GEOGRAPHICAL ANALYSIS OF RAINFALL IN SOUTHERN PUNE DISTRICT

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Abstract

Climate plays an important role in characteristics of agricultural economy in a region. Temperature and rainfall are two major elements of climate, which is treated as primary determinants of crop growth. Rainfall means amount of rain and rain means a form of precipitation consisting of water droplets ranging from 1 to 5mm in diameter. Rainfall is most important climatic element considering agricultural phenomena. Rainfall is the most important climatic factor as it determines the potential of any region in terms of crops to be raised, farming systems to be adopted, the nature and sequence of farming operations to be followed, and the targets to be achieved in agricultural productivity. Therefore attempt is made here to analyse rainfall in South Pune district. The paper is based on secondary data source. To calculate annual average rainfall and average rainy days the statistical technique, arithmetic mean has been utilized. The rainfall variability is calculated by using the formula of Co-efficient of variation. The study reveals that high rainfall in Western part and low in Eastern part of the study region is a result of physiography of study area. The high rainfall variability in Baramati and Indapur is mainy due to the location in plain and drought prone area which indicates low assurance of rainfall.

Key wards: Rainfall, Intensity Variability.

Introduction:

Man's agricultural activities depend on the physical environment in which he lives although he often has tried to minimize the restrictions (Singh and Dhillon, 1984). Nature, in its diverse manifestations, namely, the soil, the water and the climate, provides man in different area with a variety of possibilities for development (Hettener, 1947). For the scientific study of agricultural phenomena, one must pay attention to relationship in between the climate and agriculture. Climate plays an important role in characteristics of agricultural economy in a region. It can influence the choice of farming system either indirectly through its impact on soil formation or directly through such as the length of the growing season, the occurrence of frost and the availability of water for crop Growth (Shirlaw ·D.W. (1971).

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Rainfall is the most element of climate considering success of agriculture. Rainfall means amount of rain and as per Oxford dictionary of Geography rain means a form of precipitation consisting of water droplets ranging from 1 to 5mm in diameter (Susan Mayhew, 2009). Rain is the cheapest source of water availability. The crop failure and imbalance in agricultural productivity may be caused due to arbitrary nature of monsoon rainfall. Failures of rains or excessive rainfall in a short period have brought repeated crop failures and famines in many parts of the world. Heavy rainfall may directly damage plants or interfere with flowering and pollination (Husain Majid, 2002).



The study Area

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The Southern Pune district is located in westrn part of Maharashtra. The absolute location is 17° 15' 30" to 18° 40' 20" North Latitudes and 73° 20' 00" to 75° 10' 30" East Longitudes. The South Pune district has an area of 9011.25 Square kilometers. It is bounded by Satara, Solapur district on the South East, by Northern Pune District on the North, by Ahmednagar District on the east and by Raigarh District on the west. The Southern Pune district district consists of eight tahasils namely Bhor, Barmati, Haveli, Indapur, Mulasi, Daund, Purandar and Velhe. It lies on the Deccan plateau on leeward of western ghat. The altitude at Pune is 559 meters above from sea level. The western part of the district is covered by Eastern part of Western Ghat and foot hill area of it and Eastern part is of low level plain. Climate is hot and dry in the Eastern part of the study region. The average temperature in summer is from 22°C to 41°C and in winter is from 8°C to 25°C. The western part comes under the high rainfall region, while eastern in low rainfall region. The soil of the district is essentially derived from the Deccan Trap, can broadly classified into three groups i.e. shallow soil, medium soil, and deep soil. The population of study is is 4276157 (as per 2011 census) and density of population is 475per sq. km

Rational of the Study

Temperature and rainfall are two major elements of climate, which is treated as primary determinants of crop growth. Rainfall is most important climatic element considering agricultural phenomena. Rainfall is an important beam of hydrological cycle which determines the amount of water available for human use. It is the dominant single weather element influencing the intensity and location of farming systems and the farmer's choice of enterprises. It also becomes a climatic hazard to farming when it is characterized with scantiness, concentration, intensity, variability and unreliability. Rainfall is the most important climatic factor as it determines the potential of any region in terms of crops to be raised, farming systems to be adopted, the nature and sequence of farming operations to be followed, and the targets to be achieved in agricultural productivity. Irregular and inadequate rainfall leads to the water deficiency. If rainfall variability excess of 20 percent implies a great risk to farming (Williamson, 1925, Singh and Dhillon, 1984). Total rainfall and its month wise distribution is a significant factor considering production and land use intensity.

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The patterns of rainfall variability determine the areal extent of water balance. Therefore attempt is made here to analyse rainfall in South Pune district.

Hypothesis

The amount of rain decreases with the decrease of elevation of region.

Objectives

The main objectives of this paper are as following.

1) To study the spatial and seasonal distribution of rainfall in Southern Pune district.

2) To analyse intensity and variability of rainfall in the study area.

Data collection and methodology

In order to meet these objectives the relevant information and data regarding rainfall and rainy days are collected and used for the period of 1990-2014 is based on the secondary sources. The information and data was collected from Socio Economic Review and District Statistical Abstracts of Pune District, 1990-2014.

Collected rough data are processed. To calculate annual average rainfall and average rainy days the statistical technique arithmetic mean has been utilized. The Co-efficient of rainfall variability is calculated by the following formula.

Co-efficient of Rainfall variability =
$$\frac{S.D}{\overline{X}} \times 100$$

Where,

S.D = Standard Deviation

 \overline{X} = the arithmetic mean of rainfall during the 31 years

Analysis of the study has been made with help of the statistical techniques and on the basis of this results and conclusion are drawn.

Result and Discussion

Distribution of average Annual Rainfall:

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The table 1 indicates that average annual rainfall is 1077.88 mm in the study region. The rainfall varies from 491.64 mm in Daund tahsil to 2520.08 mm in Velhe tahsil. The table 1 reveals that the very high rainfall is recorded only in Velhe tahsil.

Sr. N o.	Tahsils	Monsoon June-Sept.	% to total rainfall	Post- Monsoon	% to total rainfall	Win-ter Season	% to total rainfall	Hot Season Mar-May	% to total rainfall	Total Rainfall	% to total rainfall
1	Bhor	1003.89	83.37	157.98	13.12	7.83	0.65	34.44	2.86	1204.14	100.00
2	Baramat i	377.51	69.75	146.57	27.08	2.38	0.44	14.72	2.72	541.18	100.00
3	Haveli	609.07	78.19	139.75	17.94	1.17	0.15	28.98	3.72	778.96	100.00
4	Indapur	417.12	77.09	117.95	21.80	5.41	1.00	0.60	0.11	541.08	100.00
5	Mulshi	1538.17	92.31	107.81	6.47	5.33	0.32	15.00	06.0	1666.31	100.00
6	Daund	344.50	70.07	109.78	22.33	10.62	2.16	26.70	5.43	491.60	100.00
7	Purandh ar	629.25	71.54	191.22	21.74	17.06	1.94	42.13	4.79	879.67	100.00
8	Velhe	2362.32	93.74	136.59	5.42	10.08	0.40	11.09	0.44	2520.08	100.00
	study Region	857.02	79.51	183.13	16.99	9.49	0.88	28.24	2.62	1077.88	100.00

Table 1: Annual average and Seasonal Distribution of Rainfall (rainfall in mm)

Source: Socio-economic Review and District Statistical Abstract of Pune District (190-91 to 2013-14).

The moderate rainfall is registered in the tahsils of Bhor and Mulshi, while it is low in the tahsils of Daundb Baramati, Indapur, Haveli and Purandar. Rainfall decrease from west to east in the study region. There are two peaks of rainfall pattern in July

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and September. In the month of April and May sometimes thundershowers occur in the region causing damage to crops.

Seasonal Distribution of Rainfall:

i) Southwest monsoon period:

The table 1 indicates that the study region as whole receives 79.51 per cent of total annual rainfall in the south-east monsoon period, but spatial distribution varies from tahsil to tahsil. The low rainfall is recorded in the tahsils of Baramati, Indapur, Daund and Purandar i.e. < 78per cent in the Southwest monsoon period. The moderate rainfall is recorded in the Haveli and Bhor Tahsils I.e.78 to 86 per cent, where as it is high in Mulshi and velhe Tahsil i.e. > 86 per cent. The hot and humid climate affects on crops as many disease spread all over the plants. Therefore the frequency of spraying pesticides and insecticides are being increased.

ii) Post Monsoon Period:

During this season, the study region as whole receives 16.67 per cent of the total annual rainfall from retreating monsoon and cyclonic rainfall, but tahsil wise distribution ranging from 5.42 to 27.08 per cent of total annual rainfall. The low rainfall in post monsoon period is recorded in Velhe and Mulshi tahsils i.e. < 13 percent. The moderate rainfall is recorded in Bhor and Haveli tahsils i.e. 13 to 20 percent, where as it is high in Baramati, Daund, Indapur and Purandar tahsils i.e. > 20 percent.

Post monsoon rainfall is useful to the crops particularly flowers and vegetables. If this rainfall is sufficient, the intensity of agricultural operations are increased.

iii) Winter Season:

During December to February region as whole receives only 0.88 per cent of the total annual rainfall, but spatial distribution varies from 0.15 to 2.16 per cent of total annual rainfall. (Table 2) The low rainfall in winter is recorded in the tahsils of Haveli, Bhor, Baramati, Mulshi and Velhe i.e. < 0.82 percent. The moderate rainfall is recorded in Indapur i.e. 0.82 to 1.49 percent, where as it is high in Daund and Indapur

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tahsils i.e. > 1.49 percent. Sometimes cyclonic rainfall occurs in the month of February which is harmful to fruit crops such as grapes and mangoes.

iv) Summer Season:

In summer season district as whole received 2.50 per cent of annual total rainfall. It varies from tahsil to tahsil ranging from 0.11 to 5.85 per cent of annual total rainfall. The low rainfall in summer season is recorded in Indapur, Mulshi and velhe tahsil i.e. < 2 percent. The moderate rainfall is recorded in Bhor, baramati and Haveli i.e. 2 to 4 percent, where as it is high in Daund and Punrandar tahsils i.e. > 4 per cent. This rainfall is useful for summer crops like mango, flowers and onion but it is largely limited by concentration in few days of the summer. This rainfall is not sufficient to meet annual water need for successful production. It is also not well distributed spatially as well as temporally.

Intensity of Rainfall:

The term intensity of rainfall is used in the context of rainfall received during 24 hours period. It is important as it determines the intensity of soil erosion. The table 2 exhibits that the South Pune district as a whole has 20.21 intensity of rainfall, but the spatial distribution of intensity of rainfall varies from tahsil to tahsil.

Sr.N	Tahsils	Average	Rainy	Intensity	Co-efficient of
0.		Annual	Days	Of Rainfall	Rainfall
		Rainfall in	-		Variability in %
		M.M			
1	Bhor	1204.14	65.00	18.53	27.64
2	Baramati	541.24	29.00	18.66	42.63
3	Haveli	778.96	47.63	16.36	31.60
4	Indapur	541.08	30.71	17.62	43.60
5	Mulshi	1666.31	73.04	22.81	25.01
6	Daund	491.64	29.33	16.76	34.96
7	Purandhar	879.58	40.92	21.50	35.05
8	Velhe	2520.08	85.64	29.43	25.96
	Region	1077.88	50.16	20.21	33.31

Table 2: Intensity of Rainfall and Co-efficient of rainfall variability (1990-2014)

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Source: Compilled by Researcher on the basis of Socio-economic Review and District Statistical Abstract of PuneDistrict (1990-2014).

The low intensity of rainfall i.e. < 21 is found in Bhor, Baramati, Haveli, Indapur and Daund tahsils. The moderate intensity of rainfall is observed in Mulshi and Purandar tahsils i.e. 21 to 25, whereas it is high only in Velhe tahsil i.e. > 25.

Rainfall Variability:

The table 2 indicates that the spatial pattern of average rainfall variability in the region. The district as a whole has 33.31 percent rainfall variability but the spatial distribution varies from tahsil to tahsil. The low rainfall variability is observed in Bhor, Velhe and Mulshi tahsils i.e. < 31.21 percent. It is moderate in Haveli, Daund and Purandar tahsils i.e. 31.21 to 37.41, whereas it is high in Baramati and Indapur i.e. > 35 percent because they are situated plain and drought prone area. Generally, rainfall variability increases from west to east in the study region. Therefore, rainfall reliability is low in Eastern part in relation to Weastern part of the region. As mentioned earlier, the study region as whole has over 33 per cent of rainfall variability so that agriculture without irrigation in the region becomes uneconomic. But one important point to note that is fruit crops like Pomegranate can withstand these rainfall variations and longer dry spells better.

Conclusions

The study reveals that the high rainfall in Western part and low in Eastern part of the study region is a result of physiography of study area. The rainfall is scanty in the Eastern part of Pune districtas it lies in the rain shadow zone. The low rainfall have led to semi- arid condition in the eastern part of study region. During the Southwest monsoon season study region as whole receives 79.51 per cent of the total annual rainfall which determine the availability of water resource and time table of agricultural operations depend on South-West Monsoon. The high intensity of rainfall in Velhe tahsil indicates high rate of soil erosion. The high rainfall variability in Baramati and Indapur is because they are situated plain and drought prone area indicates low assurance of rainfall. The study region as whole has over 33 per cent of

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rainfall variability so that agriculture without irrigation in the region becomes uneconomic.

Recommendations

1. The low rainfall and high rainfall variability have led to semi- arid condition in the eastern part of study region therefore it is recommended that pomegranate cultivation is more suitable in this part due to it's drought résistance nature and also recommended that to make awareness in the farmers regarding water literacy, use of drip irrigation and other agronomic innovation to save water.

2. The high intensity of rainfall in Velhe tahsil indicates high rate of soil erosion therefore it is recommended that to do plantation and watershed development programmes.

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