Chapter II

PHYSICAL SETTINGS

2.0 Introduction

In order to understand of an agriculture and agricultural practice of an area, it is very essential to study the salient geographical features of the study region. The study of physical setting, physiographic pattern, geology, landscape characteristics, climatic parameters, soil structure, landuse, cropping pattern, marketing facilities and demographic structure provides the basic and essential knowledge.¹

In physical environment spatio-temporal variations on the landscape will influence a lot of agriculture in a well developed area, the physical and non-physical environment cannot be compartmentalized. It is a universal fact that many of present patterns of human activity in the past and varying degree of modification of physical conditions, which man has introduced with the help of science and technology. Climate, soil, natural vegetation and water resources remain the same and interrelated. The impact of their share of influence on an agriculture variation can never be underestimated.² (Singh J. 1984)

Therefore, it is essential for an agricultural geographers to examine the environment because, it constitute a major factor in describing and interpreting the pattern of agricultural practices. A study of this land attempts to explain how physical factors influence the pattern of agricultural land use.
It is from this point of view that the present study makes an attempt to explain the physical aspects relating to agriculture in Koppal district. The significance of the impact of the physical factors on agriculture and to assess the concentration and diversification crops in the study area are examined.

### 2.1 Location and Extent

Koppal district is situated in northern part of Karnataka state. The district encompasses an area of 5,52,495 hectares lying between the latitudinal parallels 15°09’ to 16°03’ north latitude and 75°47’ to 76°48’ east longitude. In its shape the district may be regarded as roughly resembling inverted triangle shape, as per Peter Hegget’s shape index method. It consists of four talukas namely, Gangavati, Koppal, Kushtagi and Yelburga. The district is bound in the north by Raichur and Bagalkot districts, in the west by Gadag district, in the south by Bellary district and in the east by again Bellary and Raichur districts. All these districts which are surrounded Koppal district belongs to Karnataka State itself. The area falls in the Tungabhadra sub-basin of the Krishna basin. Tungabhadra River flowing in southern boundary in north-easterly direction and it is main Perennial River. Tungabhadra River flows in between Davangere, Haveri, Gadag, Bellary and Koppal district. (Fig. 2.1 & 2.2)

The main streams draining the area of the district are Maskinala, Ilkal-nadi and Hirenala. These are ephemeral in nature, these are also comes under Tungabhadra sub-basin. The drainage exhibits dentritic to sub-dentritic patterns.
Fig. 2.1

KOPPAL DISTRICT - LOCATION MAP

LEGEND
- District Headquarter
- Taluk Headquarter
Fig. 2.2

KOPPAL DISTRICT
ADMINISTRATIVE DIVISIONS

KUSHTAGI
YELBURGA
KOPPAL
GANGAVATI

LEGEND

- District Headquarter
- Taluk Headquarter
- District Boundary
- Taluk Boundary
2.2 Physiography and Relief

Geographers are very particular about the physiography or relief of a region. It plays a very important role in the spatial analysis of agricultural situation of the study area. The undulating topography with black cotton soil shrubs, cut across by numerous nalas or streams is the major characteristic feature of the study region. Three physiographic divisions have made considering the local conditions of landforms and crops grown in the district. (Fig. 2.3 & 2.4)

On the basis of physiography, Koppal district can be divided into three major divisions. They are (a) Koppal & Yelburga plateau, (b) Maidan division, (c) Tungabhadra valley.

a) Koppal and Yelburga Plateau

It covers an area of Koppal, Yelburga and Kushtagi talukas of the district. It covers larger parts of Yelburga, Koppal talukas and some parts of Kushtagi taluka. The division represents the landscape of an undulating topography. Dharwad schists is now partially denuded free from vegetation cover and presents a monotonous landscape while the gneissic region is generally more or less broken and is covered with a thin mantle of red loamy soil. In some places Kaladagi series rocks are also found. The Bannihalla and Maskihalla as well as its tributaries drain this division. A isolated hills are also found in Ginigera hill and Hanumasagar Gudda in Koppal and Kushtagi talukas respectively. The height of these hills is about 700 meters above the mean sea level. The outer surface of the division gently slopes from north to south of the study region.
Fig. 2.3

KOPPAL DISTRICT
PHYSIOGRAPHY DIVISIONS

INDEX
- Koppal & Yelburga Plateau
- Maidan
- Tungabhadra Valley

INDEX

Koppal & Yelburga Plateau
Maidan
Tungabhadra Valley
KOPPAL DISTRICT
RELIEF MAP

ALTITUDE SCALE
- 1200 Meters
- 900 Meters
- 600 Meters
- 300 Meters
- 150 Meters

Fig. 2.4
b) Maidan Division

It is the second biggest division of the district. It covers larger parts of Gangavati and Kushtagi talukas. Although the same area forms a part of maidan region, its relief features are slightly different from the other areas. The district consists of both maidan and hilly topography, while the western portion of the district is a plain with scanty vegetation; the eastern part has a few hillocks and shrubs. It is characterized by isolated hills like Benekal 697 meters, Kanakagiri 688 meters above the sea level. The whole ranges from 622 to 728 meters above sea level. The maidan region extends over the talukas of Gangavati, Kushtagi, Koppal and eastern part of Yelburga.

c) Tungabhadra Valley

This division extends along Tungabhadra river basin, which forms the south-east boundary of the district in a small extent. It covers the Koppal and Gangavati talukas. The land is generally plain and gradually slopes towards north-east. The division makes boundaries from Gadag in the north-west, Koppal and Bellary districts in the east, Haveri district in the south, some rocky hills are appeared here and there in the valley plain area. The land surface gradually slopes towards north-east. The general elevation varies between 500 to 600 meters, hilly area’s height at about 728 meters.

2.3 Geological History

The district lies on the Deccan plateau and comprises mainly the Dharwad and Kaladagi system as it bed rocks forming two separate belts. The oldest geological formation in the study area consists of four
main rock types and their occurrence. Dharwad series of rocks occur in the form of three small but prominent bands, the Kushtagi band, the Maski band and minor patches are also to be seen in Gangavati. The Kushtagi and Maskibands have also the minor patches. Consisting of meta-morphic series like chlorite schists, talc schists, banded ferruginous quartzities, horn-blends schists, diabasic schists and amphibolites with their intrusive like quartz reefs and veins. Maski band largely quartz veins occurring and much more so than in the Kushtagi band. The Hatti Gold mine is situated in the Maski band of Dharwad schists rock (Latif K. Sen, 1975)

The Kaladagi series of rock are found extensively in Kushtagi area and are spread over sixteen kilometers of alternative lawns of conglomerates and sandstones laid almost horizontally over the denuded surface of the gneisses. Conglomerated it can be concluded that these rocks are derived from the Kaladagi series. The district consists of various types of crystalion schists and some acid and basic intrusive rocks commonly found in other parts of the state. (Fig. 2.4)

<table>
<thead>
<tr>
<th>Formation</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil, etc.</td>
<td>Recent</td>
</tr>
<tr>
<td>Laterite</td>
<td>Sub-recent</td>
</tr>
<tr>
<td>Kaladagi Series</td>
<td>Cuddapah</td>
</tr>
<tr>
<td>Dolerite Dykes</td>
<td></td>
</tr>
<tr>
<td>Conglomerates</td>
<td>Pre-Cambrian</td>
</tr>
<tr>
<td>Granite</td>
<td></td>
</tr>
<tr>
<td>Gneisses Dharwad</td>
<td></td>
</tr>
</tbody>
</table>
KOPPAL DISTRICT
GEOLOGICAL STRUCTURE

INDEX
- Sandstone, Quartzite, Shale, Slate, Limestone & Dolomite
- Schist
- Granite
- Gneiss
2.4 Drainage

The district is drained by only one major river system i.e., Tungabhadra drainage system. In the south and south-western part of the district, the Tungabhadra river is formed by union of two rivers viz., Tunga and Bhadra both of which rise at Gangamula in the Varaha Parvata of the Western Ghats. This is also a perennial river. This river enters the district near Kesalpur village at the south-western tip of Koppal taluka. The general slope of the land in the district being north-west to south-east, the Tungabhadra has a large number of rivulets and streams serving as tributaries. All of these generally go dry during the summer. There is a Tungabhadra reservoir at Munirabad which in the border of Koppal district and Bellary district. The river flows for a distance of about 104 kilometers passing through the talukas of Koppal and Gangavati, it leaves the district at the east of Nandihalli village (Code 84) in Gangavati taluka.

The drainage pattern of this region closely follows the geological foundation of the area. Physiography and drainage are important factors for the evolution of the relief and geology. The important streams are Maskihalla, Ilkalhalla, Hirehalla, Dothihalla and others. Maskihalla is one of the important non-perennial streams in the district. It drains the Yelburga and Koppal talukas, Dothihalla drains only in Kushtagi taluka, Ilkalhalla drains only in Yelburga taluka, Hirehalla is another important stream it drains Kushtagi and Gangavati talukas and Sulekalhalla flows parallel to the Hirehalla of same talukas of the district and joins the river Tungabhadra. (Fig. 2.6)
Fig. 2.6

KOPPAL DISTRICT
DRAINAGE MAP

INDEX
- Rivers & Streams
- Ponds
- Canals
- Reservoirs

Parapur
Huliyapur
Sanganahal
Ilkalhalla
Hirehalla
Reservoir
Bhoruka
Reservoir
Ilkalhalla
Hirehalla
Reservoir
Tungabhadra
River
Tungabhadra
Left Bank Canal

15°00'N 15°10'N 15°20'N 15°30'N 15°40'N 15°50'N
75°00' 76°00' 76°10' 76°20' 76°30' 76°40' 76°50'E
2.5 Soils

Soil is a natural body consisting of mineral matter decaying organic matters and micro organisms. It is living body and reacts in different manners, depending on different climatic factors. Soil is important natural resources of nature which provides bread and butter to human beings for survival. There is a relationship between soil and vegetation, between soil and parent rock, between soil and slope and even climate and slope, but all these factors co-operate in the production of actual soil. No life without soil and no soil without life they have evolved together, so millions of people and plants lives depends on the soil. It is one of the important factors for the study of its varieties, properties and characteristics to know the spatial variation in its distribution and its contribution to the spatial development of the region. The study area possesses soils derived from a variety of parental materials, such as schists, traps, sandstones, limestones, shales, granite and laterites. The mixed brown and laterite soils occurs mostly in the north-western tract of Kushtagi taluka of Koppal district (Fig. 2.7). They are median deep granular to vesicular in structure, being at red to molted yellow and red. There are extensive areas covered with black soil in the western, south western and central part of the district. This black soil is derived from various parent materials such as traps, schists, granites and lime stones. Usually contain lime modules, have high base status and rather shallow 3’ to 4’ in the lower elevation and even shallow in the ridges. In some causes black soil and red soil occur intermixed. In the southern,
Fig. 2.7

KOPPAL DISTRICT
SOIL MAP

INDEX
- Red Sandy Soil
- Red Soil
- Black Cotton Soil
- Brown with Black Soil
- Flood Soil

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northern and western talukas of Kushtagi, Yelburga and some parts of Koppal, the soils are either red sandy loams or black soils. The red sandy loams are derived from granites or schists with predominant content found in south-western part of Gangavati, south-eastern part of Koppal and north-eastern part of Kushtagi talukas. This type of soil, of course, particles and gravel and pebbles are rather shallow in depth and have poor water holding capacity.

2.6 Climate

Climate is one of the important factors through which the activities of mankind find their place on the surface of the earth. The climate of any locality or a region is not determined by a single factor or elements, but rather combinations of climatic elements and of weather types prevailing there (Koppal). The climatic condition of a region also depending upon the man made features like industrial, intensity of the transportation system, the density of population and the green species in the towns and villages of the region.

The study region of Koppal district is characterized generally by the dryness throughout the year, except during south-west monsoon, which begins in the month of June and continues up to the late September. More than 80 percent of the total rainfall is received during this period. The retreating monsoon also brings some rainfall during the month of October and November.

The climate of the district is covered by the Koppen’s and Thornthwaite classification of AW and CAW respectively. These symbols emphasis the district dry season combined with a less than
moderate annual range of temperature. According to recent Indian climatic classification the district falls in the semi-humid or semi-arid zones. The summers are uncomfortably hot. Summers are milder in southern and south-eastern part of the district, rather than in the northern and north-western part of the district. On the whole the climate of the district is healthy and agreeable.

The climate of any region is determined by the combination of climatic elements such as temperature, rainfall, relative humidity and wind direction, etc. Analyses of these are as follows.

### 2.7 Rainfall

Though the district is exposed to both the monsoons, it receives most of the rainfall from the south-west monsoon. The monsoon usually starts from the first week of June. Continuous rainfall is not found in any part of the district like Malnad region. The yearly rainfall of the district is given in Table-2.1 (Fig. 2.8).

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Talukas</th>
<th>Actual Average Rainfall for 1999 (in mm)</th>
<th>Actual Average Rainfall for 2010 (in mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gangavati</td>
<td>518.8</td>
<td>690</td>
</tr>
<tr>
<td>2</td>
<td>Koppal</td>
<td>566.3</td>
<td>871</td>
</tr>
<tr>
<td>3</td>
<td>Kushtagi</td>
<td>653.4</td>
<td>702</td>
</tr>
<tr>
<td>4</td>
<td>Yelburga</td>
<td>437.4</td>
<td>737</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>544.0</strong></td>
<td><strong>751</strong></td>
</tr>
</tbody>
</table>
The average annual rainfall for the district as a whole is 751 mms in the year 2010. The area lying in the western part receives a higher amount of rainfall. In the north-western belt near Yelburga for instance the average annual rainfall is about 737 mms. In contrast, in the eastern most parts around Gangavati the rainfall averages is about 690 mms per annum. The south-west monsoon is relatively more active in the western zone and account for nearly 65 percent of the annual rainfall. The north-east monsoon is however more active in the eastern zone, where it accounts for about 15 percent of the rainfall. Towards the end of April and onward most parts of the district receive pre-monsoon showers, by the middle May, the west wind begins to fresh and lasts through the day. After the west breeze has set in sharp thunder storms with rain and hail are common.
These early showers are very useful as these fill the ponds and soften the soil. Towards the end of May the west wind begins to blow stronger, blocks of clouds gather in the south-west and early in June the south-west monsoon sets in. In eastern half, September and October are the months with heavy or moderate downpour.

The droughts are also common and frequent in the study region. During the south-west monsoon period normally anyone taluka not receives even the minimum rainfall during the drought year. As a result the effects of droughts are common in the region. The average rainfall of the district is 572 mm and average rainy days are 46.

2.8 Temperature

The Koppal district is located in the tropical belt. It has high temperature throughout the year and it is characterized by a dry climate under extremely warm summer. It is cool and pleasant during major part of the year except during the summer months of March to middle of June. The coldest period is December to January. The minimum temperature reaches upto 16°C and maximum reaches upto 45°C during hot summer. So, May month is the warmest month. The temperature begins to decrease at the onset of the south-west monsoon in the first week of June. In the history of the district the highest temperature recorded was 45.6° C and the lowest was 10° C.

2.9 Relative Humidity

Relative humidity refers to water vapour present in the atmosphere and it is the single most important component of the air
for standing weather and climate. The relative humidity is very high in the months of July and August.

The relative humidity in Koppal station falls down from December to April. The lowest relative humidity is found in the month of December at Koppal station. It is one of the important factors for the location of textiles, handlooms, power looms and printing activities. They require more than 50 to 60 percent of relative humidity to establish them. In this respect Koppal district the south and south-eastern part is well suited for these industries.

2.10 Wind

Wind is also an important factor of physical elements. It is clear from the Table-2.2 that the district is influenced by west, south-west and north-western winds. On an average, wind blows over the district for about 200 days in the year. From January to June wind blows from moderate to high velocity to the extent of 20 kms per hour. The highest velocity is from the west, the moderate velocity is from north-west, north-east, south-west and east. The tropical air masses are very important factors in the mechanism of the Indian weather condition of the study region. The velocity of the wind is given in Table-2.2.
Table-2.2

**Velocity of Wind in Koppal District**

<table>
<thead>
<tr>
<th>Direction</th>
<th>Velocity</th>
<th>Direction</th>
<th>Velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>2.7</td>
<td>South-East</td>
<td>3.7</td>
</tr>
<tr>
<td>North-East</td>
<td>3.2</td>
<td>South-West</td>
<td>6.7</td>
</tr>
<tr>
<td>East</td>
<td>3.5</td>
<td>West</td>
<td>7.6</td>
</tr>
<tr>
<td>South</td>
<td>3.7</td>
<td>North-West</td>
<td>5.2</td>
</tr>
</tbody>
</table>

### 2.11 Forest

A forest is a community of living trees and associated organisms covering considerable area, utilizing sunshine, air, water and earthy materials to attain maturity and reproduce itself and capable of furnishing mankind with indispensable products and services. The growth of forest depends upon several factors but in India a forest is regarded as an air, land including the vegetation growing on it. That has been declared under a legal enactment.

Forest considered from their economic point of view, got importance from the Britishers for industrial and constructional purposes. It provides many kinds of timber for house building and furniture for defence and communication purpose and for a large variety of industries (paper and pulp, etc.) in which wood is the principal raw material. They also provide sandalwood, cashew nut and other products which have earned considerable amount of foreign exchange for the country.
Fig. 2.9

KOPPAL DISTRICT
NATURAL VEGETATION MAP

INDEX
- Reserve Forest
- Shrub Forest
- Land with or without Shrub
- Water Body
In short, forest contributes not only to the wealth and well being, it also maintains the ecological balance of the region.\textsuperscript{11} Conservation and afforestation is highly required for above said purposes. Absence of it, adversely affects the climatic condition of the region. This can be clearly seen in the middle and west and south-western parts of the district. The southern part of the district is cooler than the northern and western part only due to the absence of forest coverage. (Fig. 2.8)

Koppal district is very poorly developed relatively smaller area under the forest as compared to the state average. The district has only 29,451 hectares (5.33\%) of land under forest as against 16.3 percent of the state and 19.3 percent of the nation. But according to the national forest policy the forest area should not be less than 33.3 percent of an area. The forest area of each taluka varies due to differentials land use interaction and also due to physio-climatic effects.

Table-2.3

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Talukas</th>
<th>Forest 1999-2000</th>
<th>Percentage</th>
<th>Forest 2010-11</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gangavati</td>
<td>14482</td>
<td>2.62</td>
<td>14482</td>
<td>2.62</td>
</tr>
<tr>
<td>2</td>
<td>Koppal</td>
<td>10779</td>
<td>1.95</td>
<td>10779</td>
<td>1.95</td>
</tr>
<tr>
<td>3</td>
<td>Kushtagi</td>
<td>4110</td>
<td>0.74</td>
<td>4110</td>
<td>0.74</td>
</tr>
<tr>
<td>4</td>
<td>Yelburga</td>
<td>80</td>
<td>0.01</td>
<td>80</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Dist. Total</strong></td>
<td><strong>29451</strong></td>
<td><strong>5.33</strong></td>
<td><strong>29451</strong></td>
<td><strong>5.33</strong></td>
<td></td>
</tr>
</tbody>
</table>
These, uneven distribution of forests has pulled down the standard of peasant cultivations by obliging him to burn manure in the absence of firewood.\textsuperscript{12} The highest forest area is found in Gangavati (2.62\%) and Koppal (1.95\%) talukas. It is because the Gangavati taluka has a highest geographical area and Tungabhadra river basin along with the border of Koppal and Gangavati talukas. The lowest percentage of area under forest is found in Yelburga (0.01\%) and Kushtagi (0.74\%), it is because both talukas fall under dry arid region. There is no positive or negative (increase or decrease) trend for the development of forest land in the study area (Table-2.3).
References


10) Government of India, Ministry of Information and Broadcasting (1957): India’s Forest. New Delhi, p. 3.
