Chapter – II

Geographical Setup of the Study Region

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Chapter – II

Geographical Personality of the Study Region

2.1 INTRODUCTION

In the first chapter meaning of agricultural geography and agriculture, significance of the study of agricultural geography, place of agriculture geography in Indian economy, agricultural development in India, place of agriculture in Vidarbha region, choice of the topic and region, aims and objectives, data base and methodology, review of literature and chapter scheme have been discussed.

This chapter deals with location and boundaries, historical background, territorial changes, physiography, geology, drainage, climate, soil types and natural vegetation of the study region.

2.2 LOCATION, BOUNDARIES AND AREA

Buldhana is a district in the Amravati division of Maharashtra state in western India at the westernmost border of Vidarbha region and is 500 km from the state capital, Mumbai. Buldhana district is located in the central part of the state of Maharashtra. Akola, Jalgaon, Jalna, and Parbhani districts are the adjoining districts to the East, West, and South respectively. The Nemad district of Madhya Pradesh is in the North. The Buldhana district lies between 19°51' to 21°17' North Latitude and 75°57' to 76°49' East Longitude. The district consists of five subdivisions and thirteen blocks. The district Head Quarters is at Buldhana. The distances of the other major towns from Buldhana is Aurangabad (180 KM), Pune (425 KM), Amravati (200 KM), Nagpur (350 KM).
BULDHANA DISTRICT

Location Map

Buldhana District

Map 2.1
2.3 HISTORICAL BACKGROUND

The Buldhana district like other parts of Vidarbha was undoubtedly included in the empire of Ashoka. Again fifth and thirteenth rock-edicts of Ashok mention that Bhos-Petenikas ruled Vidarbha. From ‘Satvahana’ family satakarni ruled whole of the Deccan and carried his arms north of the Narmada. About A.D. 250 the Satvahanas were supplanted by Vakatakas in Vidarbha from Vakataka family. The Vatsagulma branch was founded by Sarvasena, a younger son of Pravasasena. The Buldhana district was evidently included in its dominion as its capital was at Vatsagulma (Modern-Washim). Harishena is the last known Vakataka ruler. Thus ended the Vakataka dynasty after a glorious rule of two hundred and fifty years.

After the downfall of the Vakatakas in the beginning of the sixth century A.D. Vidarbha was occupied for some time by the Vishnukundin king Madhavavarman. The Vishnukundins were however soon ousted from Maharashtra and Vidarbha by Kalachuri king Krishna raja. He rose to power about A.D. 500. Buldhara was the last known king of Kalachurir family.

The Chalukyas of Badami rose to power in first half of the sixth century A.D. The Badami stone inscription of Pulkeshin, who is the first independent King of the family, is dated in the year A.D. 543. Kirtivarman – II was the last king of Chalukya.

In the last quarter of the twelveth century A.D. the Yadavas of Devagiri come into prominence the founder of this family was Dridhaparahara. Another Yadava king Kholeshvara constructed several temples in Vidarbha including that of Sharangdhara at Mehkar, which was discovered there underground in 1888. During Yadavas rule a peculiar style of architecture called Hemadpanti was developed in Buldhana district. They are noticed at thirty places such as Amdapur, Chikhli, Deulghat, Brahmapuri, Satgaon, Saykheda, Sindkhedraja etc. The temple of Daityasudana at Lonar is
the best example of Hemadpanti Style. In Yadavas court a learned man, Hemadri, who held the post of head of secretariat annexed to the Yadava kingdom. The eastern part of Vidarbha called ‘Jhadimandala’ which included the Buldhana district.

In 1294, Alaudin, nephew of Jalaluddin Khilji take incharge of Deccan but in 1312, Kafur, now entitled Malik Naib defeated and Slave Shankar and annexed his kingdom. The Buldhana district, thus come for the first time directly under Mohomoddin administration but the king Harpla the son in law of Ramchandra seized Devagiri and ruled it for a short time as an independent king bringing Berar and with it the Buldhana district once again under Hindu rule. In 1316, Kutub-Ud-din Mubarak shah who was then on the throne attacked Harpal. Buldhana thus passed again with the rest of Berar into the hands of Muslims until it was assigned under the treaty of 1853 to the East India Company.

The first governor of Berar under the Bahamanis was a Persian Sardar Khan Sistani. Buldhana with the rest of Berar suffered from the terrible two years of famine in 1473 and 1474, Murtaza Nizam Shah was appointed as incharge of Ahmednagar and Berar was under Nizam and then in 1575 Sayyad Murtaza Sabzavari governor of Berar.

Chand Bibi soon asserted her supremacy in Ahmednagar and Buldhana district was included into Ahmednagar empire and it was under Berar. A detailed account of Berar was added in Ain-E-Akbari in 1596-97. Though it was under Mughals but administrated by the Nizam shahi and Imad Shahi kings and Bahamanis. The present district of Buldhana comprised a large part of Akbar’s Sarkar of Narnala and Baitalwadi and the greater part of the Sarkar Mehkar. In ancient time Brahmans call it Bishan Gaya.

This brief extract describes generally the condition of the Buldhana district between the year 1724 and 1803. Now we turn to the activities of the
Bhosles in Berar, Kanhoji the son of Parsoji Bhosle not only established firmly the Maratha power in Berar but also laid the foundations of its future in the Orissa. After Kanhoji, Raghoji take incharge of Berar. After this was under the Bajirao Peshva. In 1775, Alijan, son of Nizam Ali was appointed Subhedar of Berar. The next few years were taken up by the growing conflict between Maratha and English.

Raja Mahipat Ram was succeeded in the government by Raja Govind Baksh as Subhedar of Berar and Aurangabad. In 1803, British defeated Shinde and Bhosle then they made a Devgaon treaty. At that time the situation was critical. Sindkhede was known as Nest of Thieves. There also Naik community who rob house by house and Pendhari were injurious to society so the revenue farmer succeeded over Pendhari.

The history of Berar since 1853 was marked by number of important political events besides the change made under the treaty of 1861. Its smooth course was scarcely ruffled even y the struggle of 1857. After the muting, the province was reconstituted into East Berar with headquarter of Amravati and West Berar with Headquarter at Akola.

In 1864, the tahsils of Malkapur, Chikhli and Mehkar were separated from the west Berar district and formed into an independent charge style the south west Berar district a clumsy designation which was changed in the following year. In 1867, Buldhana was selected as the headquarters of the district. In Berar, there was great demand of labour. A great exportation of cotton to Bombay was soon established. At the same time, construction of railway works throughout the whole length of the province was at its full swing. Berar was now clamoring for the establishment of local self government. Taking a bold altitude the Warhad Samachar expressed the popular feeling. Municipal act of 1883 was extended to Berar in 1887 and district boards were established. The education department in Berar was
established in 1866-67. Another important organization founded at this time was the Gorakshan Sabha in interest to preserve the cattle wealth of the country.

It may be noted that the younger generation of Berar had to great extent been educated in Pune and Bombay was greatly attracted towards Indian National Congress. It was during the viceroyalty of Lord Curzon that Berar was permanently ceded to the British by the Nizam. It was announced from fort William that Berar had been administered by British under the treaties of 1853. In the National Movement Berar Swarajya Party Played important role and decided that the time had come to adopt a policy cooperation. Again Berar Hanuman Vyayam Mandal played a constructive role in the freedom movement. Mangaldas Pakwasa took oath as free India’s first Governor of the Province of which the district of Buldhana formed an integral part.

From 1947 to 1956 the district of Buldhana along with the other district of Vidarbha region continued to form part of the central provinces. With reorganization of state in 1956, Buldhana along with the other district of Vidarbha was transferred to the bilingual state of Bombay which came into existence in that year in 1960 with the formation of the state of Maharashtra it formed part of the newly created state.

The district of Buldhana has been evolved by grouping together parts of West Berar, East Berar and Bashim District. The tahsil of Malkapur, Chikhli and Mehkar were separated from the west Berar district in 1864 and were grouped to constitute a district clumsily named as the south west Berar district but later renamed as the Mehkar district with its head quarter at Mehkar. Three years later in 1867 the administrative headquarter was shifted to Buldhana and district once again renamed as Buldhana. A new tahsil Khamgaon was created in 1870 by separating some villages from the Balapur
tahsil of the Akola district. The tahsil of Khamgaon and Jalgaon from the Akola district were added to the Buldhana district. In 1956 the district transferred from Madhya Pradesh to the eastwhile Bombay state as a result of reorganization of states and since May 1960, the district form part of the state of Maharashtra.

Since independence, the district has made commendable progress in economic, social and education field. This had mainly the result of liberal policy and socio economic reforms followed by the government which is dedicates to the programme aimed at the implementation of the socialistic pattern of society over a period of years the population of the district has increased from 6,17,990 in 1901 to 25,88,039 in 2011. The population has manly remained agricultural. The increase in number of persons employed in industry and allied occupations over a period of time is not the only indication of the industrial growth of the district but the growing urbanization that has taken place during the last 25 years. This measure of progress which the district has achieved could not be possible without an enlightened public opinion. The policy of the state has been to encourage education. The state inaugurated Zilla Parishad in the year 1962.

Now, in Buldhana district comprises 5 divisions, 13 tahsils, and 1433 villages. During the last 25 years or so after independence the country witnessed vast changes in the political, economic fields. Thrice that country had to face foreign aggression. These phenomena and their repercussions though in small degree were reflected in the day to day life of the district. Though local problems never turned the minds of the people from wider problem of national importance, the people of the district responded magnanimously at the time of the Chinese and Pakistani invasions and showed the spirit of oneness that had permeated through them for generations. For creating such a feeling of oneness, union and solidarity
amongst the people of the district the state and local leadership was mainly responsible. However horizons are wide the progress to be achieved is immeasurable and the obstacles are many but the people of district with glorious tradition of the past are well equipped to overcome these obstacles and to continue the march of success.

2.4 TERRITORIAL CHANGES

The district boundary has been changed many times. In 1480, as part of Berar taraf (province) of Bahamani Sultanate, Chikhli and Mehkar were part of Mahur division and Malkapur, Jalgaon, and Khamgaon were part of Gawil. During Akbar's time (1542–1605), it was part of the Sarkars (administrative unit) of Narnala, Baitalwadi, and Mehkar. In 1634 the area became known as Payanghat Subah (Lowlands Province) while Chikhli and Mehkar were part of Balaghat Subah (Highlands Province), but by 1636 Berar became part of a large province called Deccan. Around that time, Malkapur, Jalgaon, Badner Bholji PimpalgaonRaja, Jepur and Rajur were important parganas.

In 1853 the district came into existence as North Berar district with Buldhana as its headquarters. It along with South Berar district with Hingoli as its headquarters constituted Berar Province. North Berar district included the present Amravati district, the northern half of Akola, and Buldhana. After the Indian Rebellion of 1857 Hingoli, along with the neighbouring countryside, was restored to the Nizam. Berar province was reconstituted into East Berar district with headquarters at Amaravati, and West Berar district with headquarters at Akola. After 1857 Mehkar, Chikhli, and Malkapur were part of West Berar district. In 1864 these three talukas were made independent as South-West Berar district, which was renamed Mehkar district in 1865.

In 1867 Buldhana district came into existence, combining North Berar and Mehkar districts. After the amalgamation of Berar with the Central
Provinces in 1903, Buldhana district became the district of Central Provinces and Berar. In August 1905 Khamgaon and Jalgaon tahsils from Akola district of Central Provinces and Berar were combined into Buldhana district. In 1950 it became part of Madhya Pradesh with Nagpur as its capital. In 1956, along with other Marathi-speaking regions of Vidarbha, it became part of Bombay State and part of Maharashtra State in 1960.

2.5 PHYSIOGRAPHY

The agricultural patterns are strictly dependent on the conditions of physiography of the region such as terrain, topography, and altitude. Physiography is one of the parameter of physical environment and its impact on patterns and density of agriculture is immense. The physical environment which includes relief, drainage, soil, climate, and water influences the agriculture in many ways.

This factor determines the types of crop, the timing of agricultural operations, the extent of risk involved in agriculture, and improvement of agriculture. The social and economic factors also influence the many aspects of agriculture, but they can operate only with the limit set by the physical environment.

The study of the influence of environment upon the nature and distribution of crops and livestock is of prime importance in agricultural geography. Nature with its physical characteristics provides a lot of possibilities for agriculture and agro-based industries in different areas.

Topographically, the district falls under three structural-cum-physical units: a narrow, northern strip in the Jalgaon tahsil in the Satpuda hills, the Payanghat or the Purna plains in the middle comprising the tahsil of Malkapur, Khamgaon and Jalgaon, and the Buldhana plateau comprising the Chikhli and Mehkar tahsil to the south.
Buldhana District

PHYSIOGRAPHY

Map 2.2

Height in Meters

- Above 600
- 300 TO 600
- Below 300
The landscape in the district is rich and varied, with gently sloping fertile riverine plains studded with agriculturally prosperous villages standing in sharp contrast to the flat undulation plateau country with patches of cultivation, broad open river valleys and a monotonous scrub cover. The ghat country, deeply scoured by gullies and ravines on the edge of the plateau and the sheer black walls of the Satpuda scarps to the north add color to the variety of landforms. The district has no mountain system of considerable magnitude except for the area which lies in the north in the Gawil-gadh hills or the Satpudas. Parts of the Buldhana plateau have hills rising to about 500 meters.

**Satpudas:** The average elevation of the Satpudas in the northern part of Jalgaon tahsil of the district ranges between 700 and 1000 metres, with three high peaks: the Chandgarh, 743 metres high in the north-western corner, the Dhormoria peak, 837 metres high near the village of Bhimgara in the Raipur reserved forest area and an unnamed peak with an altitude of 928 metres overlooking the deserted village of Kille Pimpaldol.

The part of the Satpudas that lie in the district consists of high level buttes and mesas and the south facing scarp and cliff slopes that descend through sheer vertical drops of about 500 meters in most places. The scarp edge is almost straight running in an east-north-east, west-south-west direction. Along the scarp face stands exposed series of horizontally bedded basaltic lava sheets of varying thickness and the intervening ash and intra-trappean beds. The long mural escarpment is strongly suggestive of a fault plane of late Tertiary or early Pleistocene. The trap beds have a slight northward dip and in many places consists of excellent solid basalts developing columnar joints. The entire scarp face is scoured by numerous rivers and gullies that drain southwards, though in places the drainage reveals a coarse radial pattern. A number of high level plateaus, the largest of which in the district is the one on which Bhingara village is located, are found at an
average elevation of about 750 metres, and these are highly suggestive of a summit plane mostly eroded and denuded by sub-aerial agencies.

_Ajanta range:_ The Ajanta range carrying on its flat top, the high level mesa of Buldhana plateau covers the southern part of the district. The edge of this plateau, overlooking the Purna plains to its north, is a hilly ghat country at average elevations of 500 to 600 metres. It is an escarpment less well-defined than the Satpuda scarp. It has a curving trend from west to east, to southeast. It is also believed by geologists to be a fault scarp. The bend in the escarpment is probably due to active recession of the fault scarp due to subaerial denudation. The scar edge is at a higher elevation in the west adjoining the township of Buldhana about 600 m and gradually falls in height eastwards to about 500 m along the eastern borders of the district. Like the Satpuda scarp, it is also well dissected by gully erosion and ravine formation.

The southern edge of the Buldhana plateau descending to the floor of the Dudhna and the Godavari valleys is much less imposing, partly on account of gentler slopes and partly due to a lesser fall in height to an extent of 100 to 150 m. However, this edge has a number of low hills and knolls rising above the general plateau level.

A ridge of low hills runs at an elevation of 700 to 800 m from north-west to south-east and about a hundred metres above the general plateau level, broadly dividing the plateau into a Northern Penganga valley and a Southern Katepurna valley. This low flat-topped watershed gradually loses elevation eastwards. The Buldhana plateau on the crest of the Ajanta range in the southern parts of the district at an average elevation of 600 to 800 metres sloping to the south-east is the only large plateau. Differential subaerial erosion of the horizontally bedded traps particularly in the western parts, namely, the Chikhli tahsil, has divided the area into a number of plateaus at different levels with fairly steep slopes in between.
The Purna plains or the Payanghat is the main low land region of the district average elevation of which ranges between 250 and 270 metres. The slope is extremely gentle, towards the west.

2.6 GEOLOGY

Geology is the study of the Earth, the materials of which it is made, the structure of those materials, and the processes acting upon them. It includes the study of organisms that have inhabited our planet. An important part of geology is the study of how Earth’s materials, structures, processes and organisms have changed over time. The greater part of the district is covered by rocks of the Deccan volcanics of Creteco-Eocene age, and a few alluvium patches of the Purna and Penganga basin, respectively. The trap rocks are usually fine to coarse-grained, dark grey to greenish-black basalts of vesicular and massive types.

The hard compact massive flows are generally noticed on the hill tops, e.g., Melghat section whereas comparatively soft and amygdule varieties usually occupy the flanks of the hill or valley floors. Spheroidal exfoliation is a characteristic feature of weathering in the traps. Besides vertical and inclined jointing, columnar jointing is also well seen in more massive types. The vesicular and non-vesicular flows are at places separated by thin beds of ash or scoriae, but typical inter-trappean sedimentary rocks have not been recognised in the area. The amygdule varieties of flows carry secondary minerals like zeolites (mostly heulandite), calcite and chalcedony. No dykes have been found associated with the trap flows in the district where a lava pile of approximately 800 metres is preserved.

The Purna valley alluvium occupies an extensive stretch of low lying ground between Paturda and the confluence of Purna river with that of Tapi in Jalgaon district. In the river valleys and where superficial rain-wash has accumulated, a mixture of black cotton soil associated with sub-recent
conglomeratic formation or light brown laterite material is noticeable at places, but otherwise, as aptly described by Wynne (1867) there is little variation in the nature and extent of soil or any variety of geological interest. The alluvium of the plains is usually of considerable depth sometimes, exceeding upto 50 metres as noticed near Pimprala or Malkapur. At places in the river alluvium, calcareous fragmentary bones or teeth ruminants are found sporadically. Much on the alluvium produces effervescence of sodium salts. Majority of the wells sunk in the area have brackish water.

Lonar creator: Lonar creator one of the few large isolated caldera-like depression that has given rise to a good deal of controversy regarding its origin. A number of scientific accounts about the lake and its alkalinity have been published since early 19th Century, but all these accounts are based on the data collected from surface examination of the lake area only. More recently the prospecting department of Tata Iron and Steel Company Limited had carried out drilling operations in the lake area (1960) with regard to the evaluation of soda contents in the brine and silts of the lake, whereas some preliminary geo-physical and geo-chemical surveys had been undertaken by the Geological Survey with a view to ascertaining the possible nickel and cobalt contents, if any, in the Lonar crater formation (1964).

The Lonar structure variously described as a hollow, depression or crater, is situated about a kilometer to the south-west of the village of Lonar and the circular feature measuring 2,000 metres across and about 135 metres in depth has a shallow saline lake. Maximum depth of the brine is about 5.5 metres. The general elevation of the surrounding country is 550 to 600 metres above mean sea level. A raised rim or bank, up to 100 m in width and at places 10 to 15 m high surrounds the hollow. This inland lake with no effluent is fed by the seasonal drainage mainly confined to its periphery and also by a number of springs such as Dhar, Sitnahani, Ramgaya, etc.
Buldhana forms the westernmost district of Vidarbha with an average annual rainfall of 70 to 85 centimeters. Excepting for the east-west stretch of the western extremity of the fertile Purna valley in the north-central portion of the district, the entire district is occupied by the trappean hill ranges of Gawali-garh in the north and the Ajanta in the south with a general depression towards the valley of Purna from either side. In the northern portion of the valley belt an east-west stretch extending for over 30 km, with an average width of 6 km is the potable fresh water belt with a discharge of 8 to 12 litres per second within a depth range of 40 metres.

In the southern part of the valley south of the river Purna there is acute scarcity with the river alluvium; but the major part of the alluvial portion of the district is generally free from it. In the basaltic terrain the groundwater occurs partly in the western mantle and partly in the vesicular basalt and intertrappean beds, and with lack of favourable conditions there is often acute scarcity felt, particularly in peak summer months. The Lonar Crater Lake is a saline water lake and there is also some amount of salinity in the direction of the Purna saline tract.

2.7 DRAINAGE

Drainage of the region is the result of a combination of numerous factors such as climate, precipitation, isolation, cloudiness, wind direction, humidity, rock types, vegetation, soil, human activity etc. Drainage system is one of the important components of the physical environment which affects the agriculture directly and indirectly. Ground water influent becomes the base flow that maintains the flow of streams in clean weather. When we speak of surface water, we mean stream flow regardless of its source. The drainage pattern of Buldhana district is not well developed. The main rivers of the district are Purna and Penganga. These rivers network of tributaries has been spread over the region. The rivers in the district are as below:
**Purna:** The Purna, the only perennial stream in the Payanghat plains, rises in the south facing scarps of Gawilgarh hills in the district of Amravati. It flows across the northern part of this district to join the Tapi in Jalgaon district. A large number of streams rising in the scarps both to its north and to its south join the river and drain the whole region with a fairly dense network. The pattern is dendritic but some streams have a sub-parallel drainage to the main river before their confluence in the aggraded valley floor. Most of the tributary streams are just pools of water in the hot weather but devastating floods are quite common during the rains.

**Penganga:** The Penganga, the principal river of the district, rises close to the northern scarp edge of the Buldhana plateau in the Deulghat hills. The river has a generally south-easterly flow through the district before entering into the Akola district. Most of Chikhli and Mehkar tahsils fall within the drainage of the Penganga. The river has only a seasonal flow, being dry during the hot weather. The valley of the river is open, broad and shallow, presenting a mellowed mature or even senile appearance.

**Khadakpurna:** The Khadakpurna or Katepurna, or the lower Purna or the South Purna as it is differently called, also rises in the Ajanta ranges but outside the district limits in Aurangabad. It enters the district near the village of Chinchkhed in Chikhli tahsil and has a generally south-easterly flow in the southern parts of Chikhli and Mehkar tahsils. It has a run of about 50 km in the southern parts of the district "before it leaves the district to enter into Parbhani. It is also a non-perennial stream but has a flow for a longer period than the Penganga. Both the Penganga and the Katepurna are important left bank tributaries of the Godavari, but however they do not gain any importance till after their leaving the district limits.

**Dhamna:** The Dhamna river, a left bank tributary of the Katepurna,
rising in the hills of Aurangabad district and flowing southeast drains a small part in the extreme western section of the Chikhli plateau.

*Koradi*: The Koradi river rises in the Buldhana plateau to the south of the township of Chikhli and maintains a sub-parallel course to the Penganga to its south and joins the latter to the north of Mehkar town.

*Banganga*: The Banganga, rising in the Gawilgarh hills of the Amravati district enters the district as it descends from the hills. After forming the boundary for a short distance between Buldhana and Akola, it meanders southwards in a flat plain before joining the Purna on its right bank near the village of Deulgaon.

*Mun*: The Mun river, whose source tributaries the Torna, the Vishwamitri and the Mas drain the north facing scarp slopes of the Buldhana plateau in Khamgaon tahsil, flows north, mostly forming the boundary between the Buldhana and the Akola districts. It joins the Purna on its left bank about seven km downstream of the confluence of the Banganga with the Purna. It is a perennial stream.

*Gyanganga*: The Gyanganga river rises in the northern scarps of Buldhana plateau in the Matargaon reserved forest area and flows almost straight north to join the Purna on its left bank near the village of Yerli after flowing past the township of Nandura.

*Vishwaganga*: The Vishwaganga rises in the Buldhana hills close to the town. It flows north in a deeply ravined valley and joins the Purna near Harsod. It is a non-perennial stream.

*Nalganga*: The Nalganga river rises in the northern slopes of the Deulghat hills in the Amdari reserved forest area and flows north past Malkapur town to join the Purna on its left bank near the village of Narawel.
Buldhana District

DRAINAGE PATTERN
2.8 CLIMATE

Climate is one of the important factors which directly and indirectly affect the human activities. Of all the geographical influence to which man is subjected, climate seems to be the most potent. It is an influence that no individual or race can escape. On land or sea, on plain or mountains, in primitive and civilized societies man must face the climate of its own terms.

In a large measure climate determines where man may live and thrive, what crops he may raise? What type of home he may appropriately build? What sort of clothing he may wear? and what pests and diseases he must combat?9

The potential crop producing capability of a given area is dependent mainly on the existing climatic and soil condition. Since, climatic factors exert mainly a regional influence of plant life, the differences in the behavior on a crop or a group of crops over extensive area as in a given State or a group of states, may be considered as due primarily to differences in climatic rather than soil conditions.10 It is obvious that climate dictates the range of crops which a country can economically produce. This is turn sets the range of commodities which that country must import if it wishes its people to live a full life in the modern sense.11

The success or failure of the cropping seasons is determined by the intensity of the climatic factors. Climatic factors are those which act upon the growth and development of agricultural plants through the atmosphere. The three most important factors of climate from the stand point of plant response are temperature, water supply and light and they may be treated as primary determinant of crop growth.12 A particular type of climate prevailing over a region of earth is called climatic climax, and the crops and the vegetations to which it determines is called climax type of vegetation. Climate plays an important role in affecting the 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.\textsuperscript{13} The climate of Buldhana district is on the whole dry except during the monsoon season. The year may be divided into four seasons. The cold season from December to about the middle of February, followed by the summer season lasting up to the end of May the south-west monsoon season from June to September and the post-monsoon or retreating monsoon season in October and November.

i) Temperature:

Temperature is one of the most influential climatic factors, which affects the distribution of agricultural crops and plants. Temperature regulates all the chemical and physiological processes of plant metabolism. The metabolic processes begin at a certain minimum temperature and increase with rise of temperature until they reach optimum temperature. Further, the metabolic activity slows down until it ceases at a temperature called maximum. These are called cordial temperature points. The cordial limits of cold season crops are 0-5°C, 22-27°C, and 30-37°C and for hot season crops are 15-18°C, 30-35°C, and 44-55°C respectively. Chilling injury is caused when temperature goes below the minimum and desiccation is caused when temperature goes above the maximum.\textsuperscript{14}

Temperature conditions have been far less erratic from year to year than rainfall conditions in each agricultural region. However, great annual ranges may be highly significant in different zones giving rise to two or more cropping season. For this reason particularly in Buldhana district different crops raised in different season. Each crop plant needs a certain number of effective heat units for germination, growth stalkig, maturity and ripening.
This is called the thermal constant and varies from crop to crop. Temperature above the minimum is therefore, affective in furthering the growth of a plant towards maturity and ripening. The crucial air temperature is 6\degree C (Schimper 1903) at and above which plants grow.\textsuperscript{15} It is also known as the crucial limit. Ideal temperature conditions for crop production are between 18.3\degree C and 23.9\degree C.

For the agricultural geographer, two of the best indicators of regional differences in temperature correctly available or derived are (i) length of the growing season and (ii) accumulated temperature above the maximum for plant growth.\textsuperscript{16} There is no metrological observatory in the district. The cold weather commences towards the end of November when temperature begin to decrease rapidly, December is generally the coldest month with mean daily maximum temperature at about 29.5\degree C and the mean daily minimum at about 15\degree C on some occasion.

The periods from the middle of February to the beginning of the southwest monsoon season is one of continuous rise in temperature. May is generally the hottest month with the mean daily maximum temperature at about 40\degree C and the mean daily minimum at about 25\degree C. The heat during summer is intense and the maximum temperature sometimes goes upto about 45\degree C. There is appreciable drop in temperature with the withdrawal of the monsoon early in October. There is slight increase in day temperature. Nights, however, progressively become colder.

\textbf{ii) Rainfall :}

Precipitation includes rainfall, snow, hail, fog, dew etc. Out of these, rainfall is the major one. It is the single weather element influencing the intensity and location of farming system and farmers’ choice of enterprises. Rain is the cheapest source of water, if it is timely and adequate in quantity.
But rainfall in the greater parts of the region is highly uncertain and unevenly distributed. Failures of rains or excessive rainfall in a short period have brought repeated crop failures.\textsuperscript{17}

It also becomes a climatic hazard to farming when it is characterized with scantiness, concentration, intensity, variability and unreliability. It is all the more important in the minimal regions where average or normal rainfall is generally necessary for successful crop production. In such area the system of crops production must be correlated more or less to the moisture factor.\textsuperscript{18}

Farmers of Vidarbha region like others have often suffers on account of the failures of rains or heavy rainfall. Climatically the entire region comes under rain-shadow zone. The average annual rainfall in the district is about 689.35 mm which is unevenly distributed. About 84 percent of annual rainfall in the district is received during the south-west monsoon season.

The monsoon rain covers the region from mid June to the end of September. There are two peaks of rainfall in the region. The first peak is in July and the second in September. The region gets the heaviest rainfall from south-west monsoon winds in July. The south–west monsoon is the pivot around which almost the entire farm life and economy swings. The variation in the annual rainfall from year to year is large in the district.

The record of the rainfall in the district is available for the period ranging from 1985 to 2005. The details of the mean annual rainfall and rainfall co-efficient of variation is given in table 2.1

Table 2.1 shows that, above 30% rainfall variability is observed in Nandura, Sindkhedraja, Jalgaon jamod and Sindkhedraja tahsil whereas 25% to 30% variability is observed in Sangrampur, Mehkar, Malkapur, Buldhana and Motala tahsil. Below 25% rainfall variability is observed in Shegaon, Khamgaon, Deulgaonraja and Chikhli tahsil during the study period.
Table 2.1
Mean Annual Rainfall and Co-efficient of Rainfall Variability in Buldhana District (1985 to 2005)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the Tahsil</th>
<th>Mean Annual Rainfall in M.M.</th>
<th>Co-efficient of Variability in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jalgaon (Jamod)</td>
<td>677.20</td>
<td>30.67</td>
</tr>
<tr>
<td>2</td>
<td>Sangrampur</td>
<td>658.75</td>
<td>28.32</td>
</tr>
<tr>
<td>3</td>
<td>Shegaon</td>
<td>658.70</td>
<td>24.77</td>
</tr>
<tr>
<td>4</td>
<td>Nandura</td>
<td>538.70</td>
<td>38.77</td>
</tr>
<tr>
<td>5</td>
<td>Malkapur</td>
<td>672.54</td>
<td>26.05</td>
</tr>
<tr>
<td>6</td>
<td>Motala</td>
<td>673.78</td>
<td>25.55</td>
</tr>
<tr>
<td>7</td>
<td>Khamgaon</td>
<td>584.96</td>
<td>23.59</td>
</tr>
<tr>
<td>8</td>
<td>Mehkar</td>
<td>758.48</td>
<td>27.16</td>
</tr>
<tr>
<td>9</td>
<td>Chikhli</td>
<td>711.88</td>
<td>11.96</td>
</tr>
<tr>
<td>10</td>
<td>Buldhana</td>
<td>781.89</td>
<td>26.92</td>
</tr>
<tr>
<td>11</td>
<td>Deulgaonraja</td>
<td>646.99</td>
<td>15.63</td>
</tr>
<tr>
<td>12</td>
<td>Sindkhedraja</td>
<td>844.96</td>
<td>33.04</td>
</tr>
<tr>
<td>13</td>
<td>Lonar</td>
<td>752.70</td>
<td>31.77</td>
</tr>
</tbody>
</table>

Source: Computed by the Author

The mean annual rainfall in the region varies from 538.70 to 844.96 for the period ranging from 1985 to 2005. The rainfall during the north-east monsoon that is October to November though scanty is very useful for the rabbi crops. Sometimes showers in the first quarter of the year have also beneficial effects on the growth of rabbi crops and summer crops.
BULDHANA DISTRICT

Co-efficient of Rainfall Variability

Index

- Above 30%
- 25% to 30%
- Below 25%

Map 2.4
iii) Other Weather Phenomena:

   a) **Humidity:** Humidity is one of the prominent elements of weather from the farmer’s point of view and plays a significant role in changing agro-climatic conditions from place to place. Humidity, in fact is a state of atmosphere with respect to the gaseous form of water. Most plants grow well in conditions of high atmosphere and humidity. Because very often saturated air completely stops the transpiration. Except during the south-west monsoon season when the relative humidity are high and the air is generally dry over the entire study region. The summer monsoon is the driest, when the relative humidity is between 20% to 25% in the afternoons.

   b) **Cloudiness:** During the south-west monsoon season the air is humid and the skies are heavily clouded to overcast. During the rest of the year, the air is generally dry and skies are clear or lightly clouded.

   c) **Winds:** Winds have many direct and indirect influences on crops. The direct effect of strong winds is entirely of mechanical nature that is in the form of crop uprooting and logging. The indirect effect of the winds is apparent on plants physiology. The transpiration from plants makes the surrounding year moist. The crop gradually dries up and the moisture diffuses into the surrounding atmosphere.\(^{19}\)

   In the study region, winds are generally light to moderate with increase in speed during the latter half of the hot season and in the monsoon season. The wind blows predominantly from direction west and north during the hot season. Winds blow mostly from directions between southwest and northwest during the south-west monsoon season. Winds blow mostly from the direction between northeast and southeast during the rest of year. Thunder storms occur in all months of the year. They occur more frequently during April to June and from September to October. Dust storm occurs sometimes during summer afternoon in the study region.
2.9 **SOIL TYPES**

In general soil refers to the loose surface of the earth as distinguished from solid rock.\(^{20}\) Soil is the thin surface-layer on the earth, comprising mineral particles formed by the break-down of rocks, decayed organic materials, living organisms, water and air. Soil is formed under specific natural conditions and each of the elements of the natural environment contributes to this complex process, described by the soil scientists as the process of *pedogenesis*.\(^{21}\)

Soil is the very important natural resource. Because agricultural production is basically depend on the fertility of the soil. Soil formation is mainly related the parent rock material, surface relief, climate and natural vegetation. It is the natural body of soil on which plants grow and the farming activities flourish. The standard of living of the people depending on agriculture is often determined by the fertility and productivity of soils.\(^{22}\)

Farming is a business and good soil is part of the farmer’s stock in trade. Good soils are good to the extent that man makes judicious use of them. Great civilizations have almost invariably flourished on good soils, the alluvium in particular. Even at the beginning of his work on political geography, Ratzel made a statement of great significance and in sight, “Jeder staalist ein stuck menschheit.”\(^{23}\) Therefore no students of civilization can afford to forget even for an instant the crucial importance of soils. These are the source of practically the entire stock of the man’s food, clothing and we even increasing list of other needs.

So much so, that man gets nearly all of his food from the soils less than one percent of what he eats being fish\(^{24}\). Of the long list of nature’s gifts to man productive soils and water are the most basic to human life.\(^{25}\) Even today about 66% of the global population comprises farmers, deriving their
livelihood directly from the soil. Geographical investigation of soil characteristics is of great significance to agricultural geographers. Soil characteristics, particularly the physical, help us to know about the distribution of crops and the selection soils for specific crops: this may be called the ‘selective’ rather than the ‘prohibitive’ influence of the soils.  

**Soil Types in the district:**

There are three major soil types in this district, locally called as Bharkali, morand and Barad. Morand soils are silt and lime mixed heavy in texture and blackish one suitable for cotton growing. Black soil is also found in Chikhli and Mehkar area but the depth of Top soil being very low hence suitable for wheat growing. Sandy soils are locally called as Barad, percentage of sand is more than silt and clay hence light in nature hence identified as light soils. These are very poor fertile soil types than morand. Constitute the physical basis of all agricultural practices. The infiltration and transmission of moisture through soil depends upon the particle size, amount of organic mater in the soil depth. These factors are also depend upon the approach of soil for the saturation its swollen capacity and individual physical properties.

From the physical properties of the soil in the district it can be divided into

1) Coarse shallow soil
2) Medium black soil and
3) Deep black soil

Coarse shallow soil covers the high lands in district. The depth of such soil remains very lese. The infiltration is much less in these type of soils and run off is more. This type covers an area of 4564.72 Sq. Km. Medium black soil is developed comparatively in the plains along the tributaries of main rivers and small plateau of the district. This type of soil area generally low in
clayey material. The area covered by the type of soil in the district is 3574.68 sq.km. and remains at 37 percentage of the total soil.

Table 2.2
Soils in Buldana District (Area in Sq.km)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Tahsil</th>
<th>Course Shallow</th>
<th>Medium Black</th>
<th>Deep Black</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Buldhana</td>
<td>433.55</td>
<td>138.39</td>
<td>135.76</td>
</tr>
<tr>
<td>2</td>
<td>Chikhli</td>
<td>343.70</td>
<td>173.52</td>
<td>170.25</td>
</tr>
<tr>
<td>3</td>
<td>Deulgaonraja</td>
<td>474.85</td>
<td>151.55</td>
<td>148.69</td>
</tr>
<tr>
<td>4</td>
<td>Mehkar</td>
<td>320.23</td>
<td>514.50</td>
<td>150.87</td>
</tr>
<tr>
<td>5</td>
<td>Lonar</td>
<td>260.23</td>
<td>419.24</td>
<td>122.93</td>
</tr>
<tr>
<td>6</td>
<td>Sindkhedraja</td>
<td>258.00</td>
<td>414.74</td>
<td>121.66</td>
</tr>
<tr>
<td>7</td>
<td>Khamgaon</td>
<td>581.21</td>
<td>317.14</td>
<td>149.69</td>
</tr>
<tr>
<td>8</td>
<td>Shegaon</td>
<td>428.04</td>
<td>234.03</td>
<td>110.42</td>
</tr>
<tr>
<td>9</td>
<td>Malkapur</td>
<td>165.72</td>
<td>197.86</td>
<td>84.49</td>
</tr>
<tr>
<td>10</td>
<td>Motala</td>
<td>280.25</td>
<td>334.62</td>
<td>142.88</td>
</tr>
<tr>
<td>11</td>
<td>Nandura</td>
<td>171.68</td>
<td>204.97</td>
<td>87.53</td>
</tr>
<tr>
<td>12</td>
<td>Jalgaon jamod</td>
<td>299.44</td>
<td>219.86</td>
<td>44.72</td>
</tr>
<tr>
<td>13</td>
<td>Sangrampur</td>
<td>346.98</td>
<td>254.26</td>
<td>51.71</td>
</tr>
<tr>
<td>TOTAL</td>
<td>(9661.00)</td>
<td>4564.72</td>
<td>3574.68</td>
<td>1521.60</td>
</tr>
</tbody>
</table>

Source: Soil Survey Department, Buldhana

Deep black soil generally develops along the banks of the major river and main tributaries of the river in the district it has been developed along Purna (Tapi) Nalganga, Vishwaganga, Painganga, and Purna (Godavari) rivers. The soils contain much clayey material which generally have nature of swelling in high degree. The black cotton soil derived from the Deccan trap of the region are more fertile and contains rich plant elements such as lime, magnesia, Iron and alkalis. The cropping pattern of the district is generally based upon the fertility of the soil present in the area.
BULDHANA DISTRICT

Soils

Index (Type of Soil)

- Course Shallow
- Medium Black
- Deep Black

Map 2.5
2.10 NATURAL VEGETATION

Natural vegetation prevents soil erosion, regulate the flow of rivers and reduce the floods, check the spread of deserts, add to soil fertility and ameliorate the extremes of climate. Forests play a significant role in the prevention and control of soil erosion by water and wind. Roots of the trees absorb much of the rain water and use it slowly during the dry season. Thus, they regulate the flow water and help in controlling the floods. The cover of natural vegetation acts as rain-holder and a rain-banker. The trees also act like millions of tiny damp and check the flow of water like a barrage. It also keeps the environmental balance forest provides wood for making farm implements.

Therefore, forests are great instrument to put a check on the spread of desert. The fallen leaves of trees provide humus to soil after their decomposition. In this way natural vegetation helps in increasing the fertility of soil. It also effect on climate. It ameliorates the extremes of climate by reducing the heat in summer and cold in winter. They also influence the amount of rainfall by lowering the temperature of moistures laden winds and increase the relative humidity of the year through the process of transpiration. Natural vegetation reduce the surface velocity of winds and retard the process of evaporation. Natural vegetation has a role in the general economic development of the country through the utilization of forest products- major and minor.

Buldhana district has 7.08% area under forest to total geographical area. Most of the forest area of the district falls under Buldhana, Mehkar, Khamgaon and Jalgaon Jamod tahsils. Forest area is divided into reserved, protected and unclassified forest, out of which unclassified forest area in in the charge of Revenue Department. Out of total forest area, 91% is reserved area and 9% is protected forest area.
The forest area is mainly situated on the Balaghat plateau of the Ajanta hills and the Purna valley. The forest belongs to "Southern Tropical Dray Deciduous". The varieties of the forest found in the district are Superior teak forest, inferior teak forest, Anjan forest, Babul forest, mixed forest, salai forest, grass and brushwood area. Teak, bel, tiwas, kuram, lendia, dhawada, tandu, samel, anjan, char, bija, behada, bharti, chilati, khair, acacia, haldu, neem and bor.

Table 2.3

Tahsilwise Change in Forest Area of Buldhana District

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Name of the tahsil</th>
<th>1985-90</th>
<th>2000-2005</th>
<th>Volume of Change in %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area Under Forest (In“00” hect)</td>
<td>Area Under Forest (In %)</td>
<td>Area Under Forest (In“00” hect)</td>
<td>Area Under Forest (In %)</td>
</tr>
<tr>
<td>1</td>
<td>Jalgaon-Jamod</td>
<td>157</td>
<td>27.02</td>
<td>23</td>
</tr>
<tr>
<td>2</td>
<td>Sangrampur</td>
<td>131</td>
<td>20.28</td>
<td>90</td>
</tr>
<tr>
<td>3</td>
<td>Shegaon</td>
<td>6</td>
<td>0.78</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>Nandura</td>
<td>23</td>
<td>4.97</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>Malkapur</td>
<td>6</td>
<td>1.27</td>
<td>22</td>
</tr>
<tr>
<td>6</td>
<td>Motala</td>
<td>107</td>
<td>14.62</td>
<td>57</td>
</tr>
<tr>
<td>7</td>
<td>Khamgaon</td>
<td>233</td>
<td>22.23</td>
<td>119</td>
</tr>
<tr>
<td>8</td>
<td>Mehkar</td>
<td>146</td>
<td>15.89</td>
<td>121</td>
</tr>
<tr>
<td>9</td>
<td>Chikhli</td>
<td>174</td>
<td>19.75</td>
<td>102</td>
</tr>
<tr>
<td>10</td>
<td>Buldhana</td>
<td>53</td>
<td>7.46</td>
<td>41</td>
</tr>
<tr>
<td>11</td>
<td>Deulgaonraja</td>
<td>36</td>
<td>4.41</td>
<td>35</td>
</tr>
<tr>
<td>12</td>
<td>Sindkhedraja</td>
<td>50</td>
<td>6.09</td>
<td>35</td>
</tr>
<tr>
<td>13</td>
<td>Lonar</td>
<td>36</td>
<td>4.44</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>District total</td>
<td>1158</td>
<td>11.97</td>
<td>685</td>
</tr>
</tbody>
</table>

Source: Computed by the Author
The forest of Buldhana district is economically important. Out of the total geographical area of the district 11.97% area was under forest during 1985-90 and it was decreased upto 7.08% during 2000-2005.

The review of changes in forest area in Buldhana district during the period for 1985-90 and 2000-2005 is briefly presented in table 2.3. The table indicates that out of total geographical area 7% geographical area was found in Jalgaon jamod, Shegaon, Nandura, Malkapur, Buldhana, Deulgaonraja, Sindkhedraja and Lonar tahsils while 7% area was found in Sangrampur, Motala, Khamgaon, Mehkar and Chikhli tahsils during 2000-2005.

Positive change in forest area was noticed in Malkapur (3.45%) tahsil. Below 5% negative change in forest area was found in Shegaon, Nandura, Mehkar, Buldhana, Deulgaonraja, Sindkhedraja and Lonar tahsils while above 5% negative change was observed in Jalgaon jamod, Sangrampur, Motala, Khamgaon and Chikhli tahsils during 1985-1990 to 2000-2005.

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