



Research Article

SPATIAL DISTRIBUTION OF RAINFALL IN KINNERASANI CATCHMENT AND COMMAND AREA

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Abstract: Rainfall data of 10 year from (2003-2013) of study area kinnerasani basin has analysed here for trend analysis. The rainfall data collected from department of economics and statistics, Hyderabad. Study area covered with four mandals. Rainfall trend was also analyzed through linear regression line. The average annual rainfall of study area for 11 years from 2003 to 2013 was 1224.4 mm. The average annual precipitation in the Kinnerasani basin ranged from 621.1 mm to 1780.9 mm. The Burgampadu mandal received the highest amount of precipitation whereas the Gundala mandal received the lowest precipitation amount. July is the highest precipitation month followed by August in the basin.

Keywords: Trend analysis, Precipitation

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Introduction

Rainfall is one of the most important natural input resources to the crop production and its occurrence and distribution is erratic, temporal having spatial variation in nature. The knowledge of rainfall in any particular region is very helpful in sound crop planning [1] It is natural to imagine that total agricultural production depends, not only on the total rainfall in season, but also on its pattern of its occurrence. The amount and temporal distribution of rainfall are generally the most important determinate of inter-annual fluctuation in national crop production level. Dore, (2005) [2] and Kumar *et al.* (2010) [3], interpreted that rainfall is the most important but variable climatic parameter in the sub humid region and semiarid tropics. Trend and variability analysis of rainfall in Indian context require urgent and systematic attention due to significant possible implications on fresh water availability, agriculture, food security and primary economic activities, *etc.* Pandit, (2016) [4] studied the trend in seasonal rainfall of four rainy months *i.e.* June July, August and September of Rahuri, Ahmednagar India. To determine the rainfall and rainfall analysis is important with respect to crop planning for any region. The trend analysis of rainfall will help in future climate scenarios in northern hill zone and to understand the climate change. In this regard, a detailed study of annual and seasonal rainfall for the study area was understood.

Materials and Methods

Kinnerasani basin of Telangana was selected for the study. The area of the basin is 910 sq.km. It is flowing through the study area. A storage reservoir is constructed on the Kinnerasani River in the Godavari basin at Yanamboli village of Palvancha mandal. It provides irrigation to the agricultural fields and water to Kothagudem Thermal Power station (KTPS) at Palvancha for thermal power generation. The dam has a storage capacity of 233 m³ at the full reservoir leve; of 124.05m. The Latitude and Longitude of Kinnerasani Dam is 17° 41' N and 80° 40' E respectively. There are four mandals namely Gundala, Tekulapalli, Palvancha and Burgampadu under catchment and command areas.

The location map of the study area is shown in [Fig-1].

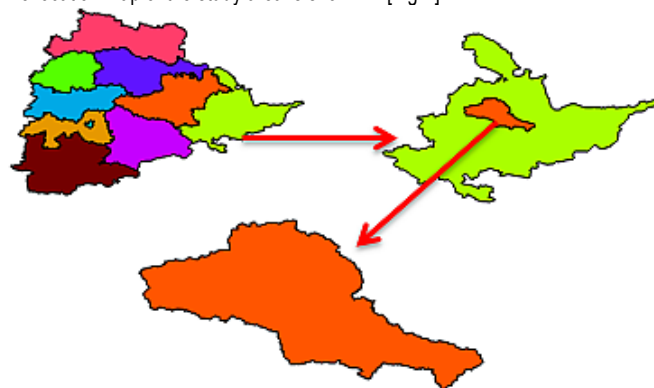


Fig-1 Location map of Kinnerasani Basin, Telangana

The physiography of the area is undulating having a slope of 1-6%, varying from nearly level to steep slope. About 13 percent of the area is nearly level and 58 percent of the area is moderately sloping. The mean elevation of study area is 107 m (351 ft) above sea level.

The major amount of rainfall is received during the South-West monsoon. The rainfall distribution is observed as seasonal with more than 75 percent of rainfall received during the South-West monsoon period. North-East monsoon and summer showers constitute remaining 25 percent of rainfall.

The average annual rainfall of study area for 11 years from 2003 to 2013 was 1224.4 mm. The total amount of rainfall received in study area from 2003-2013 is presented in [Table-2]. The highest amount of rainfall was recorded in 2010 as 1780.9 mm and lowest amount of rainfall was recorded during the year 2009 as 621.1 mm. The average maximum and minimum temperatures of study area are ranged between 33°C and 21.9°C and the average relative humidity was 65%.

Table-1 Geographical locations of mandals in study area

Mandal	Latitude	Longitude	Elevation(m)
Palvanha	17.6092	80.7048	107
Burgampadu	17.6446	80.8668	42
Tekulapalli	17.5609	80.4751	122
Gundala	17.6425	80.9152	92

Table-2 Average annual rainfall of Study area (2003-2013)

SN	1	2	3	4	5	6	7	8	9	10	11
Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Rainfall (mm)	1306.25	1058.075	1486	1186.95	1073.625	1523.575	621.1	1780.9	847.1	1525.7	1071.2

Table-3 Descriptive Statistics of the average rainfall data from 2003 to 2013 of the Kinnerasani basin

Statistics	Tekulapalli	Palvanha	Burgampadu	Gundala	Average
Mean	1141.72	1287.02	1328.25	1145	1225.5
Standard Error	97.88	101.41	117.76	113.72	102.1
Median	1123.2	1195	1428	1150	1186.95
Standard Deviation	324.62	336.32	390.55	377.17	338.63
Coefficient of variation	0.284	0.261	0.294	0.329	0.276
Kurtosis	1.11	-0.9	-1.4	-0.14	-0.38
Skewness	0.4	-0.3	-0.41	-0.04	-0.14
Range	1235.8	988.8	1110.4	1304.2	1159.8
Minimum	580.2	709.6	714.4	480.2	621.1
Maximum	1816	1698.4	1824.8	1784.4	1780.9

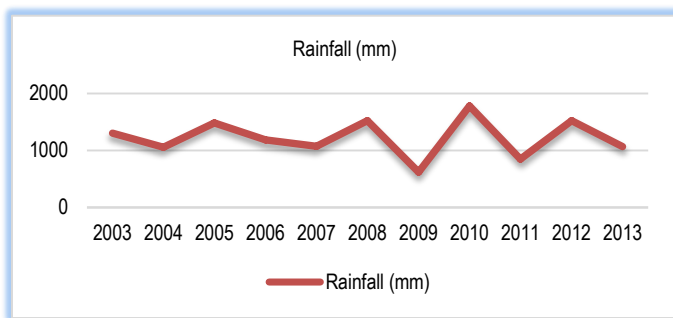


Fig-2 Average Rainfall of the study area for 10 years

Mean rainfall

Mean annual Rainfall = Total rainfall / Number of Years

Standard Deviation (SD)

$$\text{Standard deviation} = SD(\sigma) = \sqrt{\frac{\sum(X - \bar{X})^2}{n - 1}}$$

X = Rainfall frequency

X = Mean rainfall

n = Number of years

Coefficient of variation

CV % = Standard deviation / Mean x 100

Trend analysis

A trend is a significant change over time exhibited by a random variable. In general, the magnitude of trend in a time series is determined either using regression analysis (parametric test) or Mann-Kendall's test (non-parametric method). In this particular study, both the linear regression and Mann-Kendall's tests were employed.

Results and discussion

The average annual precipitation in the Kinnerasani basin ranged from 621.1 mm to 1780.9 mm. The Burgampadu mandal received the highest amount of precipitation whereas the Gundala mandal received the lowest precipitation amount. July is the highest precipitation month followed by August in the basin. Descriptive Statistics of the average rainfall data from 2003 to 2013 in the Kinnerasani basin is presented in the [Table-3]. The coefficient of variation indicates the amount of deviation in rainfall recorded over a period of time from the

mean values. The coefficient of variation of annual rainfall is an index of climatic risk, indicating a likelihood of fluctuations in Kinnerasani reservoir storage or crop yield from year to year. It is a very important statistics for marginal areas than in either very dry areas or in wet areas in agriculture. Spatial distribution of the annual rainfall for different years from 2003 to 2013 was shown in the [Fig-2a to 2]. This map clearly depicted the decreasing trend of rainfall from eastern part to western part of the basin. The eastern part of the study area received higher rainfall.

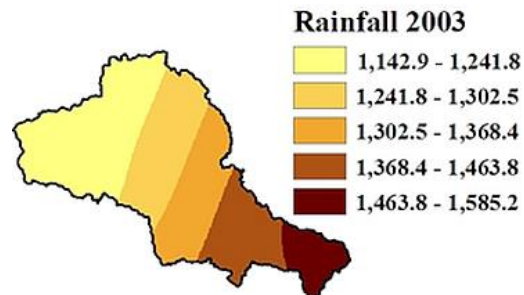


Fig-2a Spatial distribution of annual rainfall for the for the year 2004 in mm

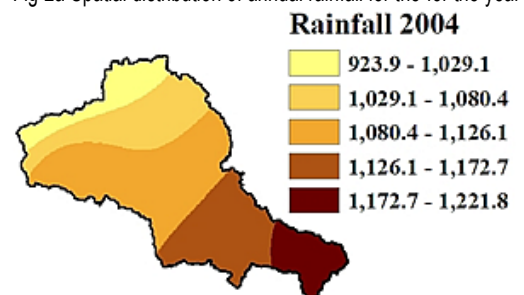


Fig-2b Spatial distribution of annual rainfall year 2003 in mm

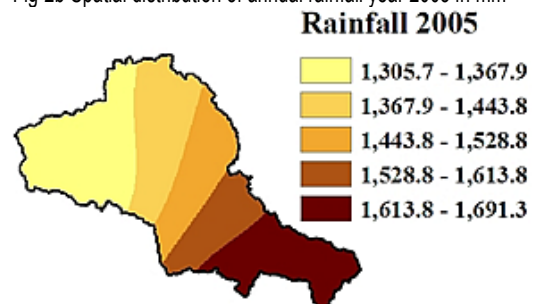


Fig-2c Spatial distribution of annual rainfall for the year 2005 in mm

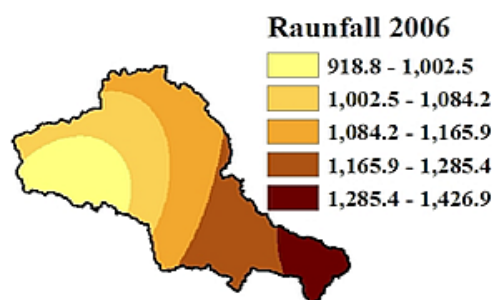


Fig-2d Spatial distribution of annual rainfall for the year 2006 in mm

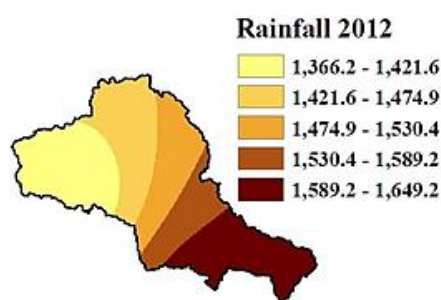


Fig-2j Spatial distribution of annual rainfall for the year 2012 in mm

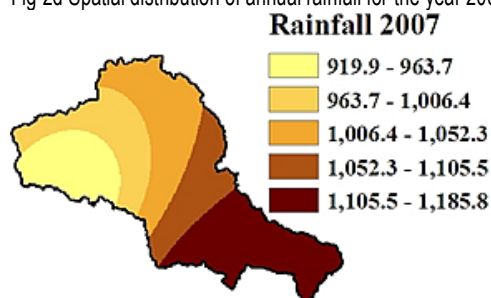


Fig-2e Spatial distribution of annual rainfall for the year 2007 in mm

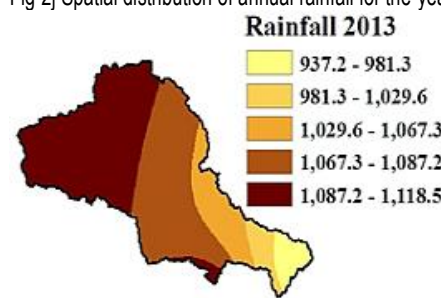


Fig-2k Spatial distribution of annual rainfall for the year 2013 in mm

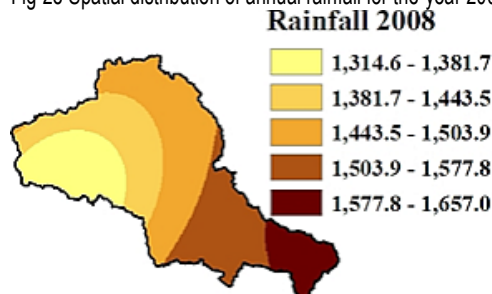


Fig-2f Spatial distribution of annual rainfall for the year 2008 in mm

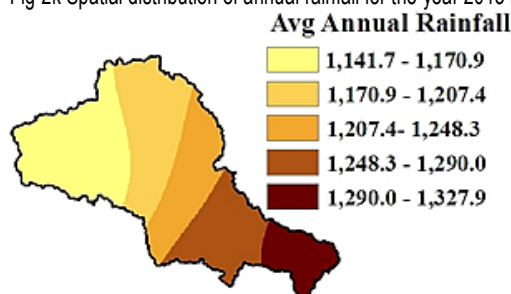


Fig-2l Spatial distribution of average annual rainfall during the year 2003 to 2013
Fig-2a to 2l Spatial distribution of Annual Rainfall (mm) during 2003 and 2013 of Kinnerasani basin

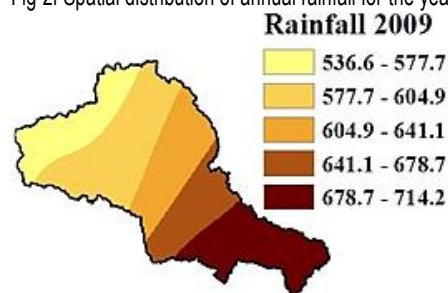


Fig-2g Spatial distribution of annual rainfall for the year 2009 in mm

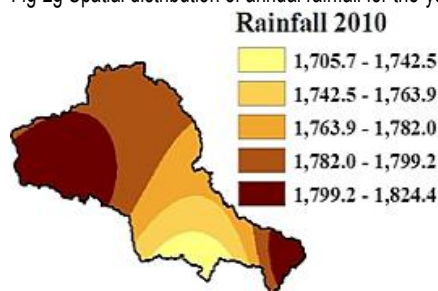


Fig-2h Spatial distribution of annual rainfall for the year 2010 in mm

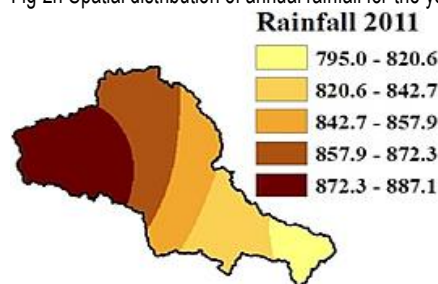


Fig-2i Spatial distribution of annual rainfall for the year 2011 in mm

Application of research: study of spatial distribution of rainfall

Research Category: Agrometeorology

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Study area / Sample Collection: Kinnerasani Catchment and Command area

Cultivar / Variety / Breed name: Nil

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

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