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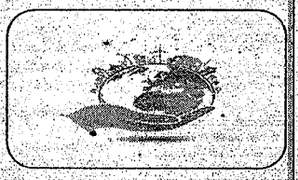

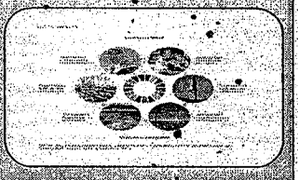

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"Physical and Human Dimensions of Environment, Climate Change, and Sustainable Development"

Agro-Climatic Zonation of Marathwada

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Abstract:

The agro climatic classification is nothing but an extension of the climatic classification keeping in view the suitability to agriculture. The suitability of climate for each crop is different. Because each crop has diverse biological and bioclimatic characteristic. Hence based on climatic and soil factors it is necessary to demark suitable region for crops. The rainfall is most influencing factor on vegetation types and temperature. Therefore it's controlling on selection of crops, sowing period, germination, growth, maturity and harvesting time of crops. The rainfall, temperature, soil types, vegetation cover, altitude, availability of moisture, length of growing period and evapotranspiration are the major common determinants in agro-climatic classification. This study focused on to demark the agro-climatic zones of Marathwada. The data of climatic variables is used from 1980 to2016. In the present classification rainfall, mean temp. MoistureIndex and soil type's parameters are used.All are converted in to raster and vector format and are superimposed on each other and agro-climatic regions have demarked and three major zones are observed.

Keywords: Agro-Climate, Marathwada, Moisture Index, zones.

Introduction:

The agro climatic classification is nothing but an extension of the climatic classification keeping in view the suitability to agriculture. There are many method have been employed for climatic classification. The classification of climate is very much useful not only for geographers but also, planner, agriculturalist, meteorologist, environmentalist, climatologist and other scientists in various fields. Based on the climate farmers can decide or plan about their farm activities such as plowing, selection of crops, time of sowing seeds, taking care of plants etc. The geographers also predict the climate of region through his observation or study of vegetation, soil types, landform, wind speed and direction, amount of moisture in atmosphere, temperature, cloud condition etc. The National Commission of Agriculture (1971) classified the country into 127 agro-climatic zones. Also the Planning Commission of India have classified into 15 agro-climatic zones using various aspects. In 2004 GourangaKar and others have classified Orissa in 10 zones, based on moisture availability Index, evapotranspiration, length of growing period. The selection of suitable land for cultivation of certain crops is a long standing and mainly empirical issues (Kalogirou, 2002). The FAO, in 1976, 1984 and 1985 classified the agricultural potential based on soil and environmental characteristics in to five classes i.e. highly suitable, moderately suitable, marginally suitable, currently not suitable and permanently not suitable. Balungi Francis (2010), has discussed and mapped agro-climatic zone of Soroti districts of Uganda using GIS. In 2010 the Government of Maharashtra also divided state in to 9 agro-climatic zones based on vegetation, rainfall and soil types.

Study region:

The Marathwada region is chosen as study region of the present research work. It belongs from Maharashtra state in India. The study region sited in upper Godavari basin which extends from 17^0 35' north to $20^0$40' north latitude and $74^0$40' east to $78^0$19' east longitude. The study region covers 64434 sq. km. which is 20.95% of states area. Population of the region is 1.87 cores (2011). The study region has been divided in eight districts for administrative purpose with 76 tehsils. The region characterized by Deccantrap mostly found basalt rock. Major part of region covered by black to deep black soil, it formed from basalt rock. The climate of study region is typical hot and dries with high temperature. It ranges from 20^0C to 40^0C some time it goes more than 40^0C in summer and also it falls down below 20^0C in winter season.

The study region receives 771.80mm. average annual rainfall mostly from south western monsoon winds. Near about 70% rainfall receives during June to September i.e. monsoon season.

Objectives:

The main objective of the present study is that to demark the agro-climatic zones of Marathwada.

Material and Methodology:

The secondary sources data is used for this study. The data of Temperature, Rainfall is gathered from IMD and Hydrological Project, Nashik for the period of 37 years from 1680 to 2016. By using the Thornthwaite's PE Index the potential Evapotranspiration is computedand moisture index the moisture zones are prepared.

Im=100((P/PE)-1)

Where, Im= Moisture Index,

P= Mean annual Precipitation and

PE= Annual Potential Evapotranspiration

Discussion:

In the present study rainfall, mean temp. Moisture Index and soil type's parameters are used. The individual layers are prepared and are superimposed on each other and agro-climatic regions have demarked.

Thornthwaite have notified that, the moisture index above 0.0 (zero) as moist climate which represented by A, B4, B3, B2, B and C2, whereas the moisture index below 0.0 (zero) as dry climate represented by C1, D and E. The following table shows the classification scheme based on moisture index and their alphabets respectively according to Thornthwaite and Mather. It is observed that the moisture index range from -21.17 to 6.77. The A'bad , Jalna, Beed, O'bad, Parbhani and Laturdistrict represent with negative value like -21.17, -19.14, -16.16, -15.25, -3.5 and -1.52 respectively. The district are belongs to 0 to -33 Index class and represent 'Dry Sub humid Climate', with C1 letter.

Table No. I Scheme of Moisture Index and Climatic Types[4]

Moisture Index	Climatic Types	Letter	Moisture Index	Climatic Types	Letter
100 Above	Pre-Humid	A	0 to 20	Moist sub Humid	C2
80 to 100	Humid	B4	(-33) to 0	Dry Sub Humid	C1
60 to 80		B3	(-66) to(- 33)	Semi-arid	D
40 to 60		B2	Below (-66)	Arid	E
20 to 40		B1			

The Nanded and Hingoli districts have positive moisture index value by 6.77 and 5.63 accordingly. It indicates that sub humid climate and represent by C2 letter.

a) Western Zone

The western agro-climate zone has been covered A'bad district, western part of Jalna and western part of Beed district. This zone receives 600mm to 750 mm annual average rainfall and having below 26^{0}C annual mean temp. The region has an elevation from 221 mts. to 951 mts. from mean sea level. The soil of this region has very shallow to deep soil from 5" to 36" depth in patches form. The soil has clay, clay-loam, sandy- loam in texture with dark black, black, gray, yellowish in color. The soil has good water holding capacity and well drained condition. Considering all those characteristics the region is suitable for Jowar, Maize, Gram, Cotton and Groundnut crops. Among those Maize, Cotton, Groundnut and Jowar as fodder can be practiced during kharif season. And Wheat, Jowar as food grain and Gram can be cultivated in rabbi season. The Cotton is the major crop in kharif and Sugar cane as annual crop. The river Godavari and its tributaries and Nathsagar Dam over there is helping to supply the water to crops in rabbi season.

b) Central Zone

This zone having the rainfall between 600mm to 800mm average annual and 26^{0}C to 27^{0}C mean temp. This zone occupies eastern Jalna, western Parbhani, northwest Hingoli, Beed, O'bad and western and central part of Latur district. The average altitude of this zone is 400 mts to 951 mts from mean sea level. The soil of this region is very shallow to very deep soil. This soil have clay, clay loam, sandy loam, stony in texture and black, moderate black, red, brown, light brown in color. The soil has moderate to well drain character. Deep and moderate deep black, clay soil have rich in organic matter. Due to all characteristics this zone is suitable for kharif, rabbi and somehow summer seasons crops. In the kharif season Jowar as fodder, Bajra, Maize Arhar, Cotton, Ground nut and Soyabean crops can cultivate.

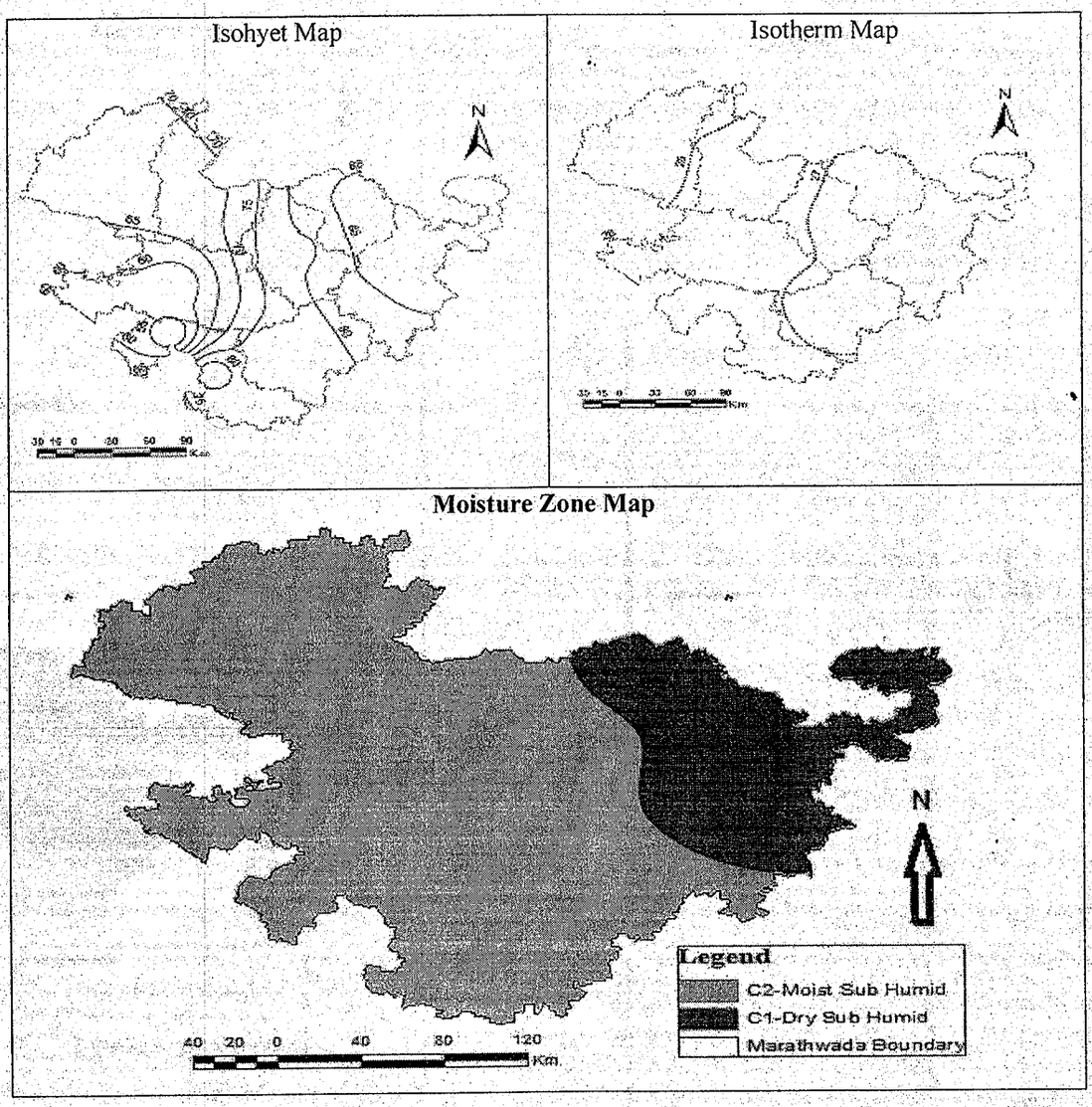


Fig.no. 1

Particularly cotton in A'bad, Jalna, western Parbhani, Hingoli and eastern Beed region. As far as Soyabean crop concern Latur, central, north and eastern O'bad, southern Beed are suitable. Beed, Jalna and central and western O'bad are suitable for Bajra crop.

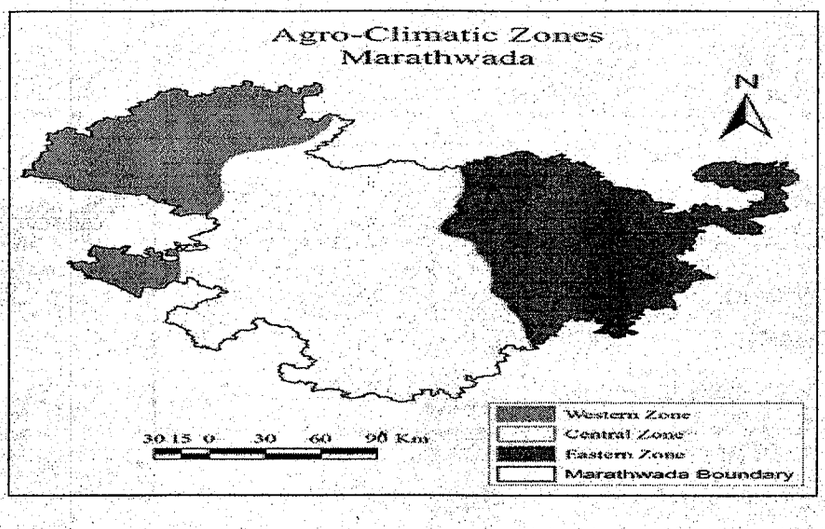
During the rabbi season Gram, Jowar as food grain, Maize crops can grow in this zone. The Prabhani, central and eastern Beed, O'bad and Latur are suitable for Jowar as foodgrain, Jalna, north Beed are suitable for maize and Latur, O'bad, Jalna, south Parbhani are suitable for gram crop.

c) Eastern Zone

Easter Agro-climatic zone is demarcated in eastern part of study region coves eastern Parbhani, eastern Latur, central and eastern Hingoli and Nanded district. This zone receives more than 800 mm average annual rainfall. The annual mean temperature is above 27^{0}C. The average elevation of this zone is from 221 mts to 600 mts from mean sea level. This zone have Godavari River and its tributary basin. So the soil is very shallow to very deep soil. Basically southern, western and north eastern part coves south Hingoli, south, central and north east Nanded, north, north east and east part of Latur have occupied by very deep to moderate deep soil. North and central Hingoli and Nanded, and along the border of Latur and Nanded have found very shallow soil. So this zone is suitable for Jowar (food grain), Arhar and Cotton crops in Parbhani, Nanded and Hingoli districts. SoyabeanJowar

(hybrid), in Latur and south Nanded. On the other hand during the rabbi season Jowar as food grain, in east Parbhani, Hingoli, Latur and Gram in Latur, South Parbhani district.

Fig.no. 2



Conclusion:

Agro climatically the Marathwada region has classified in three zones. The rainfall, mean temperature, Moisture Index and soil types are considered as parameters for classification. The layers of these parameters are superimposed and zones are demarcated. Western zone is suitable for Maize, Cotton, Groundnut and Jowar in kharif. Whereas Wheat, Jowar and Gram are in rabbi season and Cotton and Sugar Cane are as annual crops. This zone covers A'bad, western Jalna and Beed. The central zone occupied eastern Jalna, western Parbhani, northwest Hingoli, Beed, O'bad and western Latur are suitable to cultivate Jowar, Bajra, Maize, Arhar/Tur, Cotton, Groundnut and Soyabean in kharip and Gram, Jowar and Maize in rabbi. The eastern zone covers eastern Parbhani, Latur, central and east Hingoli and Nanded District. This zone suitable for Jowar, Arhar/Tur, Cotton, in Hingoli, Parbhani and Nanded. The Soyabean, Jowar (hybrid) in Latur and south Nanded in kharif and Jowar and Grams in rabbi season.

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