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# VARIATION IN RAINFALL AND ITS EFFECTS ON AGRICULTURE IN SHEVGAON AND NEWASA TEHSIL OF AHMEDNAGAR DISTRICT OF MAHARASHTRA

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**Abstract**

*One of the most important types of precipitation, rainfall has an impact on the overall ecosystem of the studied region as well as agricultural activities. As a result, comprehend the distribution of rainfall and its trends in the Shevgaon and Newasa tehsils. The area's agricultural activities have access to plenty of water and irrigation infrastructure. This study examines the spatial and temporal rainfall variability in the Ahmednagar district's Shevgaon and Newasa tehsils.*

*Since most of the crops in the Ahmednagar District are rainfed, their principal source of livelihood is subject to variations in rainfall patterns. The overall potential impact of significant changes in rainfall patterns is crop production disruption, which results in food insecurity, unemployment, and poverty. This study aims to demonstrate the relationship between the production of important crops and the pattern of rainfall distribution in the Shevgaon and Nevasa tehsil in relation to food security in the face of climate change.*

*Particularly the district of Ahmednagar is well-known for its drought. The research area receives 523.5 mm of rainfall on average annually. The distribution of rainfall throughout time and space is considered in this study. Data on annual short-term rainfall are taken from 1981 to 2020. It is discovered that the research area has a high level of spatial and temporal variability. There is a significant positive association (0.7890).*

**Keywords:** *Rainfall Variation, Impact On Agriculture, Spatial and Temporal Rainfall Distribution.*



## Introduction:

In rainfed agriculture, the cropping system is determined by the pattern and amount of rainfall. The selection of any certain crop and agronomic practises are primarily influenced by the amount, distribution, and intensity of rainfall. The management of water resources applications and efficient use of water resources would both be improved by rainfall analysis. This trend analysis aids in the management of water resources through appropriate actions and the creation of adaption strategies through appropriate tactics.

From June to September (rainy season), the study area receives 80% to 85% of its annual precipitation from the south-west monsoon winds, with the rest of the year being absolutely dry. The research region receives an average annual rainfall of 549 mm in Shevgaon tahsil and 498 mm in Newasa tahsil due to its location in the Western Ghat's "rain shadow" zone. 523.5 mm of rain fall falls on the research region on average annually. During the rainy season, wet and dry spells are observed along with temporal

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fluctuations in rainfall.

Many Indian scholars investigated changes in rainfall for last five decades (Raghvendra V. K, 1974; Moonley and Parthasarathy, 1984: Alaka Gadagil, 1986; Parthasarathy et. al., 1991; Kripalani and Kulkarni, 1997, Kale V. S., 1999, Hire and Gunjal, 2006; Rathod, Muniyappa and Aruchamy S., 2010; Gatade and Sasane, 2015) that, the western part of the study area is receiving less average annual rainfall (498 mm) in comparison to the eastern part (549 mm). The wettest month is September. Pre-monsoon months from February to May saw little to no rainfall, whereas post-monsoon months from mid-October to January saw occasional showers.

**Components and Procedure:**

**Aims and Objectives:**

Understanding how rainfall affects agriculture in the Shevgaon and Newasa Tahsil is the main aim of this study, which also has the following objectives:

1. To comprehend the spatio-temporal variation in rainfall and its properties in the study area.
2. To determine the relationship between rainfall and rainy days as well as its effect on local agriculture in the research area.

**Methodology and Database:**

By using tehsil and IMD information dating back 40 years to compile rainfall data. Through the use of central tendency and correlation analysis, data will be collated and statistically correlated. The 40-year (1981-2020) time series data on agricultural production and yield were used. This information was utilised to analyse the patterns of annual rainfall distribution and crop production throughout the previously indicated 40-year period, as well as trends in inter-annual rainfall distribution and inter-seasonal one (i.e., major and minor seasons). The Pearson product moment correlation coefficient was used to create statistical indices to comprehend the current correlations between rainfall and crop production, while the coefficient of variation (CV) was employed to analyse the interannual and interseasonal variability in rainfall.

**Study Area:**

The study area selected for the present work is located in Shevgaon and Newasa tehsil's in Ahmednagar district of Maharashtra. Total study area is 2,375.28 $km^2$. It is divided into two tehsil's Newasa tehsil is larger than Shevgaon tahsil. Nathsagar dam is across on the River Godavari in Paithan tehsil of Aurangabad district, near district boundary of Ahmednagar and Aurangabad. Back water of Nathsagar Dam is spread in Shevgaon and Newasa tehsil of Ahmednagar District. The study area is located on the east side of the Ahmednagar district, between 190 12'14" and 190 33'57" North latitude and 740 56'48" to 750 32'44" East longitude. There are 232 communities in the research region as a whole. The total area of the study area is 2374.28 km2, of which 2137.1 km2 (90.0%) is used for agriculture, 26.32 km2 (1.0%) is covered by forest, and the remaining 211.09 km2 (9%) is used for other purposes. 503.7 mm of rain falls on average.

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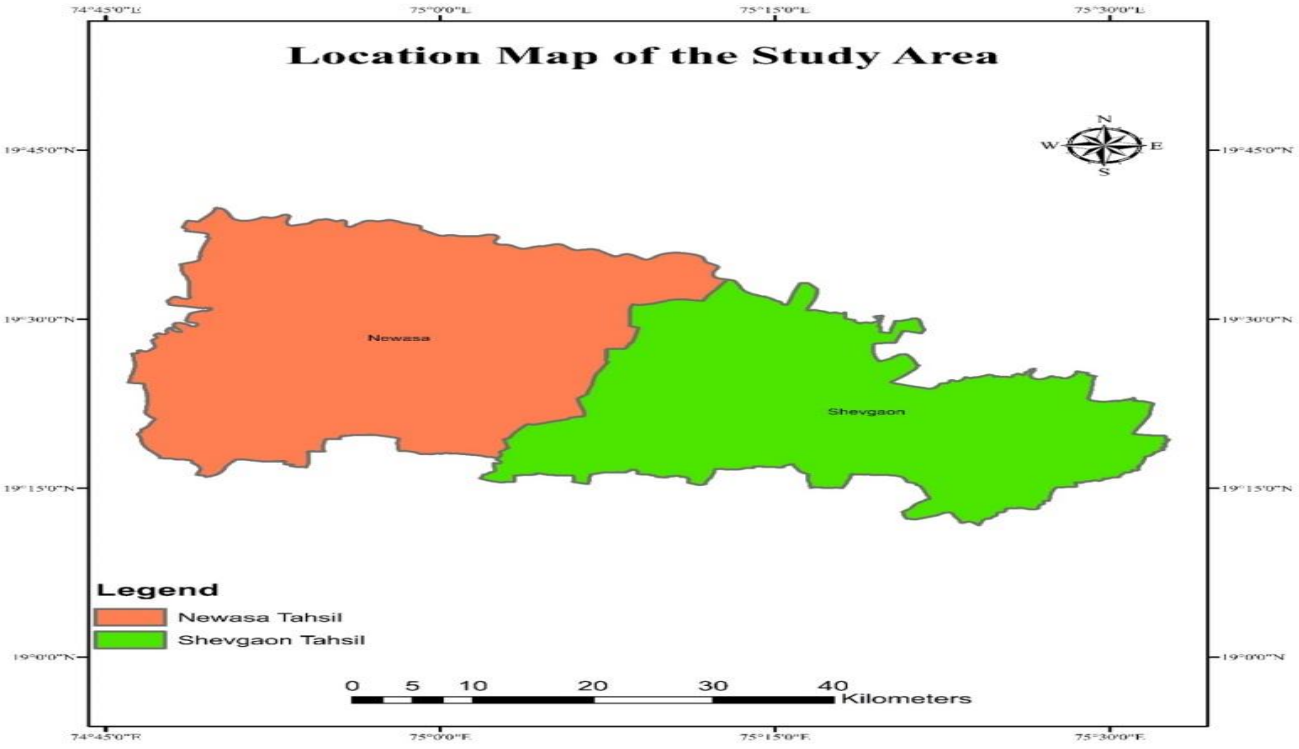


Figure – 1: Location Map of the Study Area

**Analysis and Results:**

**Spatial Distribution of Rainfall in Study area:**

Assembling the in this rain shadow region, rainfall is distributed spatially from west to east and north to south. The average yearly rainfall in the study region is 523.5 mm. The region receives between 185 mm and 1134.5 mm of rainfall on average every year, according to Tehsil and IMD records going back 40 years. East to west rainfall variance is seen in the research area. The administrative border between the Shevgaon and Newasa tehsil divides the study area into two sections, east and west. Western section is in Newasa tahsil, while the eastern portion is in Shevgaon tahsil.

**Eastern and Western Rainfall Zone:**

Shevgaon, Bhatkudgaon, Bodhegaon, Chapadgaon, Dhorjalgaon, and Erandgaon rain gauge stations are included in the eastern half of the research area and are situated in Shevgaon tahsil. The average annual rainfall in this zone is 549 mm, which is less than in the southern half. In the western portion of the research area, which is located in the Newasa tahsil, are the following rain gauge stations: Newasa Kh, Newasa Bk, Salabatpur, Kukana, Chanda, Ghodegaon, Sonai, and Wadala Bahiroba. Rainfall in this area is 498 mm on average yearly. The research area's western portion is a semi-arid region that receives less rainfall than the eastern portion, according to a review of rainfall data.

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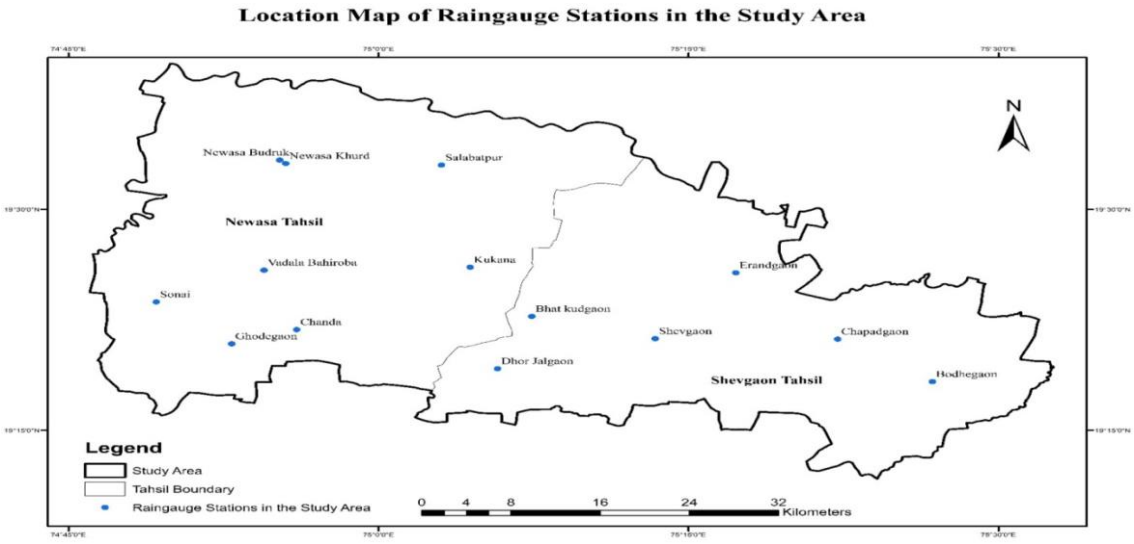


Figure -2: Rain Gauge Stations in the Study Area.

**Crops Output and Rainfall Relationship**:

**Table No.1- Shevgaon and Nevasa Tehsils Average Annual Rainfall**

| Year | Shevgaon (Rainfall in mm.) | Nevasa (Rainfall in mm.) | Year | Shevgaon (Rainfall in mm.) | Nevasa (Rainfall in mm.) |
|---|---|---|---|---|---|
| 1981 | 314 | 366 | 2001 | 507 | 312 |
| 1982 | 407 | 185 | 2002 | 476 | 305 |
| 1983 | 563 | 701 | 2003 | 362 | 219 |
| 1984 | 309 | 407 | 2004 | 785 | 508 |
| 1985 | 247 | 302 | 2005 | 465 | 479 |
| 1986 | 422 | 375 | 2006 | 759 | 629 |
| 1987 | 596 | 488 | 2007 | 450 | 391 |
| 1988 | 824 | 583 | 2008 | 520 | 591 |
| 1989 | 730 | 593 | 2009 | 729 | 456 |
| 1990 | 697 | 786 | 2010 | 824 | 860 |
| 1991 | 391 | 395 | 2011 | 741 | 474 |
| 1992 | 369 | 380 | 2012 | 276 | 502 |
| 1993 | 519 | 447 | 2013 | 532 | 534 |
| 1994 | 585 | 531 | 2014 | 383 | 513 |
| 1995 | 363 | 664 | 2015 | 407 | 457 |
| 1996 | 782 | 623 | 2016 | 699 | 616 |
| 1997 | 226 | 312 | 2017 | 640 | 787 |
| 1998 | 811 | 681 | 2018 | 292 | 332 |
| 1999 | 633 | 461 | 2019 | 621 | 668 |
| 2000 | 569 | 516 | 2020 | 1134 | 455 |

Source: Calculated by author from Rain Gauge Stations data.

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Table No.1- Analytical Value of Tehsils

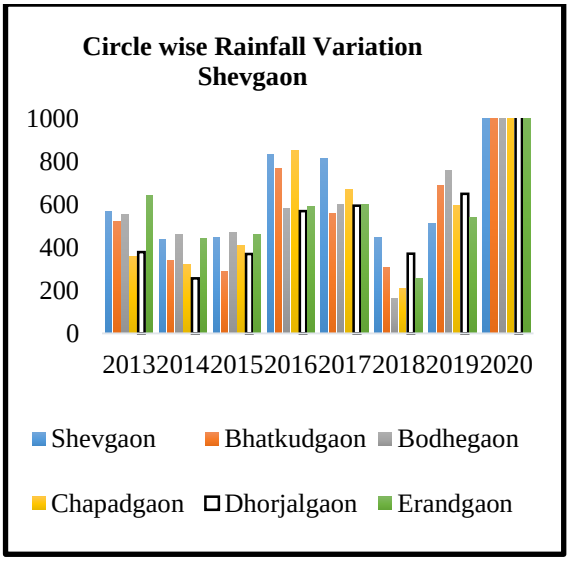
| Shevgaon Tehsil | | Nevasa Tehsil | |
|---|---|---|---|
| Mean Rainfall | 549 | 498 | Mean Rainfall |
| SD Value | 200.86 | 156.98 | SD Value |
| Skewness Value | 0.533 | 0.238 | Skewness Value |

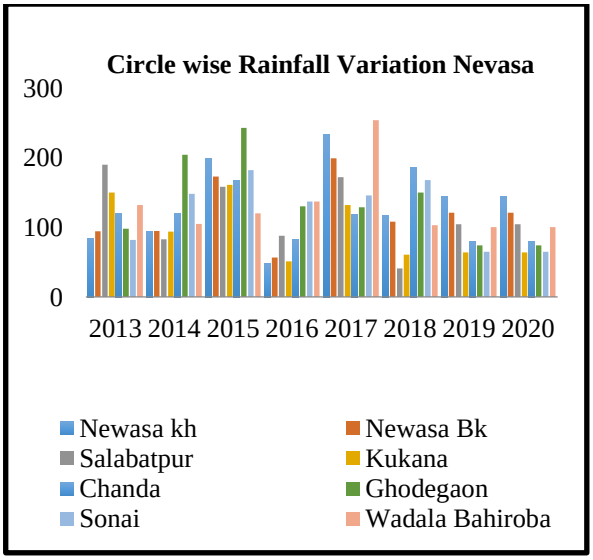
We evaluated annual agricultural yield data from 1981 to 2020 as well as 1981 to 2020 rainfall data. The gaps in the production crop data are responsible for the disparity in applying a standardised period between the two data sets. In this way, the eleven-year window between 1997 and 2020, which spans the relationship and trends between rainfall and agricultural production, was prudently chosen. To ascertain the effect of rainfall variability on change in agricultural production, bivariate correlation and cross tabulation analyses were applied to the two data sets.

In certain cases, the study looked at yearly average temperatures spanning 40 years (1981-2020), whereas in the Shevgaon tehsil area, it looked at temperatures spanning 21 years (1997-202018), which showed two outputs of minimum and maximum levels. Results from administered questionnaires and data from the tehsil reveal that agricultural systems and agronomic practises on the farms used for data collection stayed mostly the same or constant over the length of time that the data was obtained. Rainfall has a negative link with every crop in both the tehsil and the major cultivated crops taken into consideration, according to an examination of the Pearson product moment correlation coefficient. The research area's substantial positive correlation of **P < 0.7890** between rainfall and rainy days was determined.

**Seasonal Rainfall Variability:**

A pattern of variability was identified through analysis of monthly rainfall data between 2013 and 2020, which was then classified to enable comparison of variation in rainfall distribution in the region.




In other words, during the course of the seven years, there was a decline in the distribution of rainfall across the major seasons. The minor season for each CAD also showed greater variability for the years 2013 to 2020, with the first and second years of the study period showing the highest incidence of variability. The seven-year major and minor seasons' coefficient of variation (CV) results revealed significant variance in both seasons, with the minor season's CV being higher **(5.1%)** than the major

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season's **(7.1%).** In practise, the overall average rainfall amount decreased by 310 mm regularly for the major season and by 2018 mm consistently for the minor season throughout the same period (2013-2020).

**Conclusion:**

For an area with a reasonably high level of humidity, analysis of rainfall distribution and crop output could be done using a variety of models. The variance analysis of the major and minor rainfall seasons in this study revealed variability in both, albeit with a very high level in the latter season. In the research area, where agriculture is typically rainfed, such variations in rainfall variability play a significant effect in crop productivity. A decrease in agricultural production yield was connected with the minor season's significant rainfall unpredictability.

The production of agriculture is directly impacted by rain. The research location is located in peninsular India's semi-arid track and has received an average rainfall of 523.5 mm over the past 40 years, according to a 40-year examination of yearly rainfall data. The region's average annual rainfall varies from 185 millimetres in the year 1982 in the Newasa tahsil to 1134.5 millimetres in the Shevgaon tahsil in the year 2020. The research area experiences higher impact from rainfall variability on agricultural output than the national average of 523.5 mm per year.

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***Cite This Article:***

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