Chapter II

Physical Setting of the Region

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Chapter II
Physical setting of the region

2.1 Introduction:

In the first chapter meaning of agriculture, agricultural geography, significance of agricultural geography, place of agriculture in Indian economy, agricultural development in India, Maharashtra, Marathwada, choice of the region, aims and objectives, data base and methodology, review of literature and chapter scheme these points are discussed. This chapter is mainly concerned with location and boundaries, historical background, physiography, geology, drainage, climate, soil types and the natural vegetations of the study region.

2.2 Location and Boundaries:

The district of Osmanabad is the southern most district in the Aurangabad Division of Maharashtra state situated between 17° 35' and 18° 40' north latitudes and 75° 16' and 76° 40' east longitudes. The district has an area of 7512.4 km². Out of the total geographical area about 7271km² area is rural area (96.79%) where as the 241.4 km² area is urban area (3.21%). District ranks 24th in Maharashtra in respect of total geographical area. East-west maximum extent is about 282 kilometre and north-south extent is about 204 kilometres.

It is bounded on the south-west by the Solapur district, on the north-west Ahmednagar district, on the north by Beed district, on north-east and east by Latur district and south by Bidar and Gulburga districts of Karnataka state (Map 2.1).

For administrative purpose district is divided into two revenue divisions. Bhum and Osmanabad are the two sub-divisions. Bhum, Parenda and Kallam tahsils includes in the Bhum sub-division where as Tuljapur, Omerga and Osmanabad includes in Osmanabad sub-division. There are six Panchayat Sammitties which are found at every tahsil headquarters. Upto the August 1982 there were 11 tahsils in the district but on August 1982 Latur district
has formed. Latur, Ausa, Udgir, Nilanga and Ahmedpur tahsils were included in Latur district. On August 1982 eight villages from Barshi tahsil of Solapur district were included in Osmanabad tahsil. New formed Lohara and Washi tahsils are not considered for the study due to non-availability of data.

2.3 Historical Background:

The agelong famous temple at Tuljapur town of this district enshrines the Goddess "Bhavani" the popular deity of Maharashtra. The cult of Goddess is very ancient one and finds mention even in "Vedas" where she is called "Aditi". The earliest inscrptional evidence regarding its antiquity can not go beyond 1098 A.D. The Goddess was the principal deity of "Chhatrapati Shivaji" the other 'Chhatrapatis' and 'Peshwas' who donated quite generously to the temple. The village "Thair" in the district is also an ancient place and was known as 'Tagara'. It also finds a mention by Ptolemy in his work "Periplus of Eurathrea Sea" 1st century A.D. Here an ancient Buddhist 'dairya' has been converted in later period into a Brahmanical shrine by installing the image of "God Vishnu" and is at present known as "Trivikrama" temple. 'Thair' is also the native place of poor saint "Gora Kumbhar".

In the year 1853 the district was temporarily ceded by the Nizam to the British Government. It was reverted to Hyderabad state in 1860. Its head quarters formerly used to be at Naldurg and the district was known as Naldurg district till 1904. The district of Naldurg was abolished and the new district of Osmanabad was formed with headquarters at Osmanabad. In 1905, two tahsils with headquarters at Washi and Naldurg were abolished. Washi was merged in Kallam and Naldurg in Tuljapur. Headquarter of Ausa tahsil were shifted to Latur and the tahsil was named as Latur tahsil. Among the districts of Marathwada, Osmanabad had the biggest area under the Nizam's own estate called "Sarf-e-Khas". The Sarf-e-Khas was merged with the Government area under the Sarf-e-Khas (Merger) Regulation in the year 1949. All the Jagir areas were also abolished and taken over under direct government
administration in the same year. Consequent upon the integration of Sarf-e-Khas and Jagir areas, the boundaries of all the tahsils were reconstituted in the year 1950. Two new tahsils with headquarters at Ausa and Omerga and a new peta with headquarters at Bhum were created. In the same year (1950), 11 enclave villages from Solapur were transferred to the district and 52 villages from this district were transferred to Solapur district. With the reorganisation of the states in 1956 the district came to be included in Bombay state. Three tahsils of Ahmednagar, Nilanga and Udgir were transferred from the adjoining district of Bidar to Osmanabad district. Latur district was formed on August 1982 and Ahmedpur, Latur, Nilanga, Ausa and Udgir tahsils were included in Latur district. Osmanabad, Omerga, Tuljapur, Parenda, Kallam and Bhum tahsils are remained Osmanabad district. On the same date 8 villages of Barshi tahsil of Solapur district were added to the Osmanabad tahsil. New formed Lohara and Washi tahsils are not considered for the study due to non-availability of data.

2.4 Physiography:

Physiography is one of the dominant parameter of physical environment and its impact on patterns and density of agriculture is immense². 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 provided a host of possibilities for agriculture in different areas. Cropping system in the region is generally dependent upon physical factors and secondarily upon socio-economic conditions. Where as in case of the hilly tract, the latter is more dominant which has greatly caused diversification of crops³.

A greater portion of the district lies on the triangular Balaghat plateau generally over 610 metres above sea level, sloping towards the south and east forming the water divide between the Godavari and Bhima Valleys. This district is covered with small hills and offshoots of the Balaghat parts of Bhum, Kallam, Osmanabad and Tuljapur tahsils are situated on Balaghat plateau and the rest on table lands. The highest point in the district a little
over 792 metres is situated on this divide, just north-west of Kanheri about 6 kilometres south-west of Washi. North of Terkhed a spur extends eastwards and makes a right angular turn to the south around Bhabalgaon and again resumes the easterly trend and runs with a summit level of about 700 metres passing south of Moha (Map 2.2)

Geographically the district may be divided into three regions:
i) The Balaghat plateau made of residual interflues and the valleys of streams dissecting the plateau.
ii) The western bulge comprising Parenda tahsil and the western part of Bhum tahsil in the Sina drainage basin and
iii) The south western region comprising the southern and western part of Tuljapur tahsil in the Bhima drainage area.

i) Balaghat Plateau:

This plateau region rises rather steeply from the plains to the west and dips gently towards the east. The main trunk road from Beed to Tuljapur and Naldurg is laid along the top of this divide behind the scarp. The important settlements of Yermala, Yedsi, Osmanabad and Tuljapur on this road all owe their origin to their locations just where there are roads from the western plains negotiating to this main road up the plateau scarps. The principal agricultural villages are all situated away from this divide in the valleys of streams either to the east or west and every where there are kutcha approach roads linking these villages to the main road.

ii) Western Region:

The western bulge consisting of the Parenda tahsil and the western part of Bhum belongs to the Sina basin. In marked contract to the plateau relief of the first region, this region is characterised by sharp relief with innumerable small streams with rugged interflues between them. These valleys have fertile soils and abundant ground water supplies both accounting for the dominance of rabi cultivation. The crossing of this area by innumerable streams has enabled the execution of several minor irrigation works, but has to some extent hindered the development of good roads which is reflected in
the fact that Parenda has the lowest percentage of development.  

iii) The south western region comprising the southern and western part of Tuljapur tahsil comes under the jurisdiction of Bhima basin. This part is drained by the tributaries of the Bhima system. This part is fertile and covered by deep regur soil. 

Agricultural activities are mainly concentrated in the river basins and plateau region. Balaghat range region of Bhum, Kallam, Osmanabad and Tuljapur tahsils is not suitable for agricultural activities.

2.5 Geology:

No systematic geological work has been carried out in the Osmanabad district. The information available on the geology of the region is meagre. The underlying rock formation is termed as "Deccan trap" is found in all tahsils of the district and it is "Pleistocene Recent." A large part of the region is occupied by rocks to the Deccan trap formation, represented by almost horizontal lava flows of basaltic composition, thought to have been emplaced from fissures towards the close of the Mesozoic era on the lower tertiary area. 

These are referred to as Deccan traps owing to their prevalent occurrence in the Deccan and the step like appearance of their exposures. The geological formation met within the region are as follows:

- **Recent**: Soil and gravel.  
- **Cretaceous to Eocene**: Deccan trap flows with intertrapped beds.  
- **Archean**: Peninsular granite complex the rocks of the Dharwar system are found in Bhum, Parenda, Kallam, Osmanabad, Tuljapur and Omarga tahsils.

The Deccan trap flows are spread over an area of about 5 lakh sq. kms. covering parts of Maharashtra, Gujrat, Madhya Pradesh, Andhra Pradesh and Karnataka. These flows have been divided into upper traps, middle traps and lower traps. The Osmanabad district is occupied by the middle trap. The trap give rise to either brown to red or to black cotton soil (Regur). Such
belt of soil is noticed in Kallam, Tuljapur, Omerga and some parts of other tahsils.

2.6 Drainage:

Drainage is a comprehensive expression in geography. It includes surface as well as underground water flow. It is the result of a combination of numerous factors including climate particularly precipitation, insolation, humidity, cloudiness, wind force and direction, structure and type of rocks, vegetation, soil and human utilization, human obstruction to natural water flow such as roads, railways, dams and reservoirs also change its nature. However, drainage is one of the most important component of physical environment which affects agriculture directly and indirectly. Ground water influent becomes the base flow that maintains the flow of streams in fair weather. When we speak of surface water we mean stream flow regardless of its source. Therefore, surface water is by far the most important means for providing substantial irrigation which stabilizes and improves agro-economic life in an area that has otherwise plenty of land potential. Because of the uncertainty in the flow of surface water it is probable that any attempt to improve agricultural techniques and landuse planning without combating the problem with the help of shallow and deep water tables is bound to be absorptive.

Generally rivers of the Osmanabad district are from north-west to south-east and from north to south (Map 2.3). The drainage of the area is of the ordinary dendratic pattern because rivers and streams have developed a branch like system. Most of the rivers are seasonal except Manjara which flows from the northern border area of Kallam tahsil.

i) Manjara:

The Manjara river rises above Gaurwadi near the northern edge of the Balaghat plateau in Beed district and flows in a south-easterly direction towards Osmanabad district. It forms the district boundary for the greater part of its easterly course, barring a few deviations of the boundary some to the north and some to the south of the river. It is useful only to the Kallam tahsil of the Osmanabad district.
ii) Terna :

The Terna river, over 150 kilometres in length from the source to its confluence with the Manjara has the longest course of all the rivers lying entirely within the district. The Terna Project consists of an earthen dam on the river Terna above the village of Thair, south of Dhoki, with only one canal on the right bank. On account of the low relief of the adjoining divides, the dam has to be very long and of low height giving rise to a storage covering a wide area but of shallow depth.

iii) Benithora :

The Benithora river a tributary of the Bhima, rises on the slopes of Deobet hill and flows in a south-westerly direction passing by Jaoli, Yenegur and Moram. At about four kilometres south of Moram, it turns eastwards and receives a number of tributaries like Gunjoti Nala and Omerga Nala. It then turns southwards and passes outside the district.

iv) Bori :

The Bori river rising west of Dharur, flows in a south-easterly direction east of the ridge from Tuljapur to Naldurg. After cutting through the gap at Naldurg, it flows in a general south-westerly and southerly direction to join the Bhima river.

v) Harni :

The Harni river, an important tributary of the Bori, flows west of Tuljapur to Naldurg ridge with a course of about 25 kilometres within the district to join the Bori about 10 kilometres north of Akkalkot.

vi) Sina :

The sina river, a major tributary of the Bhima river, runs along the western boundary, but receives many tributaries draining the Bhum and Parenda tahsils. These are, beginning from the north the Kheri, the Nalli, the Dudhana with its tributary the Ulupa and the Chandni. All these are more or less parallel streams flowing in southerly or south-westerly direction and having their sources on the western scarp faces of Kunthalagiri, Osmanabad, Tuljapur and Naldurg watershed.
2.7 Climate:

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. The potential crop producing capacity of a given area is dependent mainly on the existing climatic and soil conditions. Since, climatic factors exert mainly a regional influence on plant life, the differences in the behaviour 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. It is obvious that climate dictates the range of crops which a country can economically produce. This in 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. The success or failure of the cropping season is determined by the intensity of the climatic factors. The three most important factors of climate from the standpoint of plant response are temperature, water supply and light and they may be treated as primary determinants of crop growth.

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.

The climate of the study region is generally dry except during the south-west monsoon. The year may be divided into four seasons. The cold season from December to February followed by the hot season from March to May, the south-west monsoon from June to September and the post monsoon from October to November.

i) Temperature:

Temperature conditions have been for 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 two or more
cropping seasons. For this reason, specially in Osmanabad a different crops are raised in different seasons without suitable temperature conditions, germination of seeds and growth of plants are retarded. Temperature regulates all the chemical and physical processes begin with rise of temperature until they reach a maximum at a temperature called the optimum. Further with rise in temperature above the optimum level the metabolic activity is showed down until it ceases

Each crop plant needs a certain number of effective heat units for germination, growth, stalking, maturity and ripening. This is called the thermal constant and varies from crop to crop. Temperature above the minimum is therefore, effective in furthering the growth of a plant towards maturity and ripening. The crucial air temperature is 6°C (Schimper 1903) at and above which plants grow. It is also known as the crucial limit. Ideal temperature conditions for crop production are between 18.3°C and 23.9°C.

For the agricultural geographer, two of the best indicators of regional differences in temperature currently available or derived are (i) length of the growing season and (ii) accumulated temperature above the maximum for plant growth.

There is only one meteorological observatory at Osmanabad, the description which follows is mainly based on the records of the observatories of the Osmanabad city. The cold weather commences towards the end of November when temperatures begin to decrease rapidly. December is generally the coldest month with the mean daily maximum temperature at about 29.5°C and the mean daily minimum at about 15°C.

On some occasions the minimum temperature drops down to about 4°C or 5°C. The period from about the middle of February to the beginning of the south-west monsoon season is one of continuous rise in temperature. May is generally the hottest month with the mean daily maximum temperature at about 40°C and the mean daily minimum at about 25°C. The heat during summer is intense and the maximum temperature sometimes goes up to about 45°C. Afternoon thundershowers which occur on some days bring
welcome relief though only temporarily. With the on set of the south-west monsoon in the district early in June there is appreciable drop in temperature. With the withdrawal of the monsoon early in October there is a slight increase in day temperature. Nights, however, progressively become colder.

ii) Rainfall:

Rainfall as the primary ecological parameter has created a variety of farming enterprises, types or systems in the world. 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 characterised 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 crop production must be corrected more or less to the moisture factor. About more than 84% of the annual rainfall in the region is received during the south-west monsoon season, the rainiest month being July. July gets the heaviest rainfall in the north-east, while the retreating monsoon rainfall in September becomes more important in the east. On an average there are 51 rainy days.

The south-west monsoon is the pivot round which almost the entire farm life and economy swings. Rainfall has control and for this reason is a seasonal rhythm of conditions influencing the patterns of landuse. The record of the rainfall in the Osmanabad district is available for the period ranging from 1970 to 1975. The details of the mean annual rainfall and coefficient of rainfall variability from 1970 to 1995 are given in the table 2.1.

The variation in the rainfall from year to year is large in the district. Generally rainfall decreases from south-east to north-west and increase from north to south.

Table 2.1 indicates that below 600 mm. mean annual rainfall was recorded in Parenda where as 600 mm. to 800 mm. mean annual rainfall was recorded in Osmanabad, Kallam, Omerga and Bhum tahsils from 1970 to 1995. Above 800 mm. mean annual rainfall was observed in Tuljapur during the period of investigation (Map 2.4).
OSMANABAD DISTRICT

MEAN ANNUAL RAINFALL

INDEX

<table>
<thead>
<tr>
<th>Above 800 mm</th>
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<tbody>
<tr>
<td>600 mm - 800 mm</td>
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<tr>
<td>Below 600 mm</td>
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</tbody>
</table>

MAP NO. 2.4
Table No. 2.1 : Mean Annual Rainfall and Co-efficient of Rainfall Variability in Osmanabad District : 1970 to 1995.

<table>
<thead>
<tr>
<th>Name of the tahsil</th>
<th>Mean annual Rainfall in M.M.</th>
<th>Co-efficient of rainfall variability in %</th>
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</thead>
<tbody>
<tr>
<td>Osmanabad</td>
<td>771</td>
<td>26.96</td>
</tr>
<tr>
<td>Kallam</td>
<td>678</td>
<td>34.44</td>
</tr>
<tr>
<td>Omerga</td>
<td>711</td>
<td>29.54</td>
</tr>
<tr>
<td>Tuljapur</td>
<td>810</td>
<td>30.90</td>
</tr>
<tr>
<td>Parenda</td>
<td>596</td>
<td>39.54</td>
</tr>
<tr>
<td>Bhum</td>
<td>704</td>
<td>33.82</td>
</tr>
<tr>
<td>O'bad district</td>
<td>810</td>
<td>33.51</td>
</tr>
</tbody>
</table>

Source : Computed by the Author.

The co-efficient of rainfall variability is calculated by the following formula.

\[
\text{Co-efficient of rainfall variability} = \frac{S}{X} \times 100
\]

Where \( S \) = The standard deviation.

\( X \) = The Arithmetic mean of rainfall during the 25 years.

It will be seen from table 2.1 that the variability of rainfall in the Osmanabad district ranges between 26.96% to 39.54% in Osmanabad tahsil and Parenda tahsil respectively. Below 30% rainfall variability was found in Osmanabad and Omerga tahsils. About 30% to 35% rainfall variability was noticed in Kallam, Tuljapur and Bhum tahsils while above 35% rainfall variability was experienced in Parenda (39.54%) tahsil during the period of investigation (Map 2.5).

iii) Other Weather Phenomena : 

A) Humidity :

The air is very humid during the south-west monsoon season and mostly dry in the rest of the year. The driest part of the year is the summer season when the afternoon relative humidity is less than 25 percent.
OSMANABAD DISTRICT

CO-EFFICIENT

OF

RAINFALL VARIABILITY

INDEX:

<table>
<thead>
<tr>
<th>Density</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>ABOVE 35%</td>
</tr>
<tr>
<td>Medium</td>
<td>30% - 35%</td>
</tr>
<tr>
<td>Low</td>
<td>BELOW 30%</td>
</tr>
</tbody>
</table>

MAP NO. 2.5
B) Cloudiness:

In the south-west monsoon season the skies are generally heavily clouded or overcast. During the rest of the year skies are mostly clear or lightly clouded. There is some increase in cloudiness during the afternoons of the summer season.

C) Winds:

Winds are generally light with some increase in force during the latter half of the summer and in the south-west monsoon seasons. Winds blow mostly from directions between south-west and north-west during the monsoon season. In the period from October to December winds blow from directions between north-east and south-east. In the next four months directions of the winds are liable to variation. In May winds are mostly from directions between west to north.

D) Special Weather Phenomena:

Thunderstorms occur in the summer and monsoon months, their incidence being higher during the monsoon season. Dust-raising winds occur during the summer season.

Parenda, Bhum, Kallam, Osmanabad and Tuljapur tahsils comes under scarcity zone where as Omerga tahsil comes under assured rainfall zone.

2.8 Soils:

Unlike climate, soils should not be regarded as part of the natural endowment of an area. In fact, it is agriculture that modifies soils, excepting certain virgin soils which can retain their original characteristics. On the whole, soils constitute the physical base for any agricultural enterprise. Farming is a business and good soil is part of the farmers stock in trade. Good soils are good to the extent that man makes judicious use of them. Our standard of living which predominantly depends on agriculture is often determined by a combination of the physical, chemical and biological characteristics of the soils and the crops and livestocks raised on them. Thus, soils endowed with a proper combination of texture, structure, salts and humus yield good results. Great civilization have almost invariability flourished no good soils, the alluvium in particular.
Soils provide essential material on which agriculture is based and therefore, comprehensive survey of the geography of agriculture should a fairly thorough treatment of soils. Even at the beginning of his work on political geography, Ratzel made a statement of great significance and insight: "Jeder staat ist ein stuck menschheit" (every nation is a bit of soil and humanity)\(^{17}\). Therefore, no student 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 man's food clothing and we ever-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\(^{18}\). Of the long list of nature's gifts to man, productive soils and water are the most basic to human life\(^{19}\). The top or upper layer of soils has an average thickness of between 15 and 20 cm. depending upon local conditions.

Topography shows dominantly influence on soil variation in the Osmanabad district. The Osmanabad district is covered by the geological formation of Deccan trap. The development of soils is, therefore, mainly influenced by the topographical situation. Soils along the river banks are deep and clay. Most of the region is covered with black cotton soils or 'Regur' drained from the Deccan trap volcanic rock. However, the soil vary greatly in texture and depth. Soils along the river banks and nalas are deep and very fertile and capable of retaining moisture. The soils however, coarse, shallow and relatively poor along the hill slopes and at the foot of the hills\(^{20}\).

Major portion of the region is covered by medium black soils. The deep black soils are found along the banks of Manjara, Terna, Bori and Benithora. Soils have light grey brown to grey brown colour on the surface, clayey texture and blacky structure. They are moderately high in soil reaction with the total soluble salt contents varying between 0.26 and 0.94 percent calcium carbonate is high but shows wide variation from 5.20% to 19.60% organic matter varies from 0.5% to 1.58%.

Out of the total soil medium black soils covers about 6 lakh 19 thousand hectares land (84.21%), deep black 29 thousand hectares (3.95%) and
coarse and shallow soil covers 87 thousand hectares (11.84%) land in Osmanabad district.

All these soils are highly clayey with clay content varying from 45.80% to 69.5%. The high rechangeable capacity of the soils indicates the inherent high status of soil fertility.

Soils of the district are classified into four groups. (i) shallow soils (ii) medium soils (iii) medium deep soils. (iv) Deep soils. (Map 2.6).

i) Shallow Soils:

These soils in general are located mostly in the north west part of the district. Some small patches also occur in the western and north western part of the district. Particularly this type of soil is occurred in Parenda and Bhum tahsil. These soils are light brown to dark grey brown colour, loamy to clayloam in texture with granular to subgranular blocky in structure with 1% to 3% slope. However, some patches of medium soils are also seen as a result of deposition. High sheet erosion is observed resulting in exposure of rocks and disintegrated murum at places. Soils are tending towards alkaline in reaction. The PH varies 7.97 to 8.7. The total soluble salts are less than 0.34 percent. Calcium carbonate varies from 2.6 to 9.7 percent which is fair to moderate. The exchangeable calcium varies from 8 to 24 m.e. percent, the higher proportion not being desirable. Exchangeable Na + K is less than 3.5 m.e. percent. Total nitrogen contents of the soils are fairly low, round about 0.05 percent. The organic matter is low to moderately low ranging between 0.38 percent and 0.93 percent. The available phosphate is from moderate to moderately high varying from 17.85% to 38.46% Mgm. The available potash is also fair to moderate varying from 14.91 to 26.88 Mgm percent. Thus it will be seen that the soils are deficient in nitrogen and organic matter contents and will give better yields on the application of the same with provisions of adequate water supply.

ii) Medium Black Soils (9" to 18" deep):

These soils are found near Washi, Bhum and eastern part of Parenda, southern part of Tuljapur, Omerga and Osmanabad tahsils. The soils are clay
loam to clayey in texture with subangular blocky to blocky in structure with dark brown to dark grey brown in colour.

The soils are alkaline in reaction with PH 8.08 to 8.53. The total soluble salts are less than 0.4 percent. The calcium carbonate varies from 2.4 to 9.7 percent which is fair to moderate. The organic matter contents are low to fair varying from 0.77 to 1.53%. The exchangeable calcium varies from 24.5 to 56.0 m.e. percent. The exchangeable magnesium varies from 8.0 to 24.0 m.e. percent which is not a desirable feature when the magnesium contents are on the high side. The exchangeable sodium and potassium together vary from 1.5 to 4.0 m.e. percent. The total nitrogen is round about 0.056 percent which is also low. The available phosphate is fair to moderate ranging between 17.85 and 38.45 Mgm percent. The available potash varies from 14.92 to 26.30 Mgm percent. Thus it will be seen that the soils are deficient in nitrogen and organic matter contents and need the application of the same for better yields.

iii) Medium Deep Black Soils (18" to 36" deep):

These types of soils are scattered and found in the north-west and northern areas and also eastern parts of north central zone in the district. The soils are clay loam to clayey in texture, granular to subgranular blocky in structure and the lower zones of the profile show angular blocky to massive structure also. The soil colour varies from dark grey brown to very dark brown. The soils are alkaline in reaction, the PH ranging between 8.38 and 8.89. The calcium carbonate is fair to moderate ranging between 4.1 and 9.2 percent. The organic matter contents are fair to moderate ranging round about 1.5 percent. The exchangeable calcium varies 31.5 m.e. percent to 55.00 m.e. percent. The exchangeable magnesium varies from 7.0 to 20.00 m.e. percent which is not desirable when present in higher proportion. The exchangeable Na/k varies from 1.5 to 11.5 m.e. percent which is also high and will require careful management if the soils are to be irrigated. The total nitrogen content varies from 0.045 to 0.057 percent which is low. The avail-
able phosphate is from fair to moderate 8.89 to 12.34 Mgm percent.

iv) Deep Black Soils (More than 36" depth):

Deep black soil covers 3.95% area of the Osmanabad district. The deep black soils are found along the banks of Manjara, Terna, Benithora, Bori, Harni and Sina and their tributaries. Soils have light grey brown to grey brown colour on the surface, clayey texture and blocky structure. They are moderately high in soil reaction with the total soluble salt contents varying between 0.26 and 0.94%. Calcium carbonate is high but shows wide variation from 5.20 to 19.60 percent, organic matter varies from 0.5 to 1.58%. These soils are highly clayey with clay content varying from 45.80 to 69.5%. The high rechargeable capacity of the soils indicates the inherent high status of soil fertility.

Exchangeable calcium varies from 32 and 57 m.e. percent and exchangeable magnesium between 5 and 34 m.e. percent. Plant nutrients status of these soils are moderately good with nitrogen varying from 0.03 to 0.06 percent available, phosphate 10.92 to 15.14 Mgm percent and available potash 14.35 to 27.02 high fertilizers will be useful in increasing the crop production in the region. Deep black soil is rich in plant nutrients supporting kharif and rabi crops like cotton, jowar, bajara, wheat, groundnut and pulses.

The soil erosion is mainly found in Bhum, Parenda and some parts of Osmanabad district.

2.9 Natural Vegetation:

Vegetation of some sort of the other is the natural covering of the land surface of the earth. Even so called deserts have their vegetation, though it may be scanty and inconspicuous. Natural vegetation is important from the view point of rainfall distribution and the fertility of the soil. It also check the soil erosion to the greater extent. It also keeps the environmental balance. Forest also provides wood for making farm implements.

The natural vegetation of region depends upon the distribution of climatic elements over the region, edaphic or soil condition, topography of the
region, drainage condition, biotic factors and the extent of human interference. Osmanabad district has scattered type trees. The forests are some what dense in Tuljapur tahsil. There is very little trees cover over Balaghat plateau region. They occupy too little a portion of the total area in this district which has definitely resulted in soil erosion to a large extent.

**Table No. 2.2 : Tahsilwise Distribution of Forest in Osmanabad District.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Osmanabad</th>
<th>Kallam</th>
<th>Omerga</th>
<th>Tuljapur</th>
<th>Parenda</th>
<th>Bhum</th>
<th>O'bad district</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970-75</td>
<td>01</td>
<td>05</td>
<td>03</td>
<td>07</td>
<td>03</td>
<td>05</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.41)</td>
<td>(0.20)</td>
<td>(0.46)</td>
<td>(0.28)</td>
<td>(0.56)</td>
<td>(0.33)</td>
</tr>
<tr>
<td>1991-96</td>
<td>02</td>
<td>06</td>
<td>02</td>
<td>16</td>
<td>04</td>
<td>06</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>(0.15)</td>
<td>(0.49)</td>
<td>(0.14)</td>
<td>(1.05)</td>
<td>(0.38)</td>
<td>(0.69)</td>
<td>(0.48)</td>
</tr>
<tr>
<td>Volume of change in %</td>
<td>+0.07%</td>
<td>+0.08%</td>
<td>-0.06%</td>
<td>+0.59%</td>
<td>+0.10%</td>
<td>+0.13%</td>
<td>+0.15%</td>
</tr>
</tbody>
</table>

Source: *Socio-Economic Abstract of Osmanabad district 1970-76 and 1990-97.* *(Figures in the brackets indicates percentages.)*

Table 2.2 reveals that area under forest increased from 2400 hectares to 3600 hectares during the period of investigation. Below 0.5% geographical area was found under forest in Omerga, Osmanabad, Kallam and Parenda tahsils where as above 0.5% forest area was noticed in Bhum and Tuljapur tahsils during 1991-96. About 0.06% negative change in forest area was experienced in Omerga tahsil while 0.07% to 0.59% positive change in forest area was recorded in other tahsils during the period under study.

**2.10 Summary :**

i) A greater portion of the district lies on the triangular Balaghat plateau generally over 610 metres above sea level, sloping towards the south and east forming the water divide between the Godavari and Bhima river. Balaghat range and other minor hilly portions are not suitable for agricul-
tural activities due to rugged topography. Therefore, agricultural activities are mainly concentrated over the plateau region and in the river valleys.

ii) There is year to year fluctuation in the distribution of monsoon rainfall. The variability of rainfall ranges from 26.96% to 39.54% in the study region. particularly it is above 30% in Kallam, Tuljapur, Bhum and Parenda tahsils, hence there is no guarantee of crops in these tahsils. Therefore, economic condition of the farmer is not sound in the study region.

iii) Most of the rivers becomes dry in summer season, therefore they are unable to provide water to agriculture in hot season. It is necessary to construct Kolhapur type bandhares on the rivers like, Benithora, Bori, Harni. Minor irrigation schemes should be increased in the study region to reduce the scarcity of the water in summer season.

iv) Soils are very rich in organic matter. Calcium carbonate is very high but it varies from 5.2% to 19.20% in the study region. It is necessary to increase the fertility of soil by using compost fertilizer on large scale. Irrigation facilities must be increased to a greater extent in the study region.

v) Table 2.2 shows us that the forest cover varies from tahsil to tahsil. It was below 0.5% in Osmanabad, Kallam, Parenda and Omerga where as it was above 0.5% in Bhum and Tuljapur during 1990-95. Therefore it is necessary to increase forest cover area in the study region by hook and crook. Social forestry Department of Maharashtra is taking more efforts to increase forest area in every district of Maharashtra since 1984.

:: References ::


