



Rainfall Trend in Drought Prone Region in Phaltan Tahsil of Satara District.

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Abstract:

In this paper the present study reveals the circle wise annual rainfall in Phaltan tahsil of Satara District during 1991 to 2011. The rainfall is one of the fundamental physical parameter among the climate as for the development of society is concern and it determines the drought as well as the environmental factors for the particular region. Thus annual rainfall conditions different from region to region. The drought prone area in the tahsil on annual rainfall occurs once in 20 years. The average annual rainfall Phaltan tahsils is 473 mm. The failure of monsoon has had a disastrous effect on the districts sizable agriculture sector and a large share of the population dependent on agricultural for livelihood. This studies focus on the four circles of Phaltan tahsils in Satara district which is particularly vulnerable to drought Vidni and Barad circle. This article aims to studies pertaining to annual average rainfall indicators shows to fluctuations in months in Phaltan Tahsil of Satara district in Maharashtra. There are differences in the results of the circle wise studies and a clear and consistent picture of rainfall fluctuating has variability in drought prone region. In a study on circle wise trend analysis four circles had decreasing trend in annual rainfall.

Key words: Annual Rainfall, Rainfall Variability, Drought Prone, Climate Change.

Introduction:

The amount of rainfall received over in Tahsil is an important factor in assessing the amount of water available to meet the various demands of agriculture, industry, irrigation, hydroelectric power generation, and other human activities. Agriculture is one of the most important activities engaging more than 70 per cent of the population in India. The problem of raising enough food for millions is of vital importance. Indian economy is inextricably linked with the monsoon and its prosperity is entirely dependent on amount of rainfall receive during monsoon. The success or failure of crops in any year is closely linked with the behaviour of the monsoon most of the sub - divisions of India receive 70 to 80 per cent rain from south-west monsoon. In order to increase agricultural production effective utilization of water resources is of prime importance. The rainfall variations are largely because of relief variations, synoptic conditions, movement of the monsoon through. Rainfall in the greater part of India is uncertain, erratic, vagaries of monsoon and unevenly distributed. Rainfall is the major

parameter influencing agriculture activity of man. Rainfall is the dominant single weather element influencing the intensity and location of farming system and the choice of enterprise. The nature of distribution of these elements determines the necessity of rain agricultural productivity as the region falls in drought prone area of Maharashtra.

Eastern part of the drought prone area in Phaltan Tahsil that is Vidani and some part of the Barad is heavily dependent on natural rainfall. The amount of temporal distribution of rainfall is thus the single most important determinant of crop production levels from year to year and rainfall in much of the district often erratic and unreliable. Rainfall variability and associated droughts have historically been major causes of food shortage, fodder shortage of cattle, shortage of water and decline level of water, shortages of wages and famine in the tahsil. Even though drought followed by food insecurity is not a new phenomenon in eastern part of drought prone region in Phaltan Tahsil, it's frequently of occurrence has increased during recent decades.

In Phaltan Tahsil is average annual rainfall is lot of affinity. This area where undulating topography, poor and shallow yellow-brown soils associated with scanty rainfall (below 500mm) have discomfort human settlement transforming into a drought prone area. The rainfall generally decreases first rapidly and then gradually from the Western Ghats towards the eastern boundary of the Phaltan Tahsil. The government of Maharashtra and Central government declared total five tahsil district drought prone areas in which Phaltan Tahsil lie. This attempt has been made 1991 to 2011 annual rainfall tabulation and use help of mean, standard deviation and coefficient of variation rainfall in Phaltan Tahsil. Eastern part of the drought prone region locale people perceptions that the total rainfall had decreased over the past 30-35 years because of the loss of summer any rainy monsoon.

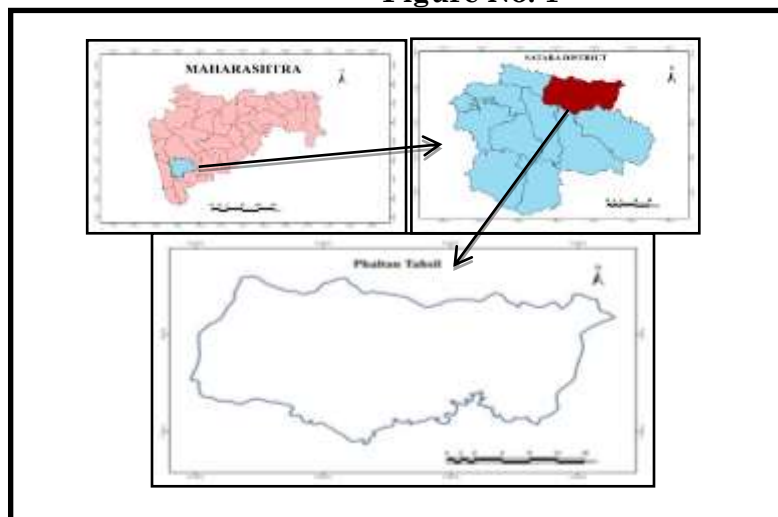
Study Area:

Phaltan Tahsil is selected for the study. The choice of topic under investigation is influenced by many considerations. Firstly, researcher belongs to Phaltan Tahsil hence is familiar with study area. Secondly study area falls in drought prone region of Deccan trap of Maharashtra state, receiving annual average rainfall between 450 -500 mm. It is distributed unevenly in study area. Thirdly irrigation is a dominant factor in study area having considerable impact on land use of Phaltan Tahsil. Banganga River, Banganga canal, Nira River and Nira right bank canal, wells and tube wells are the sources of irrigation in study area. Fourthly, this area has not been so far studied in depth from the land use point of view. Phaltan Tahsil

covering the part of Nira river basin is one of the economically prosperous Tahsils of Satara district in southern Maharashtra. It lies between 17°58' north to 18°05' North latitude and 74°20' east to 74°40' East longitude. It has total geographical area of 1028 sq.km. with 128 villages and one urban settlement. (2011 census) This area is bounded by Nira River in north side. The region attains 750 metres height (M.S.L.) with northward sloping land drained mainly by Banganga, a right bank tributary of the Nira River.

Phaltan Tahsil lies in east of Satara district. It is surrounded by Baramati Tahsil in north side, In southeast side lies Man Tahsil, In southern side lies Khatav Tahsil, in southwest side lies Koregaon Tahsil and in western side lies Khandala Tahsil and Solapur district belongs to east. The study area experiences semi-arid climate. April, May and June are the hottest months with maximum temperature of 40° centigrade. Temperature gradually reduces in December and January with minimum temperature 12° centigrade. The medium black and deep black soil appears within study area. The soil fertility encourages growth of various crops like sugarcane, jowar, bajara, onion, vegetables. According to 2011 Census the area has 3, 42,667 population, out of these 1, 76,250 are males and 1, 66,417 are females and density of population is 333 per square kilometre. State highway, major district and other roads are major routs of transport besides broad-gauge railway route in Phaltan Tahsil. Phaltan is an administrative head quarter of this Tahsil.

Figure No. 1



Objectives:

The present study has been undertaken with following specific objectives.

1. To study the average annual rainfall during the year 1991 to 2011.
2. To find out coefficient of variation and shows the trends of rainfall.

Data Base and Methodology:

The present study is based on the rainfall data collected from Indian Formula,

$$\text{Coefficient of Variation} = \frac{\text{Standard Deviation}}{\text{Mean}} \times 100$$

$$\text{Therefore, C.V} = \frac{\text{S.D}}{\text{Mean}} \times 100$$

Where,

C.V. = Coefficient of variability of Rainfall

S.D. = Standard Deviation of Rainfall

Mean = Mean of Rainfall

Annual Rainfall Distribution:

Rainfall is a prime important factor, considered by influences the agricultural economy of the region. It is also determine the cropping pattern, performance of different agricultural and cultural practices. The marked differences in its regional distribution have given rise to the disparity in the development of agriculture. It is observed that the average annual rainfall of the region is 7250 mm (2007). However, the rainfall decreases from west to east (6000 to 5000 mm). The rainfall analysis for the period 1991 - 2011 reveals that the normal annual rainfall over the Tahsil is about 542.05 mm. In the eastern part of the Tahsil around Kuravali, Rajuri, Vidni, Munjawadi,

Metrological Department for 21 years. Agricultural Statistical Information State, Socio Economic Review Phaltan Tashil and Agricultural District Office, The data has been collected from 1991 to 2011. The trend of rainfall is calculated and represent by mean, Standard Deviation, and Coefficient of Variation in percentage of rainfall in Phaltan Tahsil. For the data analysis following formula has been used.

Shindenagar, Asu, it is minimum and increases towards the west and reaches maximum around Taradgoan, Adarki, Hingangaon, Kapadgaon, Padegaon. The study also reveals that entire eastern, north eastern and south eastern parts of the tahsil comprising almost entire Phaltan city, Barad, in the plains which experienced droughts for more than 20% of the years can be categorized as "Drought Area". The average rainfall data for the period (1991-2011) are presented in Table 1. It seems average annual rainfall in Phaltan Tahsil seen in Adarki. It is found that high rainfall recorded in Tathwada. The Coefficient of variation is comes variability of rainfall the Phaltan tahsil is 37.57 per cent.

Table No 1: Rainfall Trend in Drought Prone Region in Phaltan Tahsil of Satara District.

Average Annual Rainfall in Phaltan Tahsil 1991 to 2011 (in mm)

Year	Taradgoan circle	Phaltan circle	Vidani circle	Barad circle	Average(mm)
1991	550	510	405	415	470
1992	520	490	350	360	430
1993	575	610	615	676	619
1994	595	545	490	366	205
1995	525	510	480	481	499
1996	590	595	582	645	603
1997	550	405	375	390	430
1998	775	885	860	800	855
1999	510	515	525	526	519
2000	410	350	345	399	376
2001	490	495	505	422	478
2002	350	350	325	351	344
2003	310	350	310	330	325
2004	690	715	720	807	733
2005	505	490	450	439	471
2006	670	706	680	700	689

2007	710	730	730	730	725
2008	310	310	350	358	342
2009	645	650	670	643	652
2010	1100	1050	1150	812	1028
2011	350	350	355	313	342
Total	11730	11611	11272	10963	11135
Max	1100	1050	1150	812	1028
Min	310	310	310	313	205
Mean	558.57	552.90	536.76	522.04	530.23
S.D	180.00	189.06	211.10	176.19	199.22
C.V in %	32.22	34.19	39.32	33.75	37.57

Source: Compiled By Researcher

In eastern part of drought prone region result comes of Rajuri. It is very interesting to note that or drought prone tahsil recorded low rainfall. Table No 1 and Fig No 2 shows Easter part of the Phaltan Tahsil Barad circle and Vidani circle shows the clear picture less amount of rainfall during the 21 years. The observed some of the results are thus mainly dependent on local scale climatic controls, physiographical condition, rather than large scale climatic forcing.

Rainfall in Phaltan Tahsil of the Drought Prone Region:

The data obtained on the average annual rainfall of Phaltan Tahsil for the period in two decade viz, 1911 to 2011 were analysed by simple tabular method detail of

rainfall of 2004 is shown in table no 2. The necessity of rainfall arises when the distribution of rainfall is uneven in time and space as the crops require timely and adequate water supply. Table No. 2 and Fig.No.2 shows seasonal distribution of rainfall in 2004. It is evident that the rainy season has been characterized by relatively high rainfall. The high proportion of rainfall is observed in the month of June (263.40 mm). In hot summer season (Mar to May) the region has moderate rainfall (85.40mm). The months of October and November (Post-monsoon) have also recorded 42 mm, rainfall that is useful for rabbi season. Nearly 82.66 percent rainfall occurs in rainy season.

Table 2: Phaltan Rainfall Of 2004 Station Month Wise Rainfall Distribution

Months	Jan	Feb	M	A	May	Jun	Jul	Aug	Sep	Oct	Nov	D
Total Rainfall in mm	00	00	0	00	85.4 (11.6)	263.40 (35.9)	47.00 (6.4)	64.60 (8.8)	231.0 (31.5)	27.0 (3.6)	15.0 (2.0)	0

Note: Figures in bracket indicate percentage of total rainfall 2004

Figure No. 2

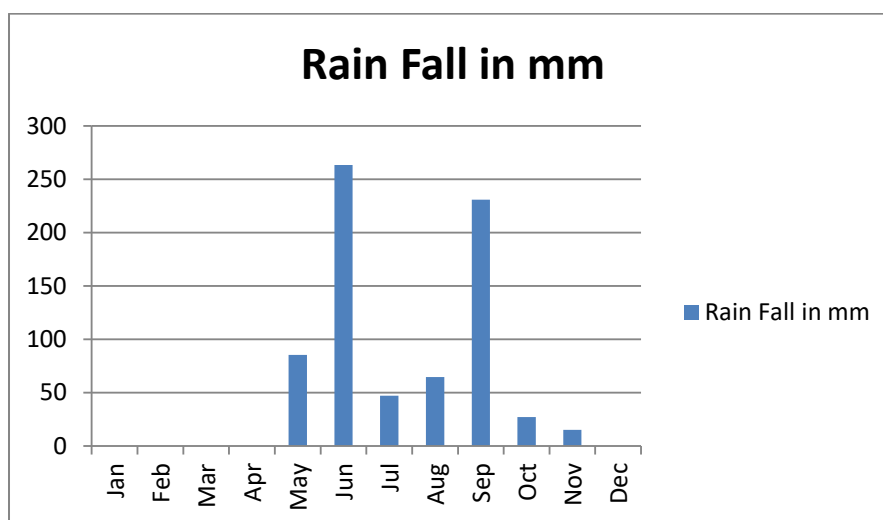


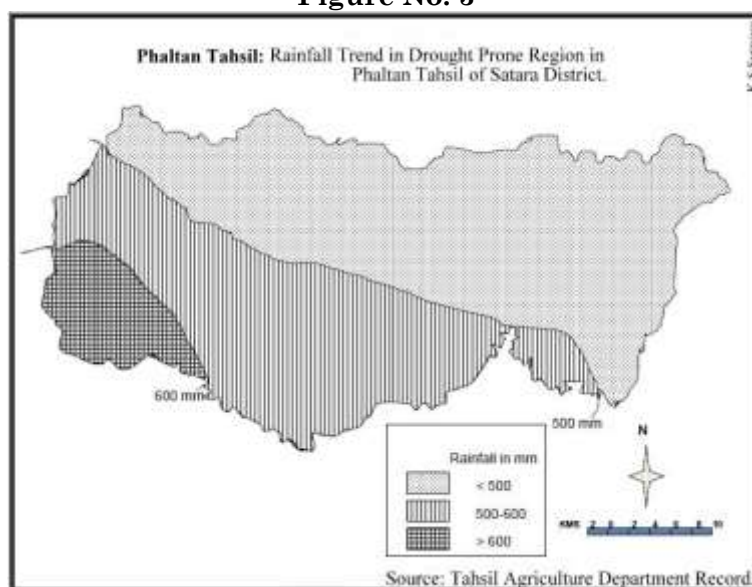
Table No 3: Phaltan Rainfall Station Seasonal Rainfall Distribution (2004).

June to Sept (Rainy Season)	82.66%
Oct to Nov (Post-Monsoon Season)	5.69%
Dec to Feb (Winter Season)	00%
Mar to May (Hot Summer Season)	11.65%

Source: Tahsil Agriculture Dept.

The seasonal nature and intensity of rainfall are important considerations, which determine water regime and consequently the development of agricultural programmer. Semi- arid areas with an annual rainfall in the range of 6000 to 4000 mm having hilly region and rolling terrain including a hard

plateau region can benefit from the agricultural productivity techniques (Bansil, 1998). For the present investigation 20 years rainfall pattern have been considered. The average annual rainfall in the region is 3430.1 mm. which declines west to east.

Figure No. 3

As the result of the rainfall variability in the Phaltan Tahsil. During the period 1991-2011, the difference of the actual average rainfall and trend of the rainfall in Phaltan Tahsil of eastern part of the drought prone region. The above Table No 1 and Fig No 3 show that the trend is positive rainfall variability of 1993, 1994, 2005 and 2006. The trend line is during 1992, 1995, 2000, 2001, 2002, 2003, 2008, 2009 and 2011 negative mainly caused due to drought area. In this year low rainfall received in rainy season. The shortage of the drinking water, decreasing level of water, shortage of fodder for cattle, food shortage, effects of agriculture, population migrated searching of water another district. The application of the dynamic least square model also suggests that the variability of rainfall of the Phaltan Tahsil is decreasing in drought prone area. The above figure of the trend of rainfall variability is indicated curve trend line and actual line is variation then, it

is clear that balanced rainfall in this study region. These results also indicated that for the analysed time period, there was no climate in the region of western Phaltan Tahsil. The circle with significant annual rainfall trends are evenly distributed to the eastern region showed negative trends.

Conclusion:

The study has presented a detailed analysis of rainfall variability and trend of rainfall in the drought prone area in eastern part of the Phaltan Tahsil. By using 21 years recoded of rainfall in four circles, the study examined the temporal and spatial variation of rainfall on a western, central and eastern circle of the Phaltan Tahsil. The main findings of the study are summarized below.

1. Annual rainfall in the Phaltan Tahsil varies from about 558.57 mm in Taradgoan circle to 522.04 mm in Barad circle.

2. Analysis of annual average rainfall indicators shows to fluctuations in Months. During the period of 2004 shows decreasing trends in drought prone region.

The focus in this study has been to describe rainfall variability as a basis for improving the understanding of crop climate relationships in this drought prone region. In a follow up paper, I analyze impacts of rainfall variability of yields of staple crops and investigate the benefits of rainwater harvesting as a livelihood strategy. In conclusion, this study has shown that there are significant intra-regional differences in rainfall amount, variability and trend. In general, rainfall amount is higher and its variability lower, in the western part of the region than in the eastern part. The observed trends in some of the results are thus mainly dependent on local scale climatic controls, rather than large scale climatic forcing. The results also suggest the need for further investigation local anthropogenic intervention in the environment, which could be one of the major causes of climate change in drought prone regions.

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