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"GEO-LOCALE PATTERN, TEMPORAL DEFLECTION'S AND DETERMINANTS OF POTENTIAL EVAPOTRANSPIRATION (PET) FROM THE YEAR 1980-2016, AN ANALYTICAL ASSERTION OF NASHIK DISTRICT, MAHARASHTRA, INDIA"

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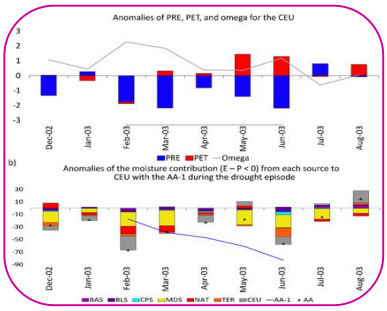
ABSTRACT

Climate is a main role player in economic development of the country especially Rainfall, Temperature and Evaporation matters must in the Agricultural development. In this paper an attempt should made to analyze the Potential Evapotranspiration pattern and Trend through Climatic data. The variations in Spatial and Temporal pattern in Potential Evapotranspiration (PET) examined for 37 Years arithmetic Mean for the better and will for the more clear and fruitful results to planning of sustainable agricultural practices and Water management in study region.



KEYWORDS : *Geo-Locale, Potential Evapotranspiration, Albedo, Crop Cover, Radiation.*

1. INTRODUCTION:

Evapotranspiration is a term used for evaporation and plant transpiration from the land surface to atmosphere, including evaporation, and from vegetation .Study area was influenced by uneven relief features, high extent of cropped area as well as more area covered under black soil and the influencible variations of climatic features. These all and other local factors also contributing to deflection in the pattern and trend of the Potential Evapotranspiration.

Evapotranspiration is the major mechanism for maintaining the upward capillary flow of water from the soil to the canopy and is controlled primarily by atmospheric vapor pressure deficit and solar radiation (J. Wallace and McLane, 2010). (Insect Ecology (Fourth Edition), 2016) Evapotranspiration,' both actual and potential, was first defined by Thornthwaite's in 1944, *(G. Stanhill, in* Encyclopedia of Soils in the Environment*, 2005)*

STUDY REGION:

Nasik district lying between 19°35'18" North latitude to 20°53'07" North latitude and 73°16'07" East longitude to 74°56'27" East longitude, with an area 15530 sq.km. and population of 6,109,052, as per the 2011 census. There are 15 Tahasil and 66 revenue circles are in the Nashik district.

Nashik district is situated in the Deccan trap of Maharashtra which is partly in the Tapi Basin and partly in the upper Godavari Basin. The main stream of hills in the Sahyadri which is runs North-South in the western proportion of the district. Ajanta range which runs right across the district. It acts as a watershed between the Girna and its tributaries which drain towards the Tapi to the north and the Godavari and its tributaries to the south. More area of this region is in the rain shadow zone which is called as rain fed area. Drought is the phenomenon which affects the cropping pattern and agricultural development. So we are interested to find out some concrete solution for the agricultural development of this region.

OBJECTIVES:

1) To identify Geo-Locale Pattern of Potential Evapotranspiration
2) To analyze the Temporal Deflection's of Potential Evapotranspiration
3) To find out the Determinants of Potential Evapotranspiration

METHODOLOGY:

This study is depending upon last 37 years data of Climate which is obtained from 'India Meteorological Department, Pune and Hydrological Department, Nashik. We are using following methods for analysis.

1. **Thornthwaite's formula** is applied for the calculation of potential evapotranspiration. The potential evapotranspiration (PET) is calculated using the mean monthly temperature (0C), with corrections for the day length, for a 30 days month (12 hours days).

PE (in cm) = 1.6(10t/I) a

Where,
PE = potential evapotranspiration
I= sum of 12 month of (t/5)1.514
a= further complex function of I
Based on Thornthwaite's formula the monthly, seasonal and annual potential Evapotranspiration are calculated For Nashik district during 30 years periods.

2. **Mean** is calculated by using the following formula.

$$\bar{x} = \frac{\sum x}{n}$$

Where, $\bar{x}$ = mean Σx = is the sum of the rainfall value
n = total number of values.

3. **Trend** Analysis by **Time Series** Method of Statistical Technique

Connotation:

Potential Evapotranspiration in study area analyzed in three categories i.e. Geo-Locale Pattern, Temporal Deflections and the Determinants of Potential Evapotranspiration are discussed as fallows.

A. Geo-Locale Pattern and Temporal Deflection's of Potential Evapotranspiration

Geo-Locale pattern of the Potential Evapotranspiration shows mainly the seasonal variations (Table No.1) in the study area in the month of March, April and May The PET recorded highest in the study area While in the month of December, January and February it is recorded very low and in the month of June, July, August and September it is in the moderate condition and in the October and November it is High. The all time average highest Potential Evapotranspiration was recorded at Deola Tahsil it was 16.3cm and lowest at Dindori it was 0.1 cm.

Seasonally Deflection and pattern (Fig.1) was varied by season to season in the Cold Season because of low solar radiation and reflection of the Solar Energy it will be having

Tahsils	Seasons			
	Cold Season Dec.-Feb.	Hot Season Mar.-May	South West Monsoon Season June-Sept.	Post Monsoon Season Oct.-Nov.
Surgana	0.6	11.13333333	9.05	3.7
Peth	0.9	11.2	8.1	4.3
Trimbak	1.16	11.03333333	9	4.65
Igatpuri	1	11.96666667	10.075	4.35
Nashik	1.06	12.06666667	8.55	4.35
Dindori	0.7	11.71666667	8.85	4.15
Satana	0.93	13.72333333	9.275	3.35
Kalvan	0.93	12.86666667	8.625	3.35
Niphad	1.03	10.73333333	8.1	3.25
Sinner	1.46	9.266666667	8.825	3.7
Yeola	1.26	10.26666667	8.325	4.1
Chandvad	1.2	11.13333333	7.675	4.05
Nandagaon	1.06	11.13333333	8.2	3.95
Malegaon	1.1	10.4	8.1	3.85
Deola	1.06	10.83333333	8.125	2.755
Total Average	**1.03**	**11.2982222**	**8.591666667**	**3.857**

Table No.1 Geo-Locale Pattern and Temporal Deflection's of Potential Evapotranspiration (PET) Average (in CM).

Source of Data: IMD Pune, Hydrological Department, Nashik, Compiled by Author.

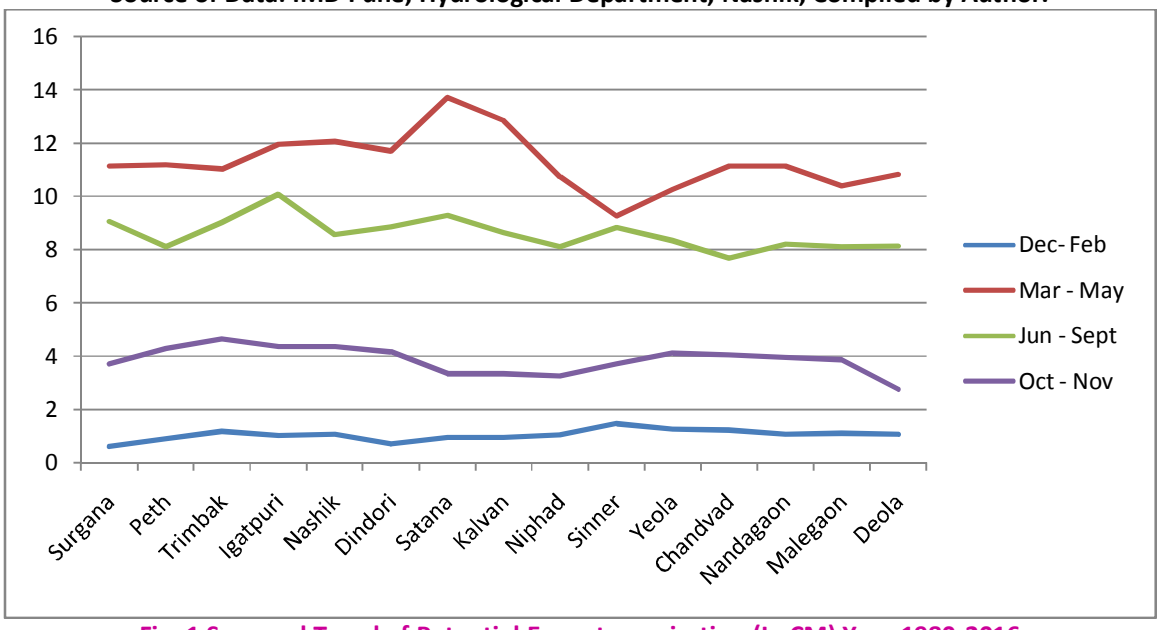


Fig: 1 Seasonal Trend of Potential Evapotranspiration (In CM) Year 1980-2016

very low average of Potential Evapotranspiration i.e. total average is 1.03 cm in the hot season, highest among the all recorded 11.29 cm and followed by South West Monsoon Season was having 8.59 cm average PET and in the Post Monsoon Period it is 3.85Cm.

A. Determinants of Potential Evapotranspiration (PET)

Determinants of the Potential Evapotranspiration (PET) are grouped in two categories i.e. agricultural determinants from the study area and the Climatic determinants from the study area. All are discussed as following.

1. Agricultural Determinants:

a. Area of Crop Cover

The transpiration of the moisture from the land is regarding with the cropped area most of the crops covering soil surface area because of that very small amount of water is lost. Total gross cropped area in Nashik district is 744542 Hectare in Year 2011-12 (Ref. Directorate of Agriculture, M.S. Pune and District Inspector Land Records, Nashik.) this value is very high to compare of other land use types because of that PET amount is Small in the Study Area.

b. Wrong Agricultural Practices

Wrong Agricultural Practices includes method of cultivation the interaction of raw crops with the sunrays is important if surrounding land is barren then automatically evaporation will be excesses, this phenomenon was occurs in the Western and Eastern parts of the Study region mainly Surgana,Peth,Malegaon,Yeola having high amount of Potential Evapotranspiration.

2. Climatic Determinants:

Study area having uneven physiography because of that the climate of the region is also varied according to elevation the middle part of the region mainly Baglan, Kalvan, Dindori, Nashik and Igatpuri having high elevation and low Evapotranspiration while other areas having more than average Potential Evapotranspiration in the region result of their physiography. Wind also the important phenomena to remove Moisture from the Surface the average wind velocity is high in the Middle part of the region as well as Wind pattern various according to the seasons that's why in the pre Monsoon period Potential Evapotranspiration recorded high in the region. Albedo (Reflection of the radiation from the Surface) also affects the amount of PET varied with type of the terrain .

CONCLUSION:

More area of this region is in the rain shadow zone which is called as rain fed area. Drought is the significant phenomenon because of the high Potential Evapotranspiration which affects the cropping pattern and agricultural development. The present study will help to understand the relationship between Potential Evapotranspiration and the influences of other factors, like Soil, water supply and technology, represented by mechanization, pest and disease control, and the other agricultural management aspects. Although these factors are crucial in agriculture and crop yield. Scientific crop planning is possible through an understanding of Agroclimatic potential of the Study Region. The region having low agricultural efficiency index is facing problems of the Deforestation, wild life is becoming rare, soil erosion is common, water level is very deep, and soil fertility has been reduced in some of the Drought Prone areas because of the High Potential Evapotranspiration rate. Most of the region having uneven Climatic and Physiographic Condition. There is regional imbalance in water resource and management. Some parts of Region having wrong Agricultural Practices. Lack of Awareness within the farmers and civilians is on climate change issues for further adaptation and mitigation. There is a Scope for Sustainable Agricultural Development of the Region.

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