3.1 Introduction

The profile of the region such as Physical, Historical, Social, Economic and Political create an influence on the scenario of the region concerned. Man can change and modify the physical landscape into cultural with his expertise as he desires for his comfort. From the historical events, man can learn a lot and may implement his past experience for future oriented plans for development. To a certain extent, political factors also play a very important role in changing the face of the region. Man can implement various policies and programs by establishing different projects for improvement of socio-economic conditions of the region. In this way, the physical landscape may be changed into social and economic landscape such as converting forest area into agricultural land, river water into artificial reservoirs, which brings a tremendous change in the region.

3.2 Physiographic Profile of the Region

The physiographic profile of the DZSD may include relief, geology, drainage pattern, soil, climate etc. Here, these aspects are given for represent of physiography of DZSD.

3.2.A. Relief

Relief affects agriculture operation in many ways. Relief directly affects land use and growth and distribution of crops. Relief influences land cultivation and farming in a region by affecting the cause of altitutition. DZSD is a part of the larger Deccan Peninsula of India. The average height of the area is about 600 meters. The maximum height is 918 meters which is observed in north eastern part of the DZSD. The lowest point is in the extreme east part where the height 480 meters above sea level. On the basis of altitudes DZSD divided in to three division i.e.

i. Height below 600 meters
ii. Height between 600 to 700 meters
iii. Height above 700 meters
i. The Plains (Height below 600 meters)

The zone of 500 to 600 meters include eastern and northeastern parts of Jat tahasils, the eastern part of Atpadi tahsil, the southern part of Khanapur tahsil, the western part of Tasgaon tahsil and the southern part of K.Mahankal tahsil. The north eastern part of Jat tahsil is less than 500 meters. The Agarani river plain area located in the southern part of K.Mahankal tahsil, Man river plain of north eastern part of Atpadi tahsil and the Bori river plain located in the eastern part of Jat tahsil.

ii. The Plateau (Height between 600 to 700 meters)

The altitude zone of 600 to 700 meters include the northern part of Miraj tahsil, the central part of Khanapur tahsil, the east central part of Jat tahsil, the southern part of K.Mahankal. The height of Khanapur plateau varies from 700 to 900 meters, some peaks having the height of more than 900 meters are found along the north eastern fringe of plateau. The height of Jat plateau varies from 600 to 700 meters and maximum height is 758 meters. The Khanapur Plateau is comparatively less undulating than the Jat Plateau.

iii. The Foot Hill (Height above 700 meters)

The south central part of Jat tahsil, the extreme western part of Atpadi Tahsil, the north eastern part of Miraj tahsil, the western part of K.Mahankal tahsil and the eastern part of Tasgaon tahsil are included in the altitude zone of above 700 meters. This zone can be divided in to three subdivisions 1) Foot hill areas lying to the west of Khanapur-Jat Plateau. 2) The foot hill areas lying to the east of plateaus. 3) The hilly and foothill area lying to the west of the Yerala River plain. The average slope of this area is comparatively more than the other areas and the slope is very steep along the border of the plateaus.

3.2. B. Geology

The geological formation of Dry Prone Area of Sangli district is the Deccan traps. The Deccan lava flows are found usually in the form of horizontally bedded sheets. Vertical or inclined jointing at right-angles to the bedding planes of the trap are marked at places. The flows usually form flat-topped hills so characteristic of the trappean country. The traps belong to the type called 'plateau basalt'. They are more or less uniform in composition corresponding to dolerite or basalt. These are dark grey or greenish grey in colour. These traps are distinguished into vesicular and non-vesicular varieties. The non-vesicular types are hard, tough, compact and medium to
fine-grained, and break with a conchoidal fracture. The vesicular types are comparatively soft and friable and break more easily. The amygdaloidal types are characterized by vesicles filled with quartz, chalcedony, calcite and zeolite. The river valley areas, are occupied by the typical black soil derived from the Deccan traps. All the types, though varying in quality, are fertile on the whole. The black soil contains high alumina and carbonates of calcium and magnesium with variable amount of potash, low nitrogen and phosphorus. The soil is generally porous and swells considerably on addition of water, and dries up with cracks on losing moisture. The black soil is very fertile and does not require manuring for long periods. The soil of reddish brown colour is found on the hills. This type of soil becomes fertile on proper minoring and irrigation.

The inter-trappean beds generally form aquifers. In the area of Tasgaon, which is composed of Deccan trap flows, the main aquifers are either the inter-trappean beds or the decomposed zones in the traps. The depth of the water-table is variable, generally being more than 6 meters. In general the Deccan traps are unreliable sources of ground-water because of the sporadic distribution of their inter-trappean beds. Supplies are often exhausted owing to the limited storage areas and by leakage through natural springs. Shallow wells located on the banks of streams usually give fair supplies for household purposes. The quality of ground-water is good for all purposes, excepting where contamination results through the introduction of foul matter or by infiltration. Contamination is very common in the area and as such the water is hard, especially if drawn from the decomposed, amygdaloidal varieties of the traps, and is often brackish owing to the presence of sodium chloride and the sulphates of calcium and magnesium.

3.2.C. Drainage

The rivers like Krishna, Yerala, Man, Agrani, Bore River and many other smaller tributaries drain in the DPAS. Among them Krishna and Man are important rivers in this area. (Fig No 3.2)

i. The River Krishna:

The river Krishna is one of the dominant rivers in Sangli District. Within the DPAS it flows for a distance of about 28 kilometers approximately western part of Miraj Tahsil and is joined by the Varna; and the Yerala, while the Agarani river, with a greater part of its course within the district, joins it just outside. The Krishna is unfit
for navigation. The channel bed is only about 40 to 45 meters across and outside the monsoon season the river is so shallow that it is possible to drive even bullock-carts across the bed in about knee-deep water.

ii. The River Yerala:

The Yerala River is the left bank tributary of Krishna River. It collects water from the western and central part of Khanapur and Tasgaon tahsil. It flows north to south in a valley flanked by the Vardhangad-Machchhindragad range on the right and by Mahimangad-Panahala range on the left. The most west bank tributary of Yerala, the Nani Nadi, has a course some what parallel to the Vardhangad-Machchhindragad range draining the western parts. Sonhira stream is another west bank tributary of the Yerala Following eastwards.

iii. The River Agarani:

The river Agarani rises above Balvadi in Khanapur plateau and flows 3.29 kms. east of Khanapur, deeply incised in the plateau. The narrow valley bottoms of this river and its incised tributaries are the only areas of fertile soils with facilities for well irrigation in the other side barren plateau areas. The east bank tributaries of Agarani river have cut down relatively broader valleys and hence, there is a greater intensity of agriculture and the valley are consequently larger and more frequent to the east of the river than to the west.

iv. The River Man:

The river Man has only about 18 kms. of its course within and on the border of the Sangli District. But along with its tributaries, it is responsible for draining the north eastern parts of Khanapur and Miraj talukas and the northern part of Jath taluka into Bhima River. The Mhaswad canal created on Man just before its entry into the district provides irrigation facilities to the east of the river in Khanapur taluka. To the west of the river are a number of tributaries draining the slopes of Khanapur plateau eastwards.

v. The River Bor:

The Bor River is principally drained in the eastern part of Jath taluka with its tributaries of Dodda and Darai. These tributaries turn northwards towards Bhima River. The river Bor rises on the northern slopes of the water divide about 4.8 kms. to the northeast of Jath where it is known as ‘Don’.
3.2. D. Soil

Agriculture depends on soil to a great extent. The size of soil in particular determines the soil texture and arrangement of soil particles refers to the structure of soil. The land suitability of crops depends largely on these physical characteristics of soil. The availability of moisture in the land or the immediate absorption of water, the wide extension of roots and aeration and maintenance of naturisms of plants are the characteristics of soil. The physical characteristics are related to the structure, texture, colors of the soil and temperature of the soil. The chemical characteristics are also of great importance and the fertility of the soil to a large extent depends on its chemical structure.

Soil formations in DZSD have been predominantly influenced by the climate. The transition zone of Krishna valley has deep black soils of alluvial origin. The eastern drier zone, which consists largely of granular black soils and poor shallow soils. Saline-alkaline soils are met with in the low-lying patches in the areas of low rainfall. Therefore, soil of DZSD can be classified as following.

i. Shallow Soil

The area of shallow soil is about 60 percent of the total area of DZSD, however there is tahsilwise variation in distribution of shallow soils. These soils are redish brown colour and are found in the central, southern parts of Khanapur tahsil and west central part of Jath tahsil. These soils are poor in structure and texture. It is known as ‘Murum soil’. The lime content in these soils is comparatively more than the black soil.

ii. Medium Deep Soil

This soil has black to dark brown colour. The medium soils of dark brown colour are found in the eastern part of Miraj tahsil, the western and northern part of Kavathemahankal tahsil, the western and the central part of Jath tahsil, the eastern part of Khanapur tahsil, the western and north eastern part of Atpadi tahsil. The medium soil of black colour is found in the southern and central part of Atpadi tahsil, the central part of K.Mahankal tahsil and eastern part of Jath tahsil.

iii. Deep Soil

The deep soils are of black to dark brown colour and these are found along the major rivers and nalas. The adjoining areas of the rivers Yeral, Agarani, Man and
Dry Zone Area of Sangli District

Soil

INDEX
- Shallow Soil
- Medium Soil
- Deep Soil

SCALE
16 km 0 16 km

Fig. 3.3
Bor are occupied by these soils. The advantages of these black and medium soils contain high alumina and carbonates of calcium and magnesium with variable amount of potash and low nitrogen and phosphorus. The soil is generally porous and swells considerably on addition of water and dries with cracks on losing moisture, the soil close to the rivers and nalaS are very fertile due to high humus content.

**3.2. E. Climate**

Among physical factors, climate is a quite significant determinant for the agriculture land use and agriculture pattern of the region. Climate consists of temperature, rainfall, humidity, sunshine, fog, mist, snow, hailstorm, winds and air pressure. These always exists a significant relationship between climate and crops because of limits imposed on crop growth by existing board natural climate conditions which determine the pattern of farm activity and crop production.

The climate of the DZSD is on the whole agreeable and is characterized by general dryness except during monsoon season. The year climate is mainly divided into four seasons. The cold season from December to 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 season in October and November.

**3.2. E. i. Temperature**

For the growth of crops there is a limit in temperature and if any crop crosses that limit, it can not be grown in that region. Each crop plant needs a certain number of effective heat units for germinating, thriving, stalking, maturing and ripening. This is called the thermal constant and it varies from crop to crop.

Temperature is a very important factor of climate. Sangli district is located in drought prone area and hot tropical region. So the temperature of the district is hot and high. The cold weather commences towards the end of November when temperature begins to decrease rapidly. December is the coldest month with daily maximum temperature about 28ºc and the mean daily minimum temperature at about 12.8ºc.

The heat during summer [April to May] is intense and maximum temperature sometimes goes up to about 38ºc. Afternoon thunder shower which occurs some days during brings welcome relief through temperately with onset of the South East
monsoon in the district early in June. There is an approachable drop in temperature with the early withdrawal of the monsoon.

In rainy season monthly maximum temperature for Jun is 34.4ºc. Towards the end of September, temperature again increases slightly. In October high increase in the temperature occurs, which is called as “October heat”, but temperature of night steadily decreases.

Table 3.1
Mean Monthly Minimum and Maximum Temperature [2009-10]

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Month</th>
<th>Maximum temperature in ºc</th>
<th>Minimum temperature in ºc</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>January</td>
<td>29.1</td>
<td>14.1</td>
</tr>
<tr>
<td>2</td>
<td>February</td>
<td>32.4</td>
<td>18.6</td>
</tr>
<tr>
<td>3</td>
<td>March</td>
<td>36.5</td>
<td>19.4</td>
</tr>
<tr>
<td>4</td>
<td>April</td>
<td>38.5</td>
<td>22.4</td>
</tr>
<tr>
<td>5</td>
<td>May</td>
<td>36.3</td>
<td>22.7</td>
</tr>
<tr>
<td>6</td>
<td>Jun</td>
<td>34.4</td>
<td>23.5</td>
</tr>
<tr>
<td>7</td>
<td>July</td>
<td>29.0</td>
<td>22.4</td>
</tr>
<tr>
<td>8</td>
<td>August</td>
<td>30.5</td>
<td>21.9</td>
</tr>
<tr>
<td>9</td>
<td>September</td>
<td>29.0</td>
<td>20.6</td>
</tr>
<tr>
<td>10</td>
<td>October</td>
<td>31.3</td>
<td>20.8</td>
</tr>
<tr>
<td>11</td>
<td>November</td>
<td>30.3</td>
<td>16.2</td>
</tr>
<tr>
<td>12</td>
<td>December</td>
<td>28.0</td>
<td>12.8</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>32.4</td>
<td>20.6</td>
</tr>
</tbody>
</table>

Source:- Socio-Economic Abstract of Sangli District [2010]

In cold season maximum temperature ranges from 28ºc to 30ºc. December and January are coldest month of the year with minimum temperature of 12.8 ºc and 16.2 ºc.

The percentage of humidity at 8.30 hrs. varies from 44 percent in March to 78 percent in August. Similarly, the percentage of humidity at 17.30 hrs. varies from 18 percent in April to 89 percent in July.
DZSD

Mean Monthly Minimum and Maximum Temperature (2009-10)

Fig. 3.4

Temperature

Month

- Maximum temperature in °C
- Minimum temperature in °C

Fig. 3.4
3.2. E.II. Rainfall

Rainfall as the primary ecological parameter has created a variety of farming enterprises types or systems of agriculture. It is the dominant single weather element influencing the intensity and location of farming system and the farmer’s choice of enterprises. The amount of rainfall is determined the necessity of irrigation. Rainfall is a basic factor in all crop producing areas, normal rainfall is generally necessary for successful crop production.

a. Spatial Distribution of Rainfall

It may be said that rainfall is the most important climatic factor, as it determines the potential of any region in terms of crops to be raised. The necessity and feasibility of irrigation are determined by the degree of evapo-transpiration and the characteristics of rainfall. Where rainfall is confined to a particular period or when a short rainy season is succeeded by a long dry season, soil moisture gets rapidly depleted by high rates of evaporation.

Table 3.2
DZSD: Distribution of Annual Rainfall and Rainy day

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Tahsil</th>
<th>Rainfall mm</th>
<th>Rainy days</th>
<th>Intensity of Rainfall</th>
<th>Co-efficient of variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Khanapur</td>
<td>581.70</td>
<td>29</td>
<td>20.06</td>
<td>100.24</td>
</tr>
<tr>
<td>2</td>
<td>Atpadi</td>
<td>565.70</td>
<td>24</td>
<td>23.57</td>
<td>97.48</td>
</tr>
<tr>
<td>3</td>
<td>Tasgaon</td>
<td>597.40</td>
<td>27</td>
<td>22.13</td>
<td>102.94</td>
</tr>
<tr>
<td>4</td>
<td>Miraj</td>
<td>629.20</td>
<td>28</td>
<td>22.47</td>
<td>108.42</td>
</tr>
<tr>
<td>5</td>
<td>K. Mahankal</td>
<td>549.70</td>
<td>30</td>
<td>18.32</td>
<td>94.72</td>
</tr>
<tr>
<td>6</td>
<td>Jath</td>
<td>558.30</td>
<td>30</td>
<td>18.61</td>
<td>96.20</td>
</tr>
<tr>
<td></td>
<td>Total DZSD</td>
<td>580.33</td>
<td>28</td>
<td>20.72</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Socio-economic Abstract of Sangli District. [2010]
DZSD
Rainfall Variation

INDEX
- Below 95
- 95 to 100
- Above 100

Fig. 3.5
The average annual rainfall in the DZSD is 580.33 mm. Highest number of rainy days are recorded at K.Mahankal and Jath tahsils in 2010 and against low rainy days are found is Tasgaon and Atpadi tahsils in same period (Fig 3.5). An increase or decrease in the number of rainy days in an area depends on forest and coverage by crops. The spatial rainfall distribution is represented with help of intensity of rainfall and the variation of rainfall.

**Rainfall intensity:**

The term intensity is used in the context of rainfall received during 24 hours period. It is important as it determines the intensity of soil erosion. Moreover, the intensity of rainfall determines the water regime and thereby irrigation potentials of the region. It is calculated by using following formula.

\[
\text{Intensity of rainfall} = \frac{\text{Rainfall in mm}}{\text{Rainy Days}}
\]

The average intensity of rainfall is 20.72 in DZSD that is very low compared to the other tahsils of Maharashtra state. Intensity of rainfall is very high which is found in Atpadi tahsils that is 23.57 and very low intensity is in the K.Mahankal tahsils that is 18.32.

**Rainfall Variation**

The coefficient of variation is very useful to measure dispersion. The variation in rainfall characteristic affects agriculture as a whole; therefore, there is need to investigate. Hence, with this technique the tahsil wise comparison in respect of annual rainfall is attempted here. For the measurement of rainfall variation the following statistical equation is used.

\[
\text{Rainfall variation} = \left( \frac{\text{Average annual rainfall in ‘a’ particular unit}}{\text{Average annual rainfall in whole region}} \right) \times 100
\]

Table 3.2 shows the spatial variation is rainfall in the study area, which is very remarkable. It has been observed that rainfall has gradually irregular and uneven in DZSD. The highest (above 100) coefficient of rainfall variation is observed in western part and lowest (below 100) in eastern part of DZSD.

**b) Seasonal Distribution of Rainfall**

The necessity of rainfall arises when the distribution of rainfall is unequal in time and space though for the better growth of crop timely and adequate water supply
is significant. Table 3.2 shows the temporal variation is rainfall in the study area, which is very remarkable. In view of the fluctuations accruing in rainfall, the year can conveniently be divided into seasons.

**i. Monsoon Period:** (June to September)

The period of this season is from June to September. During this season study region as whole receives about 80.93 percent of the annual total rainfall. The rainfall is heavy, mostly assured and very much useful for Kharif crops. Successful cultivation of about ¾ of the cultivated land depends on the adequacy of these rains. The intensity of rainfall during the season is important in the context of water availability for irrigation in the following seasons.

**ii. Post-Monsoon Season** (October to November):

This period is climatically transitional during this season district as whole received about 9.96 percent of the annual total rainfall.

### 3.3. Demographic profile of the region

Man is most active element in the process of agricultural development, particularly in technological field i.e. irrigation, HYV seed etc. Natural resources like soil, water etc. cannot develop by themselves. Natural resources get modified based on the need of the population. Population growth and literacy are responsible for bringing changes in agriculture. These exist best in each other company, hunger make men willing to work and new ideas give them incentive for action. The physical attributes of an area become resources, only when its people are able to use them. Whether to accept and apply irrigation methods to develop agriculture is decision making factor of the man, who practices agriculture. There is close relationship between population and landuse. The huge concentration of population in rural area as like in India, confirms deep rooted relationship between people and natural resources. Overall, irrigation development depend both physical and demographic factors of the region. Because agriculture is affected by climate, but 55 ultimately it is outcome of human effects; though man’s role is irrigation is great importance.

### 3.3. A. Population Growth

The population growth is instrumental in bringing about agricultural change in an agrarian society. The trend of growth of population indicates gradual increase in total population, while decadal growth rate gives a different picture. The growth of
Population in an area is determined by three basic factors namely births, deaths and migration (in migration or out migration). The difference between births and deaths is called natural increase in population. For this purpose of analysis total population growth is considered:

\[
PGR = \frac{P2 - P1}{P1} \times 100
\]

Where

- \(PGR\) = Population Growth Rate
- \(P2\) = Population of Current Year
- \(P1\) = Population of Previous Year

Table 3.3

DZSD: Population Growth Rate

<table>
<thead>
<tr>
<th>Sr</th>
<th>Tahsil</th>
<th>Year 1981</th>
<th>Percent</th>
<th>Year 2001</th>
<th>Percent</th>
<th>Change</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Khanapur</td>
<td>271958</td>
<td>18.7</td>
<td>298317</td>
<td>13.9</td>
<td>+26389</td>
<td>+9.69</td>
</tr>
<tr>
<td>2</td>
<td>Atpadi</td>
<td>84016</td>
<td>5.80</td>
<td>125265</td>
<td>5.80</td>
<td>+41249</td>
<td>+49.1</td>
</tr>
<tr>
<td>3</td>
<td>Tasgaon</td>
<td>300597</td>
<td>20.7</td>
<td>533608</td>
<td>24.9</td>
<td>+233011</td>
<td>+77.5</td>
</tr>
<tr>
<td>4</td>
<td>Miraj</td>
<td>506320</td>
<td>34.8</td>
<td>756048</td>
<td>35.3</td>
<td>+249728</td>
<td>+49.3</td>
</tr>
<tr>
<td>5</td>
<td>K. Mahankal</td>
<td>97274</td>
<td>6.7</td>
<td>144596</td>
<td>6.80</td>
<td>+47322</td>
<td>+48.6</td>
</tr>
<tr>
<td>6</td>
<td>Jath</td>
<td>193096</td>
<td>13.3</td>
<td>283950</td>
<td>13.3</td>
<td>+90854</td>
<td>+47.1</td>
</tr>
<tr>
<td></td>
<td>Total DPAS</td>
<td>1453261</td>
<td>100</td>
<td>2141782</td>
<td>100</td>
<td>+688521</td>
<td>+47.4</td>
</tr>
</tbody>
</table>


The table no 3.3 gives the population of DZSD and its variation in each tahsil. The population of DZSD is 688521 persons according to 2001 census. The spatial distribution of study area is uneven. The highest population is observed in Miraj (35.3 percent) and followed by Tasgaon tahsil (24.9 percent). The lowest population is located in Miraj tahsil (5.8 percent). The population of DZSD increased from 1453261 in 1981 to 2141782 in 2001 giving growth of 47.4 percent during investigation period. Regarding the growth of talukas, there are also significant differences in the rates of growth of population in various talukas. Highest growth rate (77.5 percent) is observed in Tasgaon tahsil due to the agriculture development and lowest growth rate
(9.69 percent) due to the drought and the huge migration towards the town for employment.

B. Literacy

The term literacy is one of the very significant qualitative indicators of social development associated to the economic development. Even today education is the most intrinsisc instrument for changing the socio-economic status of an individual and society as a whole. According to the Indian census, “A person who can both read and write with understanding in any language has been taken as a literate”. Literacy is necessary for all those who wish to practice the agricultural occupation on modern lines. Literacy is the main factors to develop the agriculture. Literacy and population growth are the two factors which bring about a change in agricultural. Without literacy we can’t imagine the agriculture development.

Table 3.4

DZSD: Rural and Urban literacy

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Tahsil</th>
<th>Percentage of Literacy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>1</td>
<td>Khanapur</td>
<td>65.93</td>
</tr>
<tr>
<td>2</td>
<td>Atpadi</td>
<td>66.40</td>
</tr>
<tr>
<td>3</td>
<td>Tasgaon</td>
<td>67.67</td>
</tr>
<tr>
<td>4</td>
<td>Miraj</td>
<td>82.10</td>
</tr>
<tr>
<td>5</td>
<td>K. Mahankal</td>
<td>73.00</td>
</tr>
<tr>
<td>6</td>
<td>Jath</td>
<td>63.00</td>
</tr>
<tr>
<td></td>
<td>Total DZSD</td>
<td>69.68</td>
</tr>
</tbody>
</table>


It is noticed from the Table 3.4 and Fig 3.7 that the study region is 69.68 percent as a whole, the literacy rate for urban (80.22 percent) is substantially higher compared to rural area (69.68 percent). The tahsilwise breakup shows that Miraj tahsil with 82.10 percent literacy top the list, while Jath tahsil with 63.00 percent stands at the bottom. Urban literacy rates are low (80.22 percent) in only Khanapur tahsil compare to the region’s average. Rural literacy rates are also low in four of six tahsils.
DZSD

Population Literacy (2009-10)
(In Percent)

Fig. – 3.7
C. Population Density

Population density has been studied in order to understand the regional variations in the population density and its influence on agricultural landuse. The population density values were calculated as ratio of total population to total area. The average density of population is expressed as a number of people per sq.km. The distribution of population is uneven and mostly influenced by the Physiography and agricultural pattern of the area.

Table - 3.5
DZSD: Population Density

<table>
<thead>
<tr>
<th>Sr.</th>
<th>Tahsil</th>
<th>Area in sq.km</th>
<th>Population</th>
<th>Population Density (per sq. km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Khanapur</td>
<td>744.32</td>
<td>162963</td>
<td>219</td>
</tr>
<tr>
<td>2</td>
<td>Atpadi</td>
<td>830.26</td>
<td>125265</td>
<td>151</td>
</tr>
<tr>
<td>3</td>
<td>Tasgaon</td>
<td>958.80</td>
<td>533608</td>
<td>557</td>
</tr>
<tr>
<td>4</td>
<td>Miraj</td>
<td>926.10</td>
<td>756048</td>
<td>816</td>
</tr>
<tr>
<td>5</td>
<td>K. Mahankal</td>
<td>934.06</td>
<td>144596</td>
<td>155</td>
</tr>
<tr>
<td>6</td>
<td>Jath</td>
<td>2196.05</td>
<td>283950</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>Total DZSD</td>
<td>6589.59</td>
<td>2141782</td>
<td>325</td>
</tr>
</tbody>
</table>


According to 2001 census the DZSD has the total population is 2141782 persons and average population density is 325 persons per sq. km. The highest (816 person) population density is observed in Miraj taluka. The main reason of high density in this tahsil because of Sangli, Miraj and Kupwad cities are located. The moderate density (557 person) observed in Tasgaon tahsil. This tahsil agriculture is well developed due to the available of irrigation facilities. The lowest (129 person) population density is observed in Jath Tahsil. Remaining tahsil of DZSD has observed low (below 300 person) population density. The main cause of low density is this region is drought prone, no irrigation facilities available, no agro-based industries, however the migration trends toward the cities is large.
Dry Zone Area of Sangli District
Population Density

Fig. 3.8

INDEX
- Low Density
- Moderate Density
- High Density
A. Agriculture Density

Another interesting ratio between man and land, which gives clearer picture regarding pressure of population on land, is agricultural density. The sum of cultivators and farm workers are taken as an agricultural population of the region. The ratio of agricultural population and area under agriculture is called as agricultural density. This gives a clearer and relative realistic picture of the pressure of population on land. The study of Agricultural density is necessary for agricultural development. The study of agricultural density pattern is necessary. That is measured by using the following statistical equation.

\[
\text{Agriculture Density} = \frac{\text{Cultivators + Farm Workers}}{\text{Agriculture Area}}
\]

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Tahsil</th>
<th>Area in sq.km</th>
<th>Cultivators</th>
<th>Agri. Labours</th>
<th>Agriculture Density per Sq.km.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Khanapur</td>
<td>744.32</td>
<td>36797</td>
<td>13384</td>
<td>69</td>
</tr>
<tr>
<td>2</td>
<td>Atpadi</td>
<td>830.26</td>
<td>25841</td>
<td>8781</td>
<td>42</td>
</tr>
<tr>
<td>3</td>
<td>Tasgaon</td>
<td>958.80</td>
<td>54532</td>
<td>21539</td>
<td>79</td>
</tr>
<tr>
<td>4</td>
<td>Miraj</td>
<td>926.10</td>
<td>51677</td>
<td>36028</td>
<td>95</td>
</tr>
<tr>
<td>5</td>
<td>K. Mahankal</td>
<td>934.06</td>
<td>33584</td>
<td>10381</td>
<td>47</td>
</tr>
<tr>
<td>6</td>
<td>Jath</td>
<td>2196.05</td>
<td>70298</td>
<td>21473</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Total DZSD</td>
<td>6589.59</td>
<td>272729</td>
<td>111586</td>
<td>58</td>
</tr>
</tbody>
</table>


Table 3.6 shows that the high cultivators are observed in Jath tahsil and lowest in Atpadi Tahsil. But the high agricultural labour is consisted in Miraj tahsil and lowest in Atpadi tahsil. In the region under study, the population is largely depend on agriculture.
For the year 2001, the average agricultural density in the region is 58 persons per sq. km. The Miraj tahsil represents the highest value of agricultural density due to relatively high percentage of people engaged in the cultivation. The regions which show higher agricultural density than the region average are Tasgaon and Khanapur tahsils. This clearly shows that in such tahsils, the ratio between man and land is higher due to enough availability of land for agriculture. Besides, the region showing lower agricultural density than the region average, where the proportion of the agricultural land due to physical constraint is relatively low, such tahsils are namely Atpadi, Jath and K.Mahankal tahsil. In such regions, the proportion of waste land and in other category of land is higher which is not suitable for cultivation. Hence, the ratio of agricultural land is lower than the district average.

**E. Population pressure on Agriculture land**

The agriculture landuse is largely connected with rural population whose livelihood is depending on agriculture. It constitutes a much larger proportion of the total population. As such it is now proposed to examine the pressure of population on agriculture land. For it is felt that the only way to meet the increasing burden of population seems to be the adjustment and readjustment of land.

For measuring the actual pressure of population on agricultural land the relative co-efficient of over population is computed by taking in to consideration the standard hectare i.e. namely 0.4047 hectare suggested by author of Swaminathan and quoted by “Limits of Growth” (1974). Using these criteria the unit 0.4047 of hectare is divided by per hectare land. The use of quotient obtained gives the relative co-efficient of over population. Thus, the greater the co-efficient value, the higher pressure of population on agriculture land.
The agriculture landuse data and census population of the year 2001 gave the per capita agriculture land in the region. The regions per capita land divided by standard hectares (0.4047 hectare). Therefore, the relative co-efficient of over population is 1.15 in the study region.

The relative co-efficient of over population of talukas is calculated and the region average is 1.15 which is taken as more or less marginal. Table 3.7 shows the relative co-efficient of over population of the talukas in the DZSD. With help of these data, the region can be grouped into three categories viz; high (above 1.5), medium (1-1.5) and low (below 1) over population. The high over population is observed in Khanapur and Jath tahsil. Followed by Atpadi and Tasgaon tahsil in moderate over population and low over population is in Miraj and K.Mahankal tahsil.

3.3 Socio-economic profile of the Region

A. Irrigation

Irrigation is essential for cultivation and better yield. Especially in drought prone area or in areas where rainfall is uncertain. Farming without irrigation is very limited and if the rainfall decreases to less than 20 c.m., agriculture is impossible without irrigation. (King 1953) Irrigation is practiced from well, rivers, tank etc. Since long time, the type of irrigation is determined by physical features viz. topography, geology and ground water etc. which varies from different parts.
Dry Zone Area of Sangli District
Population Pressure on Agriculture Land

Fig. 3.10

INDEX
Relative Co-efficient of Over Population
- Below 01
- 01 to 1.5
- Above 1.5
Sources of Irrigation

Irrigation is key element in the success of farming. The study region has suffered by scanty, erratic, uneven and uncertain rainfall. Therefore, irrigation is essential to ensure stable yields and success of agriculture in the study area. Irrigation facilities in the study region are available through major, medium and minor irrigation projects.

i. Medium Irrigation Projects:

Medium irrigation projects are those which provide irrigation facilities to cultivable areas between 2000 to 10,000 hectares. There are four medium irrigation projects in the study area. Out of two is located in Jath Tahsil and one each in K.Mahankal and Tasgaon tehsil.

Table 3.8
DZSD: Sources of Irrigation

<table>
<thead>
<tr>
<th>Sr</th>
<th>Tahsil</th>
<th>Medium project</th>
<th>Small project</th>
<th>Percolation tank</th>
<th>KP Dam</th>
<th>Wells</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Khanapur</td>
<td>00</td>
<td>08</td>
<td>76</td>
<td>15</td>
<td>9226</td>
</tr>
<tr>
<td>2</td>
<td>Atpadi</td>
<td>00</td>
<td>12</td>
<td>179</td>
<td>09</td>
<td>2675</td>
</tr>
<tr>
<td>3</td>
<td>Tasgaon</td>
<td>01</td>
<td>07</td>
<td>73</td>
<td>22</td>
<td>7910</td>
</tr>
<tr>
<td>4</td>
<td>Miraj</td>
<td>00</td>
<td>03</td>
<td>49</td>
<td>07</td>
<td>9294</td>
</tr>
<tr>
<td>5</td>
<td>K. Mahankal</td>
<td>01</td>
<td>10</td>
<td>136</td>
<td>18</td>
<td>7100</td>
</tr>
<tr>
<td>6</td>
<td>Jath</td>
<td>02</td>
<td>19</td>
<td>276</td>
<td>12</td>
<td>10466</td>
</tr>
<tr>
<td></td>
<td>Total DZSD</td>
<td>04</td>
<td>59</td>
<td>789</td>
<td>83</td>
<td>46671</td>
</tr>
</tbody>
</table>


ii. Minor Irrigation Projects:

An irrigation project which covers less than 2000 hectares as the cultivate command area is called minor irrigation scheme. There are 59 minor irrigation projects in the study area. Maximum minor irrigation schemes are in Jath Tahsil (19 projects), Atpadi (12 projects) and minimum (03 projects) in Miraj tahsil.

iii. Percolation Tanks:

The construction of local level percolation tank is indirect irrigation project which helps to increase ground water table. Percolation tanks are very useful for indirect irrigation in drought prone area. More than 789 percolation tanks are registered in study region.
DZSD

Irrigation Sources

Fig 3.11
Recently state government provide 100 percent subsidy for the construction of percolation tank in the study region. Maximum Percolation tanks are observed in Jath (276), Atpadi (179), K.Mahankal tahsils (136) and minimum (less than 100) in remaining tahsils of the study area.

iv. **Kolhapur Types Bandhare:**
The construction of local level Kolhapur type bandh are has been introduced in study region in the year 1989. The irrigation potential of this K.T.Bandhare 50 to 100 hectares which are help to increase underground water table of the region. There are 83 K.T.B. observed in study region, mostly K.T.B are observed in Tasgaon (22), K.Mahankal (18), Khanapur Tahsil (15) and minimum in Miraj (07) and Atpadi tahsils (09).

v. **Wells**
Well irrigation is an important and indigenous method of irrigation. There are about 46671 irrigation wells in study area. The large number of irrigation of well are observe in Miraj Tahsil (9294) and Khanapur Tahsil (9226). The lowest density of well is mainly in Atpadi Tahsil (2675). Generally the water lifting means used in well irrigation in DZSD are motors, mechanical pumps viz. electrical pumps and oil engines.

3.3. B. **Agriculture implements**
Agriculture implements play a vital role in enhancing the productivity of land. Agriculture implements driven in study region are bullock carts, ploughs, irrigation pumps, sugarcane crushers, tractors and others.

a. **Agriculture Plough:** It can be seen in table 3.8 that the 24695 wooden ploughed used in DZSD farmers. The spatial distribution is uneven. The high (31.85 percent) wooden ploughed lie in Jath tahsil and low (8.74 percent) in Khanapur tahsil. This is due to subdivision of holding and increase the number of house holds.

b. **Bullock Cart:** The agriculture implements are subject to constant change an account of changing socio-economic status of farmers and technological change. Carts are more unevenly distributed but they are more in talukas of Jath, K.Mahankal
and Miraj tahsil. Remaining tahsil has observed low bullock carts. There is significant use of carts in the study region.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Tahsil</th>
<th>Agri. Plough</th>
<th>Bullock cart</th>
<th>Sugarcane crusher</th>
<th>Irrigation pump</th>
<th>Tractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Khanapur</td>
<td>2160</td>
<td>1755</td>
<td>50</td>
<td>2315</td>
<td>208</td>
</tr>
<tr>
<td></td>
<td>percent</td>
<td>8.74</td>
<td>13.27</td>
<td>7.15</td>
<td>10.29</td>
<td>12.21</td>
</tr>
<tr>
<td>2</td>
<td>Atpadi</td>
<td>4537</td>
<td>2395</td>
<td>101</td>
<td>3820</td>
<td>209</td>
</tr>
<tr>
<td></td>
<td>percent</td>
<td>18.37</td>
<td>18.11</td>
<td>14.44</td>
<td>16.98</td>
<td>12.27</td>
</tr>
<tr>
<td>3</td>
<td>Tasgaon</td>
<td>2338</td>
<td>1685</td>
<td>07</td>
<td>3643</td>
<td>294</td>
</tr>
<tr>
<td></td>
<td>percent</td>
<td>9.46</td>
<td>7.25</td>
<td>1.00</td>
<td>16.20</td>
<td>17.26</td>
</tr>
<tr>
<td>4</td>
<td>Miraj</td>
<td>4333</td>
<td>2249</td>
<td>146</td>
<td>3481</td>
<td>480</td>
</tr>
<tr>
<td></td>
<td>percent</td>
<td>17.54</td>
<td>17.01</td>
<td>20.88</td>
<td>15.48</td>
<td>28.18</td>
</tr>
<tr>
<td>5</td>
<td>K. Mahankal</td>
<td>3461</td>
<td>2357</td>
<td>364</td>
<td>5346</td>
<td>195</td>
</tr>
<tr>
<td></td>
<td>percent</td>
<td>14.01</td>
<td>17.83</td>
<td>52.07</td>
<td>23.77</td>
<td>11.45</td>
</tr>
<tr>
<td>6</td>
<td>Jath</td>
<td>7866</td>
<td>2777</td>
<td>31</td>
<td>3882</td>
<td>317</td>
</tr>
<tr>
<td></td>
<td>percent</td>
<td>31.85</td>
<td>21.00</td>
<td>4.43</td>
<td>17.26</td>
<td>18.61</td>
</tr>
<tr>
<td></td>
<td>Total DZSD</td>
<td>24695</td>
<td>13218</td>
<td>699</td>
<td>22487</td>
<td>1703</td>
</tr>
</tbody>
</table>

Source:

**c. Sugarcane Crusher:** It is labor and time saving and more spare time to farmers to look after other farm activities. It is 699 crushers in 2009. Table 3.11 shows the spatial distribution of crusher in study region. The high number of crusher used in K.Mahankal tahsil and low in Tasgaon tahsil.
DZSD

Agriculture Implements

Fig 3.12
d. **Irrigation Pump:** One of the major technological developments of the post Independence period has been application of mechanical power to agriculture. The two type of irrigation pumps used in DZSD is oil and electronic pumps. There were differences in spatial distribution. The high number of pumps used in K. Mahankal and low in Khanapur tahsil.

e. **Tractors:** Tractors replaced many implements driven by bullock and other. In the region the use of tractor increased in last some years. In taluka of Miraj the use of tractors is large and in K. Mahankal it is low observed.

### 3.3. C. **Transport network**

Transport plays an important role in the growth and distribution of rural and urban settlements as well as in developing the economy and rural-urban interaction. The modes of transport in study region are mainly roads and railways.

#### Table 3.10

**DZSD: Road Transport Network**

<table>
<thead>
<tr>
<th>Sr</th>
<th>Tahsil</th>
<th>State highway</th>
<th>District road</th>
<th>Other</th>
<th>Total</th>
<th>Road per 100 sq.km</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Khanapur</td>
<td>100.89</td>
<td>127.91</td>
<td>229.66</td>
<td>458.46</td>
<td>101.95</td>
</tr>
<tr>
<td>2</td>
<td>Atpadi</td>
<td>64.85</td>
<td>213.40</td>
<td>206.58</td>
<td>484.83</td>
<td>94.53</td>
</tr>
<tr>
<td>3</td>
<td>Tasgaon</td>
<td>90.50</td>
<td>198.67</td>
<td>734.15</td>
<td>1023.32</td>
<td>106.73</td>
</tr>
<tr>
<td>4</td>
<td>Miraj</td>
<td>153.94</td>
<td>243.97</td>
<td>1224.2</td>
<td>1622.10</td>
<td>175.15</td>
</tr>
<tr>
<td>5</td>
<td>K. Mahankal</td>
<td>78.09</td>
<td>253.22</td>
<td>654.30</td>
<td>985.61</td>
<td>134.27</td>
</tr>
<tr>
<td>6</td>
<td>Jath</td>
<td>232.61</td>
<td>429.88</td>
<td>662.49</td>
<td>1803.26</td>
<td>82.11</td>
</tr>
<tr>
<td></td>
<td>Total DZSD</td>
<td>720.88</td>
<td>1467.05</td>
<td>3711.38</td>
<td>6377.58</td>
<td></td>
</tr>
<tr>
<td></td>
<td>percent</td>
<td>11.30</td>
<td>23.00</td>
<td>58.19</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

i. **Roads:**

Road is important means of transportation for the social and economic development in a particular region. Unlike railway, roads provide door to door services. In terms of road transportation, the DZSD is better off, since it has total length of 6377.58 km. Out of this, 720.88 km. (11.30 percent) roads are major state highway. Apart from this, the major district roads have the length of 1467.05 (23 percent) km. while other roads occupy 3711.38 km. (58.19 percent). The village roads comparatively have a large sizeable length in kilometers which means district connecting all the villages in the district.

Spatial distribution of road network is uneven in DZSD. The state highway is highest in Jath (232.61 km) and lowest in Atpadi tahsil (64.85 Km). The district road is also as high as in Jath tahsil and lowest in Tasgaon tahsil. But, the other roads are more in Miraj tahsil and lowest in Atpadi tahsil. The road density means length of road per sq. km in a region. The highest road density per 100 km is highest in Miraj tahsil (175.15 km) and lowest in Atpadi tahsil (82.11 km).

ii. **Railway**

Railway network is fast and guaranteed mode of transport. It is huge capacity mode transport. The development of region is also depend on transport network as well as railway network. The broad-gauge railway type is observed in study region. Miraj is very important railway junction which connect kankan or coastal area of arabian sea, southern india, north india, eastern part of Maharashtra state. The total length of railway network in study area is 96. This railway network available in some part of three tahsils.
References