri, eastern Loha, Kandhar, Mudkhed, Dharmapuri, Degloor, Naigaon and Billolitalukas. There after Tamsa (41.5%), Bhokar (42.4%), Nanded (43.7), Mahur (45.0%), Malegaon (46.0%) and Sarkhani (48.1%) noticed variation is above 40%. Those stations occupied Mahur, Western Kinwat, Hadgaon, Himayatnagar, northern Bhokar and Ardhapurtalukas of Nanded district. The district observed as the north western and northern part have greater variation than the southern part (Fig. no.02(A)).

Seasonal Rainfall variation:

The variation of rainfall is also computed for seasonal scale. The seasons are considered as Winter, Pre monsoon, Monsoon and Post monsoon. The figure no.02 (B, C, D and E) shows spatial variation of rainfall over Nanded district.

Winter Rainfall Variation:

The winter season considered for the month of January and February according to IMD. During the winter season the variation of rainfall is varies from 220.3% to 447.7% at Kinwat and Mahur station respectively. The statistical variation is grouped in to three classes as like below 300, 300-400 and above 400% variation. There are 12 stations seen as variation of rainfall is less than 300%. It covers south, southeast and western part of district. The five stations namely Bhokar, Sarkhani, Shivani, Tamsa and Umri are recorded the variation between 300 to 400% and only Mahur stations observed with variation more than 400%, it is located in the northern most part of district. During the winter season from south to north the variation is increases. The northern part of district is characterized by undulating land.

Pre monsoon Season Variation:

The pre monsoon season is measured from March to May. The variation of rainfall during this season is varies from 135.3% at Mukhed station to 300.00% at Tamsa station. The variation is grouped in to two groups i.e. below 200 and above 200. There are six stations viz. Billoli, Lohagaon, Mahur, Sarkhani, Shivani and Tamsa recorded rainfall variation above 200% and remaining 12 stations noticed less than 200% variation. These stations are located in south, central and western part of district. The central east, and northern part of district have higher variation.

Monsoon Rainfall Variation:

The variation of Rainfall in monsoon season shows in fig.no. 2(D), In a very short period of time i.e. monsoon season more than 80% rainfall receives in this season. The variation of rainfall during this season ranges from 26.8% to 73.7% at Lohgaon and Limboti stations. The variation is grouped in two groups i.e. below 50% and above 50%. The stations Lohgaon (26.8%), Umri (31.1%), Limboti (30.7%), Kandhar (31.7%), Malegaon (33.9%), Degloor (33.4%)Mukhed (34.2%), Shivani (35.2%), Kesrali (37.2%), Patoda (38.6%), Tamsa (39.6%), Jamb (BK) (39.8%), Bhokar (44.7%), Nanded (45.1%) and Billoli (46.1%) are recorded less than 50% variation and Kinwat, Mahur and Sarkahni stations observed 73.5%, 64.2% and 71.9% variation respectively.

Post Monsoon Variation:

The post monsoon season considered for the month of October, November and December. It is shown in fig.no. 2(E) and table no.01, the variation varies from 84.7% over Malegaon to 152.8% at Shivani stations. The statistical measures arranged in to two groups with 100 interval. The stations Bhokar, Jamb BK, Kandhar, Limboti, Malegaon, Mukhed, Nanded and Umri are recorded variation below 100%. Those stations occupied central and western part of district. Remaining 10 stations located in the northern, eastern and southern part of district which are having more than 100% variation.

Conclusion:

The district observed as the north western and northern part have greater variation than the southern part. During the winter season from south to north variation increases. It's varies from 220.3% to 447.7% at Kinwat and Mahur station respectively. The south, central and western part of district have less variation than the central east, and northern part of district in pre monsoon season. The variation of rainfall in monsoon season is found in uniform distribution throughout the region. During the post monsoon season, the northern, eastern and southern part of district have rainfall variation found with high range.

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Table no.1. Annual and Seasonal measures (CV)of Rainfall

Stations	Annual	Pre Monsoon	Monsoon	Post Monsoon	Winter
Bhokar	42.4	171.3	44.7	96.9	316.6
Billoli	38.9	222.0	46.1	122.7	256.6
Degloor	31.1	187.6	33.4	108.5	298.4
Jamb BK	21.1	169.7	39.8	98.1	228.2
Kandhar	31.0	170.6	31.4	89.9	241.9
Kesrali	35.2	176.4	37.2	100.8	280.0
Kinwat	31.1	144.4	73.5	106.8	220.3
Limboti	25.5	137.7	30.7	96.2	237.0
Lohgaon	33.0	264.8	26.8	141.2	289.9
Mahur	45.0	294.7	64.2	118.6	447.7
Malegaon	46.0	143.5	33.9	84.7	246.4
Mukhed	30.4	135.3	34.2	87.8	297.9
Nanded	43.7	164.9	45.1	89.9	227.7
Patoda	33.4	186.2	38.6	109.8	260.0
Sarkhani	48.1	285.3	71.9	126.1	361.1
Shivani	35.0	263.6	35.2	152.8	377.0
Tamsa	41.5	300.1	39.6	109.8	350.9
Umri	31.3	164.0	31.1	85.5	368.2

Compiled by Researchers
CV in %

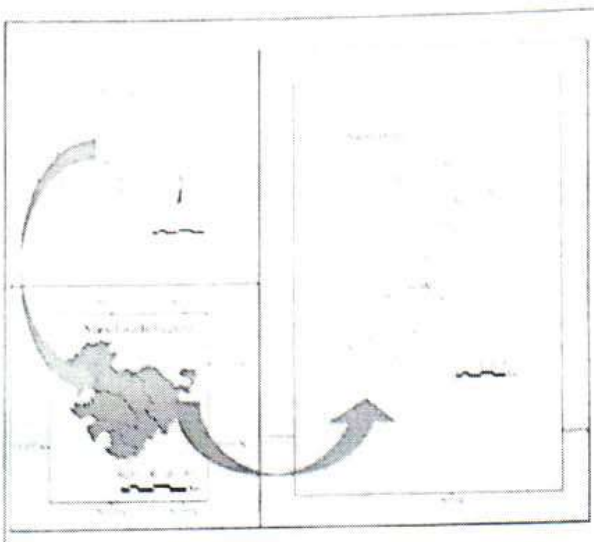
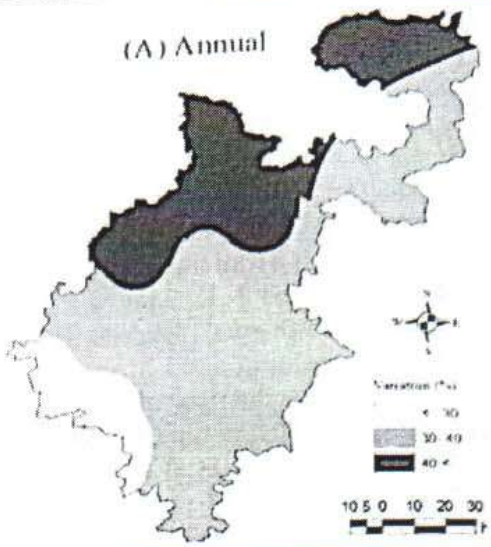
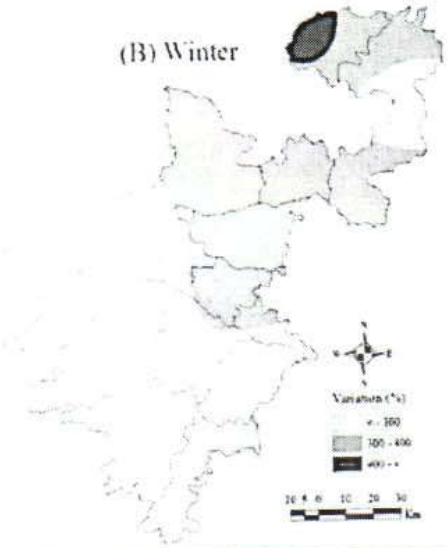
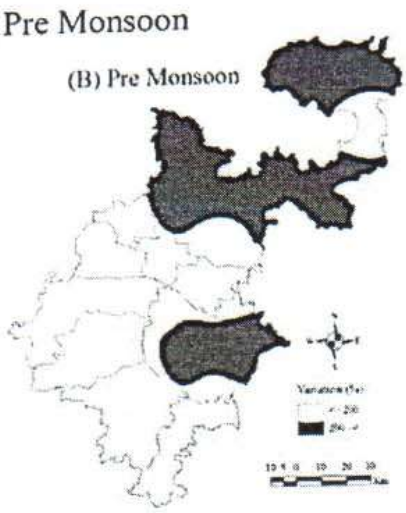


Fig. no.01. Location Map of Study region



(A) Annual





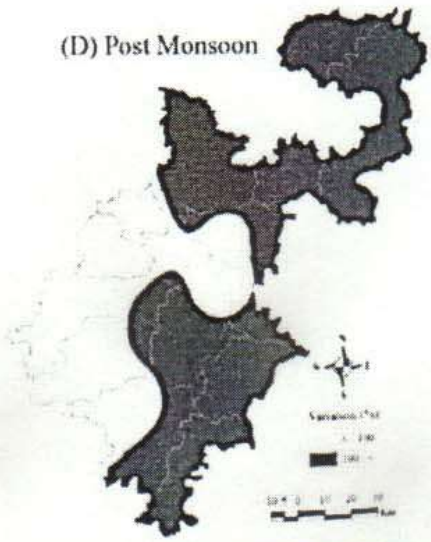


Fig. no. 02 Annual and Seasonal Variation of Rainfall