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# **PART I**

## **REGIONAL STRUCTURE**

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THE REGIONAL SET UP

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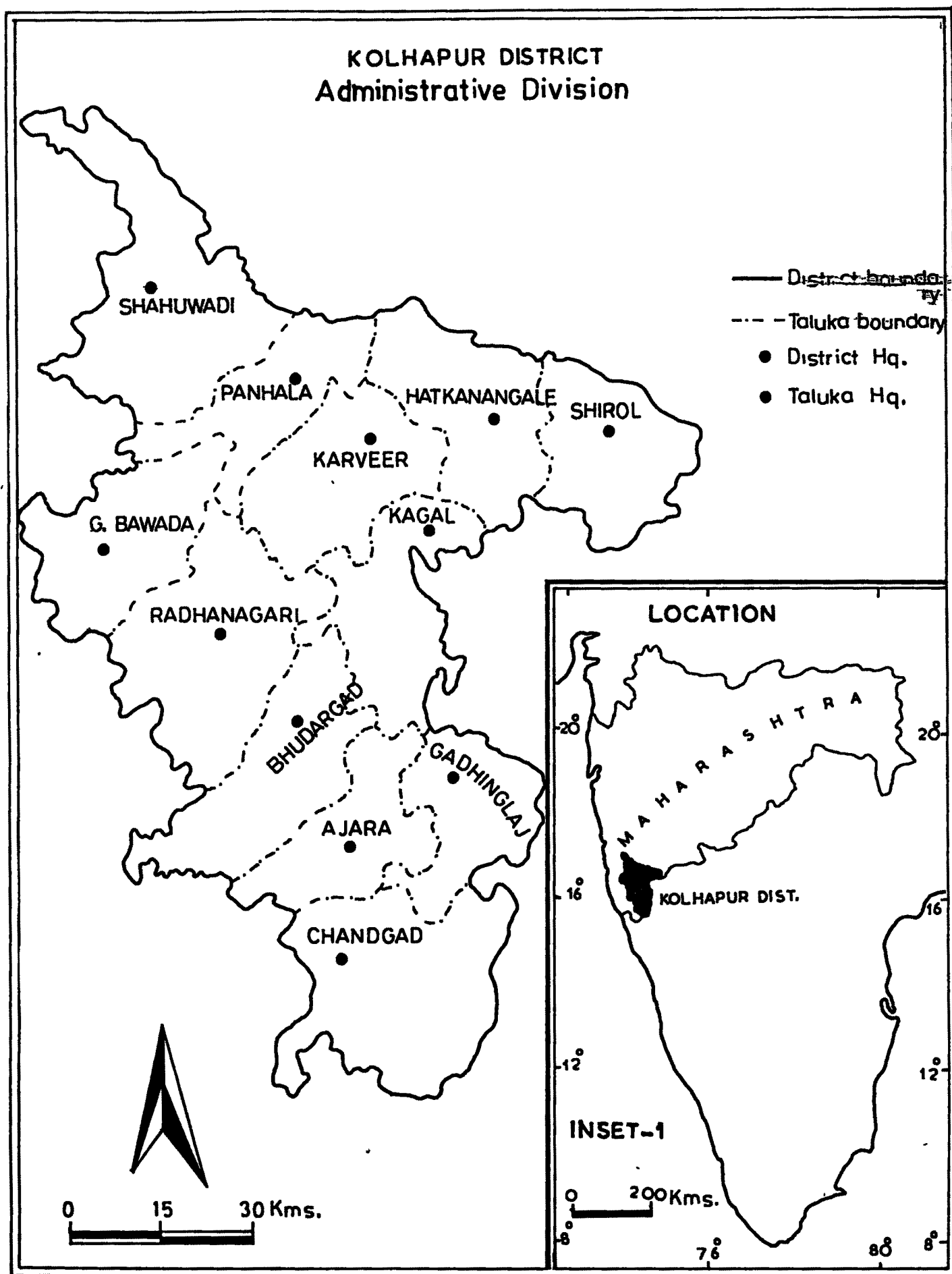


Fig.1.1

The physical environment, relief, drainage, climate, soil and subsoil water influences the crop growing in many ways. They determine the type of crops, the timing of agricultural operations, the extent of risk involved in agriculture and improvement of agriculture. The plant response thus is conditioned by the total environment. The economic factors clearly influence the choice of farming systems. The landuse is modified by the various aspects of population. The physical attributes of an area become resources only when the people are able to use them. The relation between population and landuse is reciprocal. The electricity, transport facilities are pre-requisite for the development of a region.

#### 1. Location :

The region under study lies between  $15^{\circ}-45'$  and  $17^{\circ}-11'$  north latitudes and  $73^{\circ}-41'$  and  $74^{\circ}-42'$  east longitudes and is located entirely in the Panchanganga and Krishna Basins. East west spread of the district is about 107 Kms and across north south it is about 154 Kms; which gives an area of 8258 Sq.Km. (2.68% of the state's area). It is bounded on the north by Sangli district, on the west by Ratnagiri district and on the south and east it has a common boundary with Karnataka state. For administrative purposes it is divided into 12 tahsils (Fig.1-1). However, in May 1981, 37 villages of Gaganbavada tahsil of Kolhapur district were attached to the newly formed coastal Sindhudurg district.

## 2. Relief and Drainage :

### a) Relief

Relief of the land influences landuse, particularly through the elevation, ruggedness and slope. Relief also influences farming by modifying the climate and by affecting the ease of cultivation (Singh-1974). The relief of the region varies markedly from place to place and the broad land relief changes are seen in the west-east direction with local variations (Fig.1-2). These variations in land are due to the geological complexity of the region and varied geomorphological evolutions (Deshpande,1971). Therefore, the relief of the district can be best appreciated against the background of its geology. It may be noted in general that over a major portion of the district the Deccan 'Trap' influences the landscape only in the south. The rocks of the Dharwar and Lower Kadalgi series introduce a change in the topography.

The district on the whole is a part of the Deccan table land with the Sahyadrian scarp forming the most prominent feature along its western administrative boundary. The Sahyadri proper is a narrow crest zone of the divide with a width of 15 to 25 kms (Dikshit,1971). It is broken in several places by stream erosion on both the flanks. The watershed which divides the eastern drainage from the western is marked by hill top features separated by low saddles. In height the crestline proper varies from above

# KOLHAPUR DISTRICT Relief and Drainage

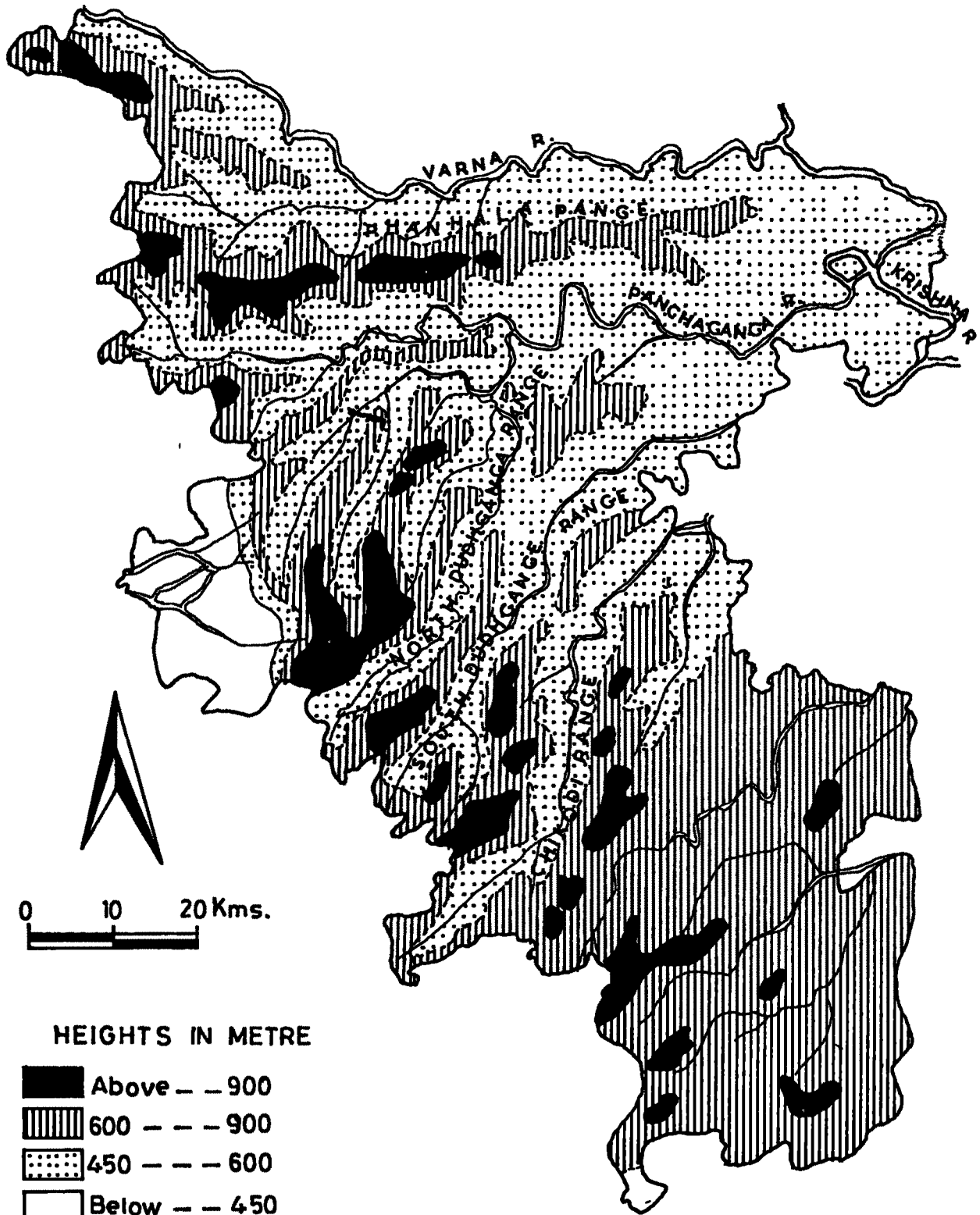


Fig.1-2

900 meters to as low as 600 meters above sea level. In many places rapid erosion by the Konkan streams has literally pushed back the crestline features into the plateau. In this crestline, there are many isolated basaltic table lands, such as Vishalgad in the north, Gagangad in the middle and Bhydargad in the south.

b) Relief divisions

With the variations of relief in west-east direction the district can be divided into three relief divisions viz. i) Hills and Ghats ii) Foot hills and iii) Plains.

i) Areas with altitude of 900 meters and above belong to the first division. The major portion of this category comes in the western part of the district from Malkapur in north to Samangad in the south. This division consists of scraps of the Sahyadris and steep basaltic walls. Quite a large area of this division is under forest cover.

ii) The area having the height of 600 to 900 meters comes under second division. From the main Sahyadri several hill ranges run to the east and the foot hill zone of these ranges is included in this relief division. This area is covered by forest in the western part and by scrub, grasslands towards the east.

iii) The area having an altitude between 450 to 600 meters comes under third relief division. The major portion of the river valleys draining the land towards east comes under this head.

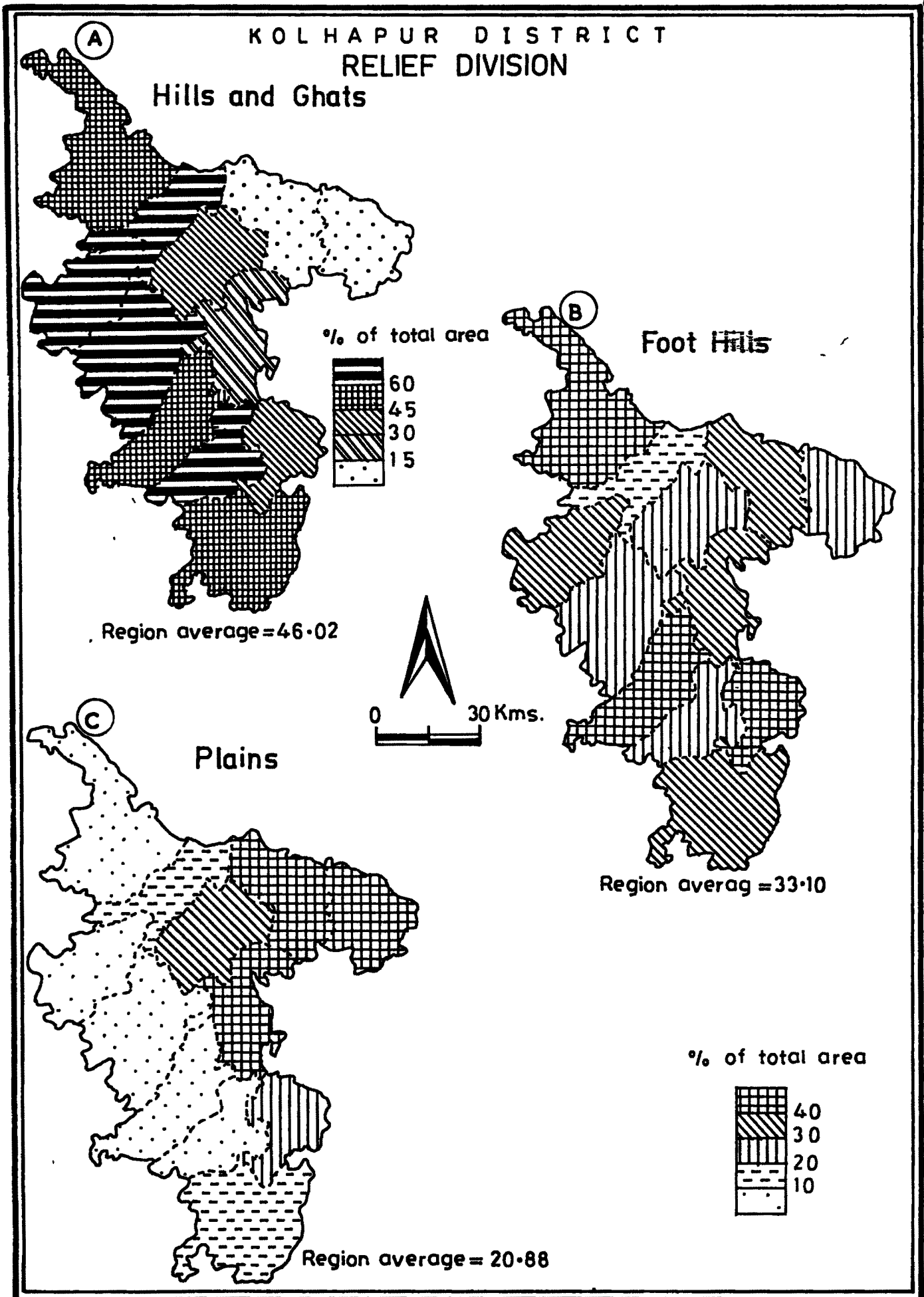


Fig. 1.3



From the human point of view this division is the most important area of the district. It is well cultivated and large sized nucleated villages are typical of this region.

Level land in the district is relatively small i.e. only 20.88% of the total geographical area and is confined to Shirol, Hatkangale, Karveer, Kagal and Gadhinglaj tahsils. Foot hill zone comprises some 33.10% of the total geographical area and is mainly situated in Shahuwadi, Bhudargad, Gadhinglaj, Gaganbavada, Chandgad, Kagal and Hatkangale talukas and part of it is also of agricultural relevance. But the major part of land area viz. 46.02% is rugged and of little use being not very suitable for cultivation (Fig.1-3).

Thus, the foregoing discussion reveals that relatively unfavourable topography for agriculture exists in the western part of the district. The proportion of land which is steep or high is more in the west. Many hills with dense forest cover are too high for cultivation. In contrast to this extensive areas of level to gently rolling land which are well suited to agriculture are found in the eastern part of the region.

#### c) Drainage

The drainage pattern of Kolhapur district is well developed and geared to the base level of the Krishna which has mastered all the river course of the district. From north to south the district is drained by Varana, Panchaganga, Dudhaganga, Vedaganga, Hiranyakeshi, Ghatprabha, and Tamraparni rivers.

Varana has a long course with a slope of 424 metres in 80 kms. length, quite steep slope but has much restricted basin. Panchaganga, on the otherhand, commands a large drainage area through its main tributaries like Kasari, Kumbhi, Tulshi and Bhogawati. Panchaganga has a slope of 217 meters in 130 kms. length and it is perennial. Dudhaganga with its main tributaries, Vedganga and Hiranyakeshi have long course but smaller and independent valleys.

Other important rivers flowing through the region are Ghatprabha, Tambraparni. There is also an interesting contrast in the direction of flow of these rivers. Varana flows from the north-west to south-east; Panchaganga from west to east; while the southern rivers flow from south-west to north-east. This is most probably due to geological structure underlying and Krishna river which controls the flow of these rivers. Krishna from its confluence with Varana form the eastern boundary of Kolhapur district has meandering course through a black soil plain and is joined by Panchanganga near Narsobawadi and by Dudhaganga and Ghatprabha outside the district.

These rivers have developed the flood plains and terraces which are (locally known as Malai) highly prized for soil fertility. These are most important areas of the district and are well cultivated. Further, the physical setting of these river valleys facilitated for constructing Kolhapur type of weirs, locally known as bandhara which facilitate good irrigation.

### 3. A. Climate :

Climatic conditions are of foremost importance in determining the distribution and performance of crops. For healthy growth and good yields, certain optimum conditions of rainfall, temperature, wind, sunshine, soil moisture etc. are essential.

The climate of Kolhapur district is wet tropical. The western part of the district is always cooler than the eastern part. The nights are generally cool due to the influence of sea breezes which set in the afternoon. Temperature is not a significant consideration in plant growth than rainfall. On the whole there is an adequate warmth and bright sunshine throughout the year, to provide ripening conditions of crops.

### 3. B. Rainfall :

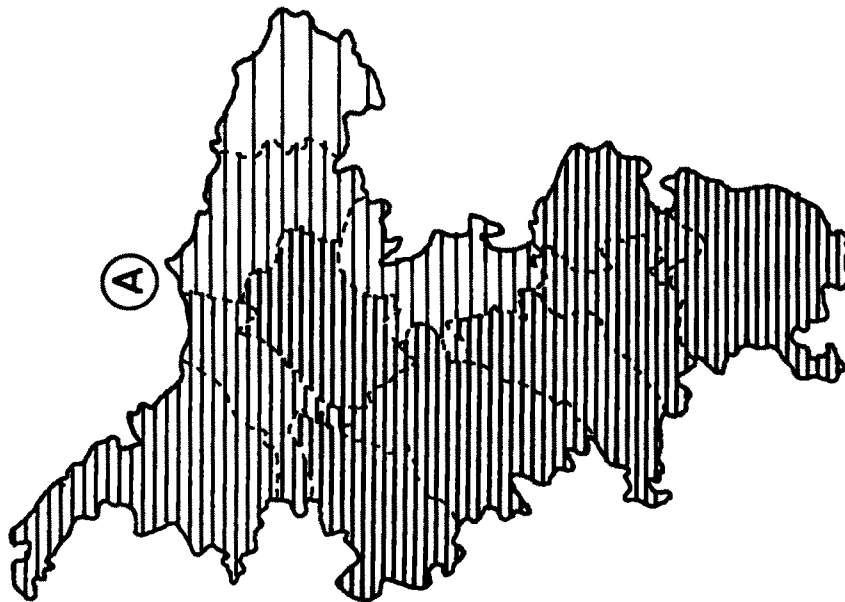
Of all the weather elements rainfall is the dominant single weather parameter and climatic hazard that affects plant growth and crop production because of its insecurity, variability and for major parts its meagreness (Singh, 1972). Following are some of the important characteristics of rainfall in study area.

#### a) General distribution of rainfall

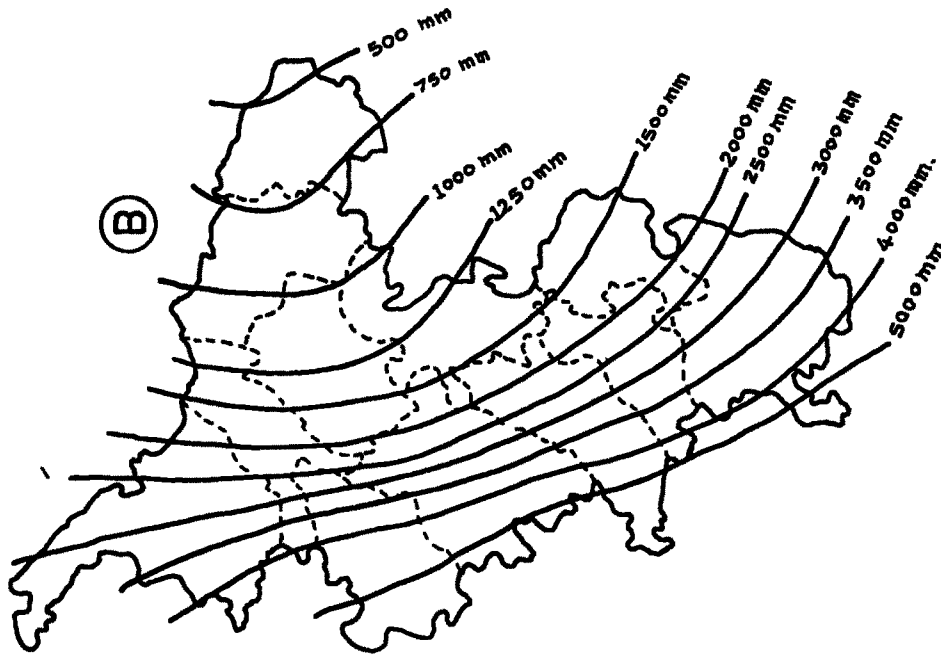
The rainfall decreases from west to east. Gaganbavada tahsil in the west receives as much as 6000 mm rainfall during the year, whereas it is as less as 500 mm in the eastern tahsil Shirol (Fig.1-4B). June to September is the general rainy season.

KOLHAPUR DISTRICT

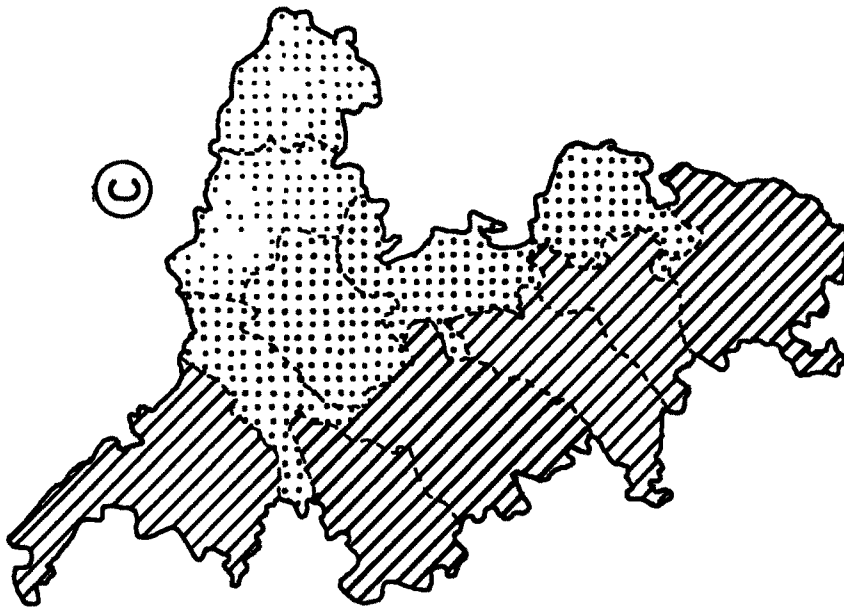
Number of Rainy days



Rainfall



Intensity of Rainfall



M.M. PER RAINY DAY

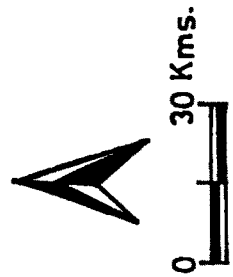
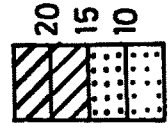


Fig. 1-4

Ajara, Chandgad, Radhanagari tahsils being the western tahsils receive heavy rainfall followed by Bhudargad. The tahsils like Kagal, Hatkangale, and Shirol fall under poor rainfall tract. The rainfall in Karveer and Gadhinglaj tahsils is at optimum level.

b) Seasonal distribution of rainfall

The seasonal distribution of rainfall in Kolhapur district is uneven. 75 to 90% rain comes in general rainy season; about 2% rain comes in cold weather season whereas 5 to 10% of the rainfall is recorded during hot weather season. The concentration of rainfall is recorded during hot weather season. The concentration of rainfall in a few months reduces its usefulness. Accute shortage of drinking water and green grass is during the months of March to June; in most of the parts of the district.

c) Intensity of rainfall

Rainfall intensity is important as it determines the intensity of soil erosion. The term 'intensity' refers to intensity in 24 hours period. It is calculated by employing the following formula used by Monkhouse and Wilkinson (1971).

$$I = \frac{A}{X}$$

where, I = Intensity of rainfall

A = Annual rainfall

X = Number of rainy days



Intensity of rainfall in Kolhapur district varies from 7.90 mm to 47.23 mm per rainy day (Fig.1-4C). Over 40 mm rainfall per day is recorded in Gaganbavada, Radhanagari, Ajara tahsils whereas it is 10 to 20 mm per rainy day in Panhala, Karveer, Bhudargad, Kagal tahsils. In the rest of the tahsils it is below 10 mm per rainy day.

#### d) Variability of rainfall

The rainfall variability is the most important parameter. The coefficient of variability is calculated by the formula.

$$\frac{S}{X} \times 100$$

Where S is the standard deviation and X is the Arithmetic mean. In general the variability is high where the rainfall is less (Das, 1969). Variability in excess of 20% implies great risk in farming (Williamson, 1929).

The rainfall variability increases from west to east, Shirol tahsil has recorded over 26% , whereas less than 18% is observed in the western tahsil, such as Gaganbavada, Radhanagari, Ajara. The rainfall variability is 18 to 26% in the middle tract of the district.

#### e) Number of rainy days

The number of rainy days decreases from west to east in the district (Fig.1-4A). The rainy days are more than 100 in the

western tahsils in Gaganbavada, Radhanagari, whereas the rainy days between 65 to 90 are recorded in Shirol, Hatkangale and Kagal tahsils. The report of the fact finding committee in 1974 had revealed that the district is never subjected to drought conditions. However, the north eastern portion is a semiarid with low rainfall, high variability of rainfall and less number of rainy days.

#### 4. Soils :

The soils are mainly derived from trap except in the forest covered mountainous area in the west where they are of lateritic origin. On the basis of the different physical characteristics three broad soil zones are distinguished (Fig.1-5).

- i) The western part covered with laterite and reddish brown soils.
- ii) The central part with coarse shallow and medium black soils.
- iii) The eastern dry part with medium to deep black soils of varying depth.

##### a) Laterite soils

Laterites are red to brownish in colour by the presence of iron and are mostly eroded and shallow with good drainage. This soil covers mainly in the western hilly tracts of heavy rainfall on the hill tops, and in the ridges which are not covered by forests, large concentrations in Gaganbavada (82.97% and Radhanagari (32.18% tahsils). Hill millets are taken from them. Paddy

# KOLHAPUR DISTRICT SOILS

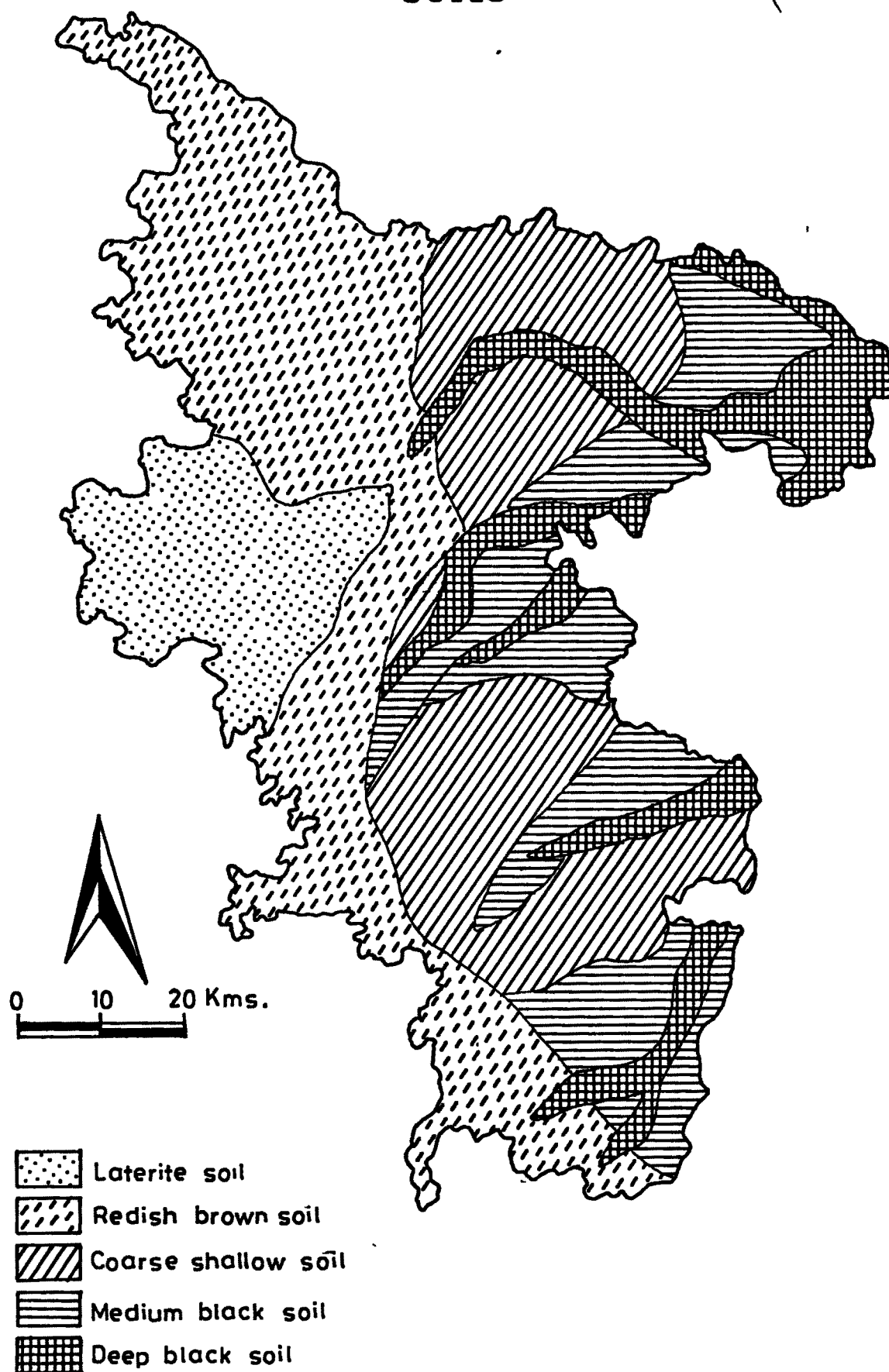


Fig.1-5



is grown on them in the valleys.

b) Reddish brown soils

They are mainly derived from trap and are dark brown in colour with reddish tinge. They are rich and fertile with excellent granular structure. The patches of these soils are in the north west portion of the region; particularly on the hill slopes. These soils dominate mainly in Shahuwadi (100%), Panhala (59.30%) and Radhanagari (42.83%), elsewhere it's share is low.

These soils at higher elevations are usually unsuitable for cultivation whereas in low land areas jowar and groundnut are grown on these soils in Kharif season. Sugarcane and vegetables are taken wherever irrigation facilities are available.

c) Coarse shallow soils

These are residual soils and are derived from trap. They are some what sandy and usually found on hill slopes. These soils are located in Hatkangale (62.28%) and Ajara (71.24%) tahsil. In Panhala, Karveer, Bhudargad, and Gadhinglaj their portion ranges from 20 to 60% while in Kagal, Chandgad and Radhanagari its share is below 20%. Generally groundnut, wheat, jowar are raised on these soils, especially when well manured.

d) Medium black soils

They are derived from trap and vary in depth considerably from place to place, depending upon the topographical situation.

Their texture varies from loam to clay loam. These soils are mainly found in the eastern part extending from Shirol to Chandgad tahsil viz. Shirol (40.91%), Kagal (63.76%), Gadhinglaj (34.92%). These soils are good for Kharif and Rabi crops.

e) Deep black soils

The deeper soils are black in colour. These soils have high clay content. They are fairly rich in phosphorus contents. They are confined to level topography. Major concentration is in Shirol tahsil. They are also found in parts of Hatkangale, Kagal and Gadhinglaj tahsil. These are ribbons of deep black soils along the major river valleys of the region i.e. Varana, Panchaganga, Dudhaganga, Vedganga and Hiranyakeshi. These soils are intensively cultivated and particularly are suitable for growing jowar, wheat and sugarcane.

5. Population :

Man himself is an important resource and plays a decisive role in agricultural sector. The physical attributes of an area become resources only when the people are able to use them (Singh, 1970).

18,84,308 people are living in 1083 villages and 6,22,022 people living in eleven towns (Urban areas). The distribution is dominated by rural population which is 75.18% of the total population of the district. The western and southern hilly areas

covering Shahuwadi, Panhala, Gaganbavada, Radhanagari, Ajara, Chandgad tahsils stand out distinctly from the plain lands of Karveer, Kagal and Shirol tahsils, being sparsely populated with small population, absence or small sizes of towns, and urban population and a relatively poor growth rate decade after decade. On the otherhand the eastern tahsils constitute dense urban centres and represent as a model of highly developed and balanced socio-economic structure, a balance between agricultural and non agricultural activities. The basic imbalance in development of this district is due to rapid development of the central eastern zones. There are particularly no urban towns in the western area except for a small town like Malkapur, in the Shahuwadi tahsil.

#### a) Population densities

The population of Kolhapur district was only 9 lakhs in 1901, it has increase upto 25,06,330 in 1981. At present the average density of population of Kolhapur district is 311. It varies from 903 per sq.km. in Karveer tahsil to 101 sq.km. in Gaganbavada tahsil. Karveer, Hatkangale, and Shirol tahsils are situated in the fertile valleys of Varana, Krishna, & Panchaganga rivers. These are most densely populated areas, not only in the district but also in the state. The lowest density is observed in Gaganbavada tahsil (101 per sq.km.) followed by Shahuwadi (131.61 per sq.km.) (Fig.1-6). The density of population decreases from east to west as the nature of topography and soil changes.

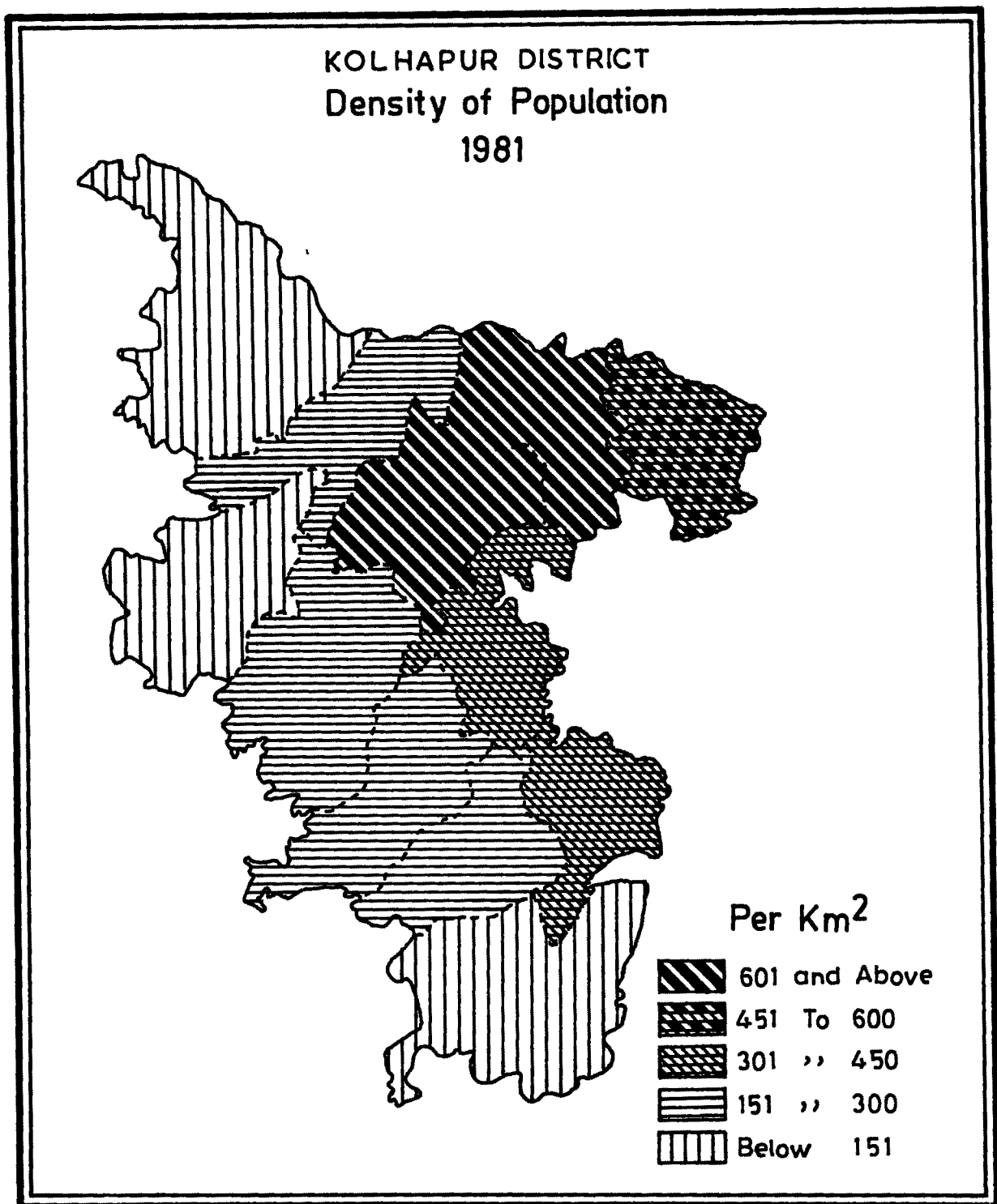


Fig.1-6

## b) Land man ratio

The extent of land available to population depending on it, for their livelihood is an important decided item in considering the land as resource.

Table 1.1 Land man ratio (1981)  
(land in hect.).

Sr. No.	Tahsil	Land available per person (Rural)
1.	Karveer	0.19
2.	Panhala	0.18
3.	Hatkangale	0.18
4.	Shirol	0.20
5.	Kagal	0.27
6.	Gadhinglaj	0.26
7.	Chandgad	0.36
8.	Ajara	0.34
9.	Bhudargad	0.28
10.	Radhanagari	0.22
11.	Gaganbavada	0.24
12.	Shahuwadi	0.27
District		0.24

Source : Compiled by author

The land man ratio is worked out by considering the total rural population. The per capita availability of land in Kolhapur district is 0.24 hect. per person of total rural population. It varies between 0.18 in Panhala and Hatkangale tahsil to 0.36 hect. in Chandgad tahsil

Further the relation between land and people is being investigated by computing different landuse densities for the region. Two variables viz. population (1981) and cultivated land (77-80), are considered for computing these densities.

i) Agricultural density (Ferenczi, 1938)	=	$\frac{\text{Total agricultural population}}{\text{Total cultivated area}}$
ii) Nutritional density	=	$\frac{\text{Total rural population}}{\text{Total cropped area}}$
iii) Economic density (Singh J., 1967)	=	$\frac{\text{Total rural population}}{\text{Total net sown area}}$
iv) Caloric density	=	$\frac{\text{Total rural population}}{\text{Total area under food crops}}$
v) Man soil density (Kuperus, 1938) <u>or</u> Physiological density	=	$\frac{\text{Total population}}{\text{Total cultivated area}}$

Table 1.2 Landuse densities (1981), persons per hect.

Sr. No.	Tahsil	Agri. density	Nutri-tional density	Eco. density	Caloric density	Man-Soil or Physiologi-cal density
1.	Karveer	1	5	5	8	12
2.	Panhala	1	6	6	8	5
3.	Hatkangale	1	5	5	7	9
4.	Shirol	1	5	5	6	6
5.	Kagal	1	4	4	6	4
6.	Gadhinglaj	1	4	4	6	4
7.	Chandgad	1	3	3	5	3
8.	Ajara	1	3	4	5	3
9.	Bhudargad	1	4	4	5	4
10.	Radhanagari	1	5	5	7	4
11.	Gaganbavada	1	5	5	7	4
12.	Shahuwadi	1	4	4	7	4
District		1	4	4	6	6

Source : Compiled by author

#### 6. Electricity :

Power is one of the most important infrastructural factors for the agricultural development of the region. Kolhapur district which had only 93 villages and 8 towns electrified in 1960-61, has now 935 (88.09%) villages and all towns electrified (Fig.1-7B).

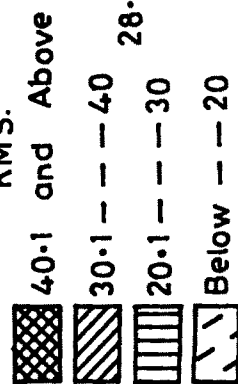
# KOLHAPUR DISTRICT

Length of Roads per 100 Sq.Kms

1978

(A)

KMS.



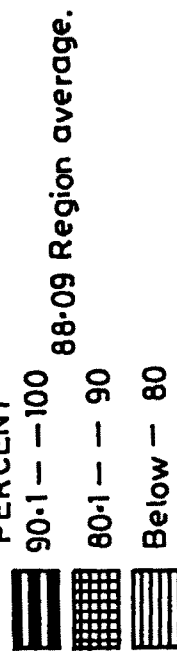
28.5 Region average.

Percentage of Electrified Villages

1981

(B)

PERCENT



88.09 Region average.

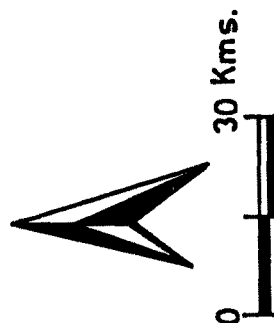


Fig. 1.7



One half tahsils of the district are fully electrified, where proportion of water pumps connected is higher. These tahsils are located in the central and eastern zones of the district. Chandgad tahsils have the lowest percentage of villages electrified followed by Gaganbavada tahsil.

#### 7. Transportation facilities :

Transport is a also necessary pre-requisite for economic development. Transport sector contributes to the success or failure of nearly every investment in the economy. The total road length in 1961 was 1764 kms. which increased upto 4375 kms. in 1980-81. The length of roads per lakh of population in 1980-81 comes to 213.62 kms. which is nearly double as that of 1960-61. It is obvious that due to hilly region and rough terrain the road length per 100 sq.kms. is low in the western zone. It is as low as 13.5 kms. in Gaganbavada tahsil and less than 30 kms. in rest of the western tahsil. It is maximum (46.2 kms.per 100 sq.kms.) in Karveer tahsil followed by Hatkangale (45.2 kms.), Panhala (35.6 kms.). Thus the length of roads per 100 sq.kms. increases from west to east (Fig.1-7A).

#### 8. Summary :

It is evident from the foregoing analysis that the region is not uniformly endowed with the natural resources. The western



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