I N T R O D U C T I O N

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   B. Relief

   C. Drainage

   D. Climate

   F. Soils

2. RESEARCH DESIGN

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   B) Sources of data

   C) Methodology

   D) Previous work done

   E) Outline of the work

REFERENCES

Agriculture is a basic occupation and meets the primary needs of man i.e. food, clothing and shelter. It is the source of economy of the country. It provides the raw material to different industries. Thus, agriculture plays an important role in the economic development of a country. In India about 70% of its labour force is employed in agriculture. But the level of agricultural production which depends upon the fertility of soil, use of the modern inputs and level of technology is very low. In under developing countries there is a scarcity of inputs and technological knowledge. Therefore, there is more dependance on agriculture as a source of livelihood.

Agricultural land is a control to all discussions of agricultural problems and policies. Its significance further increases with the increasing pressure of population on land but it is a limited resource. Its scientific utilization has become more important and it is possible only if the whole complex of agriculture is studied at the district and taluka level.

It is with this spirit the present investigation deals with the study of some aspects of agriculture in Solapur district.

1. THE REGION :

The physical environment - relief, drainage, climate, soil and subsoil water influences the agriculture in many ways.

They determine the type of crops, the timing of agricultural operations and improvement of agriculture. Agriculture thus is conditioned by the environment. Social and economic factors influence the farming systems, yet they can operate only within the limits set by the physical environment. Therefore, the location and factors of physical environment which appear relevant to the pattern of agricultural activities are presented.

A. LOCATION :

The district of Solapur lies entirely in the Bhima-Sina-Man river basin. The district is bounded by 17°10' north and 18°32' north latitudes and 74°42' east & 76°15' east longitudes. The district is fairly well defined to its west as well as to its east by the inward-looking scarps of Phaltan Range and Osmanabad plateau respectively. The adjoining districts are Sangli to its south-west, Satara to its west, Pune to its north-west, Ahmadnagar to its north, Bhir and Osmanabad to its east and Bijapur district in Karnataka state to its south. Though of an irregular shape, the district is roughly squarish, 200 kms. east-west and 150 kms. north-south. The district has a total area of 150,21 sq.kms. and population of 22,53,840 as per 1971 census which constitute 4.88 percent of the Maharashtra State.

The district of Solapur is known after its town head-quarter. 'Solapur' is believed to be derived from two words 'Sola' meaning sixteen and 'pur' meaning village. The present

city of Solapur is spread over sixteen villages. Recent research work however shows that the name Solapur is derieved not from the congregation of sixteen villages but from the inscriptions of Shivayogi Shri Siddeshwar of the time of the Kalachuris of Kalyani that the town was called Sonnalagi. One of the inscriptions found in Solapur fort shows that the town was called Sonalapur. The name Solapur was evolved by dropping 'na' from the name Sonalapur and hence the present name of the town is Solapur.

The area which now constitutes Solapur district was origionally a part of Ahmadnagar, Pune and Satara districts in 1869. The sub-divisions of Solapur, Barshi, Mohol, Madha, Karmala, Pandharpur and Sangola were grouped together to form Solapur district. In 1875 the Malshiras taluka was added to the district by its transfer from Satara district. Till 1941, there were no other changes in the limits of the district. With the reorganisation of states in 1956, the Solapur district was included in the larger bilingual Bombay State and since May 1960, it forms a part of the State of Maharashtra. For administrative purposes, the district is presently divided into eleven talukas (Fig.In.1).

B. RELIEF :

Relief of the land influences landuse, particularly through the elevation, ruggadness and slope. Relief also influences farming by modifying the climate and by affecting

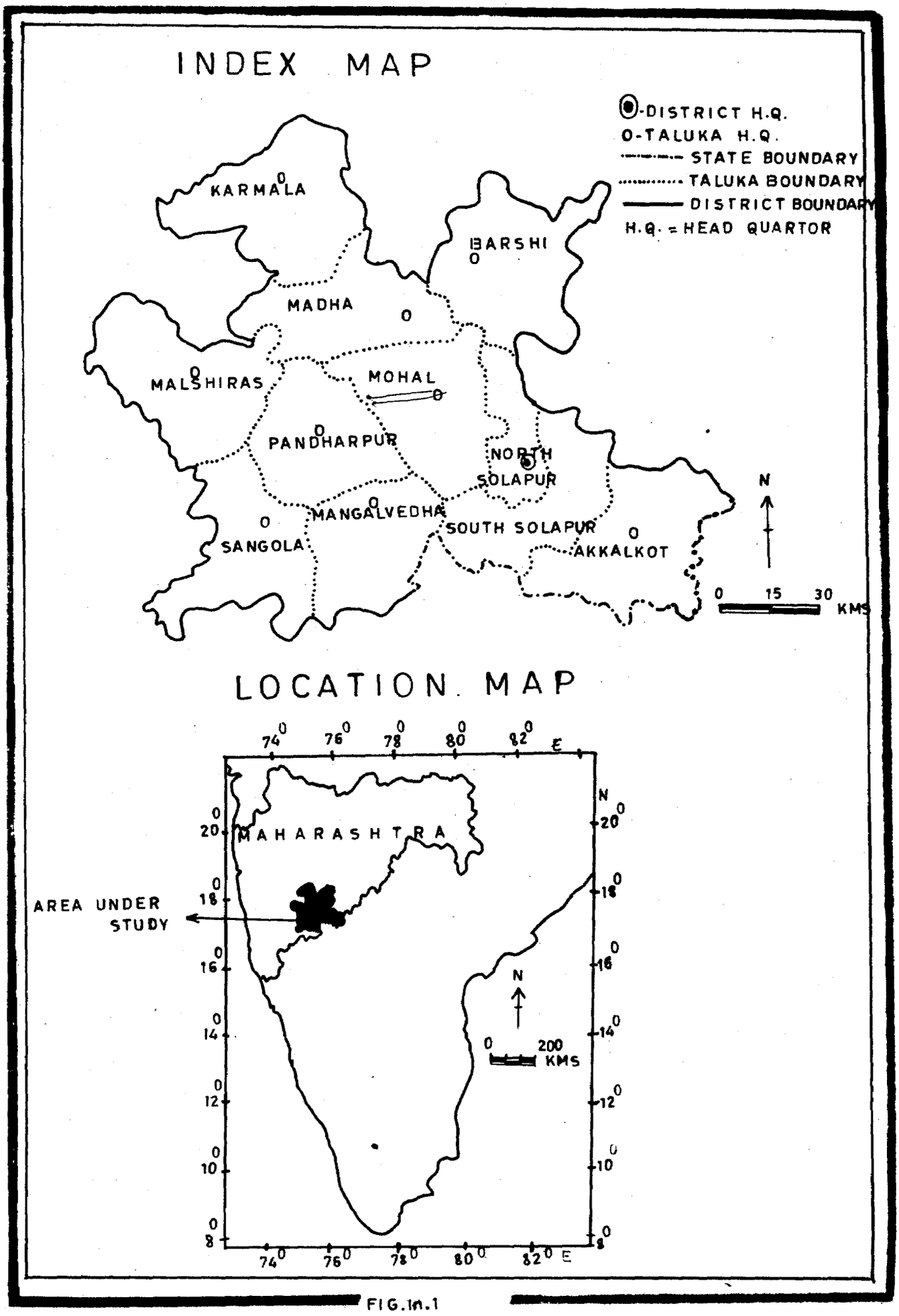

INDEX MAP
⊙-DISTRICT H.Q.
O-TALUKA H.Q.
STATE BOUNDARY
TALUKA BOUNDARY
DISTRICT BOUNDARY
H.Q. = HEAD QUARTOR
KARMALA
BARSHI
MADHA
MALSHIRAS
MOHAL
PANDHARPUR
NORTH SOLAPUR
MANGALVEDHA
SOUTH SOLAPUR
SANGOLA
AKKALKOT
N
0 15 30 KMS
LOCATION MAP
74° 76° 78° 80° 82° E
20° 18° 16° 14° 12° 10° 8° N
MAHARASHTRA
AREA UNDER STUDY
N
0 200 KMS

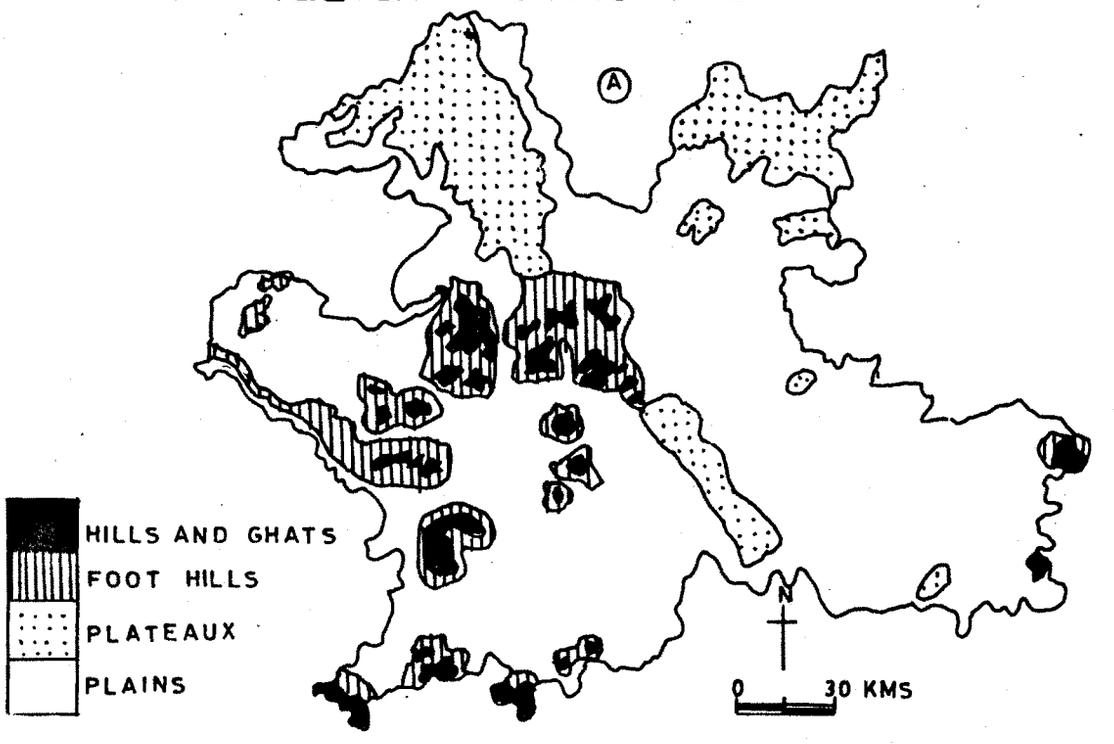
FIG.In.1

the case of cultivation (Singh,1974). The relief pattern of the district is exhibited in Fig.In.2.

The relief of Solapur district changes from place to place and these variations in land are due to the geological complexity of the region and varied geomorphological evolutions (Deshpande,1971). There are no prominent hill ranges in the district and the region is characterised by typical Deccan trap geomorphology. The Solapur district on the whole is a part of the Deccan tableland with small hills. The western part of Malshiras and southern part of Sangola are hilly. In the Solapur district, relief is flat or waving. Most of the surface comprises long, low uplands seperated by hallows or shallow basins with an occasional level. Height of the area varies from above 600 metres to 300 metres above sea level.

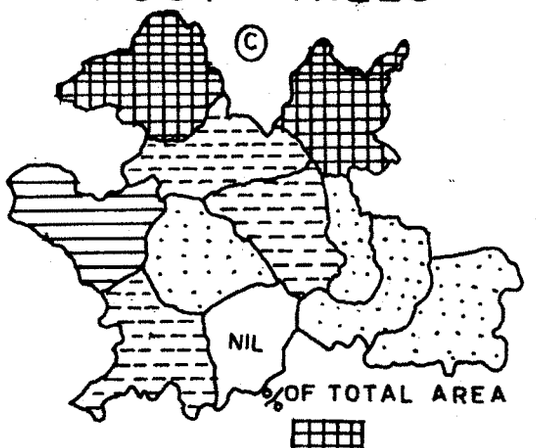
The chief knolls are Vadshinghat in Barshi, Waghoba and Bodki in Karmala, Chinchgaon in Madha, Gurvad and Phaltan range in Malshiras and the Khanapur and Jath hills of Sangola. The western flanks of Balaghat hills outcrop and rise to the elevations of over 600 metres with occasional scarp edges. The Vadsinghat hills are the several spurs of the Balaghat range. In this region, they run with a southerly trend east of Barshi. Minor isolated knolls are also found around Koregaon, Pangaon, Vairag, Gaudgaon, Waghoba and Bodki hills are to southeast of Karmala. In the extreme eastern part there is a broken hill ground with a number of north-south spurs. Other hill ranges

RELIEF DIVISIONS

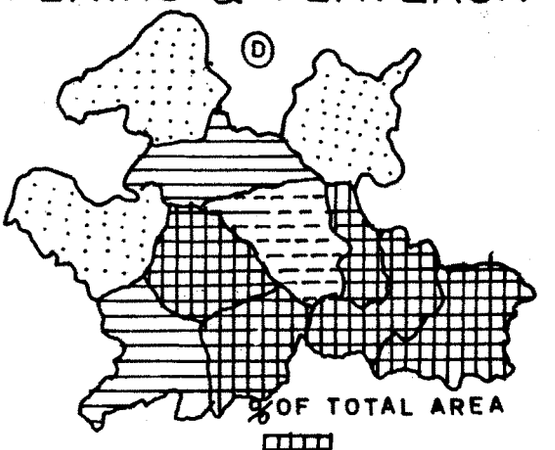


HILLS & GHATS

FOOT HILLS



PLAINS & PLATEAUX



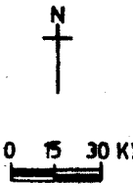


FIG In. 2

are also flat-topped. The western boundary of the Malshiras taluka is formed by hills known as the 'Phaltan range'. The hill near the village Gurwad is about eight miles south of Malshiras.

Relief divisions :

With the variations of relief the district can be divided into three relief divisions viz. i) Hills and Ghats ii) Foot hills iii) Plains and Plateau (Fig.In.2).

Hills and Ghats :

The area of 450 to 600 metres and above comes under first division. The major portion of this category comes in the western part of the district from Gurwad in west to Chinchgaon in the east (Fig.In.2B). This division consists of broken small hills of various ranges. Quite a large area of this division is under grass cover.

Foot hills :

The area having the height of 300 to 450 metres comes under the second category. The average gradient in the foot hill zone varies from 2 metres per kilometre to 7 metres per kilometre (Director of Groundwater Survey and Development Agency,Government of Maharashtra,1976). This area is covered by forest in the western part and scrub, grasslands towards the east.

Table In.1 : Talukawise areal extent of relief divisions in Solapur district (in percent).

Taluka	Hill & Ghats %	Foot Hills %	Plain & Plateau %
Karmala	-	66.50	33.50
Barshi	-	49.94	50.06
Madha	-	18.63	81.37
Malshiras	9.46	41.46	49.08
Pandharpur	1.29	01.44	97.27
Mohol	6.06	29.79	64.15
N.Solapur	-	00.42	99.57
S.Solapur	-	08.29	91.72
Sangola	8.60	12.59	78.81
Mangalwedha	-	-	100.00
Akkalkot	-	02.14	97.86
Region Average	2.31	21.02	76.67

SOURCE : i) Complied by Author ii) An appraisal of hydro-geological conditions of Solapur District - Director of Groundwater Survey & Development Agency, Government of Maharashtra.

Plains :

The area below 300 metres comes under third relief division. The major portion of river valleys draining the land towards middle, comes under this division. The gradient of land

in this region varies from 0.58 metres per kilometre to 3.2 metres per kilometre. 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.

The talukawise areal extent of these relief divisions in the region is shown in Table In.1. Level land in the district is relatively more i.e. 76.67 percent of the total geographical area. Foot hill zone comprises some 21.02 percent of the total geographical area and is mainly situated in Karmala, Barshi, Malshiras, Mohol, Madha, Sangola and South Solapur talukas and part of it is also of agricultural relevance. But the minor part of the land area viz.2.31 percent is rugged and of little use being not very suitable for agriculture (Fig.In.2 B,C,D).

C. DRAINAGE :

The district comes under basins of the Bhima, Sina, Nira and Man rivers. Major part of Malshiras taluka in the west drains northwards into the Nira river which falls into the Bhima river to the west of the district. The drainage area of Bhima which winds south-east through the district includes on the left bank Karmala, Madha, Pandharpur, Mohol and South Solapur and on the right bank Malshiras, Sangola, Pandharpur and Mangalwedha. The Sina which flows roughly south east, parallel to the Bhima, drains eastern Karmala, central Madha, Barshi, eastern Mohol and Solapur north and south. The chief river of the district is Bhima.

Its rightbank feeders are Nira and the Man and its left-bank feeder is Sina. During the dry season, all these rivers are fordable. Even the main river Bhima trinkles into a number of stagnant pools with water just ankle-deep. However, during the peak of south-west monsoon season, not only the main streams but also the seasonal feeder streams are flooded.

These rivers have developed the terraces which are highly prized for soil fertility. These are most important areas of the district and are well cultivated.

D. CLIMATE :

Solapur district comes under the dry tropical climate. The nights are generally cool due to the influence of winds which set in the afternoon. On the whole there is an adequate warmth and bright sunshine throughout the year to provide ripening conditions of crops. The mean daily maximum temperature in Solapur city is 40.7°C and the mean daily minimum is 17.1°C. The daily range of temperature is so wide. The mean monthly maximum and minimum temperatures and relative humidity in the district for Solapur centre are shown in Table In.2.

The climate of the district on the whole is characterised by general dryness in the major part of the year. The change from warm season to cold season is fundamental feature of the climate and the agricultural operations are closely associated with the different seasons of the year. There are three seasons in the

district, the duration and characteristics of each season are shown below.

Seasons of the year :

Hot season :

In Solapur district, fast increase in the temperature is in March, April and May, the hottest months of the year with an mean maximum temperature of 37.0°C, 40.7°C and 39.5°C respectively (Table In.2). The heat during the summer season is intense and the maximum temperature may sometimes go upto about 44°C or 45°C. The diurnal variation of temperature is high and the mean value ranges from 15.9°C in March to 14.2°C in May.

The prevailing wind direction is mainly from north. During May winds flow mostly from west to north. Due to the winds thunder showers are brought afternoon.

Rainy season :

The normal period of the onset of the south-west mansoon in the district is the first of week of June. June to September is regarded as a rainy season and the rainfall during this period amounts to about 74 percent of the total annual rainfall. The direction of winds during this period is mainly westerly. There is a complete change, in November when the winds are mainly from north-east to east.

Table In.2 : Maximum and minimum monthly temperature & relative humidity in Solapur district (centre Solapur).

Month	Maximum temp. °C	Minimum temp. °C	Mean temp. °C	Range of temp. °C	Relative Humidity	
					1st 0830 hours	1st 1730 hours
January	31.1	18.3	24.70	12.8	49	30
February	33.3	18.1	25.70	15.2	40	22
March	37.0	21.1	29.00	15.9	35	19
April	40.7	25.2	32.90	15.5	38	19
May	39.5	25.3	32.40	14.2	48	24
June	36.9	24.7	30.80	12.2	69	51
July	33.0	22.8	27.90	10.2	74	61
August	31.3	22.2	26.75	09.1	76	58
September	31.7	32.0	26.85	09.7	77	57
October	33.5	22.5	28.00	11.0	64	43
November	30.0	20.5	25.20	09.5	57	34
December	30.0	17.1	23.50	12.9	53	29
Year	40.7	17.1	28.90	-	57	37

SOURCE : Socio-Economic Review & District Statistical Abstract of Solapur District.

The monthly maximum temperature for July and August is 33°C and 31°C. Towards the end of September temperature again increase slightly (Table In.2). In October there is high increase

in the temperature i.e. called 'October heat' but the night temperature steadily decrease. The moisture content of the atmosphere in this season is very high and the air is nearly humid.

Cold season :

The mean minimum temperature ranges from 17.1°C to 20.5°C. December and January are the coldest months of the year with minimum temperature of 17.1°C and 18.3°C. The mean daily range of temperature in December and January is 12.8°C. The mean relative humidity for the season is 51 percent in the morning and 30 percent in the evening (Table In.2).

RAINFALL :

Of all the weather elements rainfall is the dominent 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,1974). Such nature of rainfall demands a through analysis. In this study the annual average distribution, annual variation from normal, intensity of rainfall and annual average rainfall variability are discussed.

Average annual rainfall :

The average annual rainfall in the district is 584 mm. The rainfall in the district varies from 448.8 mm. at Akluj near the western border to 689.2 mm. at Akkalkot near the south-eastern border of the district. Some rainfall in the form of thunder showers occur during the months of April and May. The isohyets

particularly run from north to south and about 50 percent portion of the district receives more than 500 mm. rain annually (Fig.In.3). Irrigation is necessary particularly in Karmala, Madha, Mangalwedha, Mohol and southern part of Sangola talukas. Here rainfall is very low and irregular.

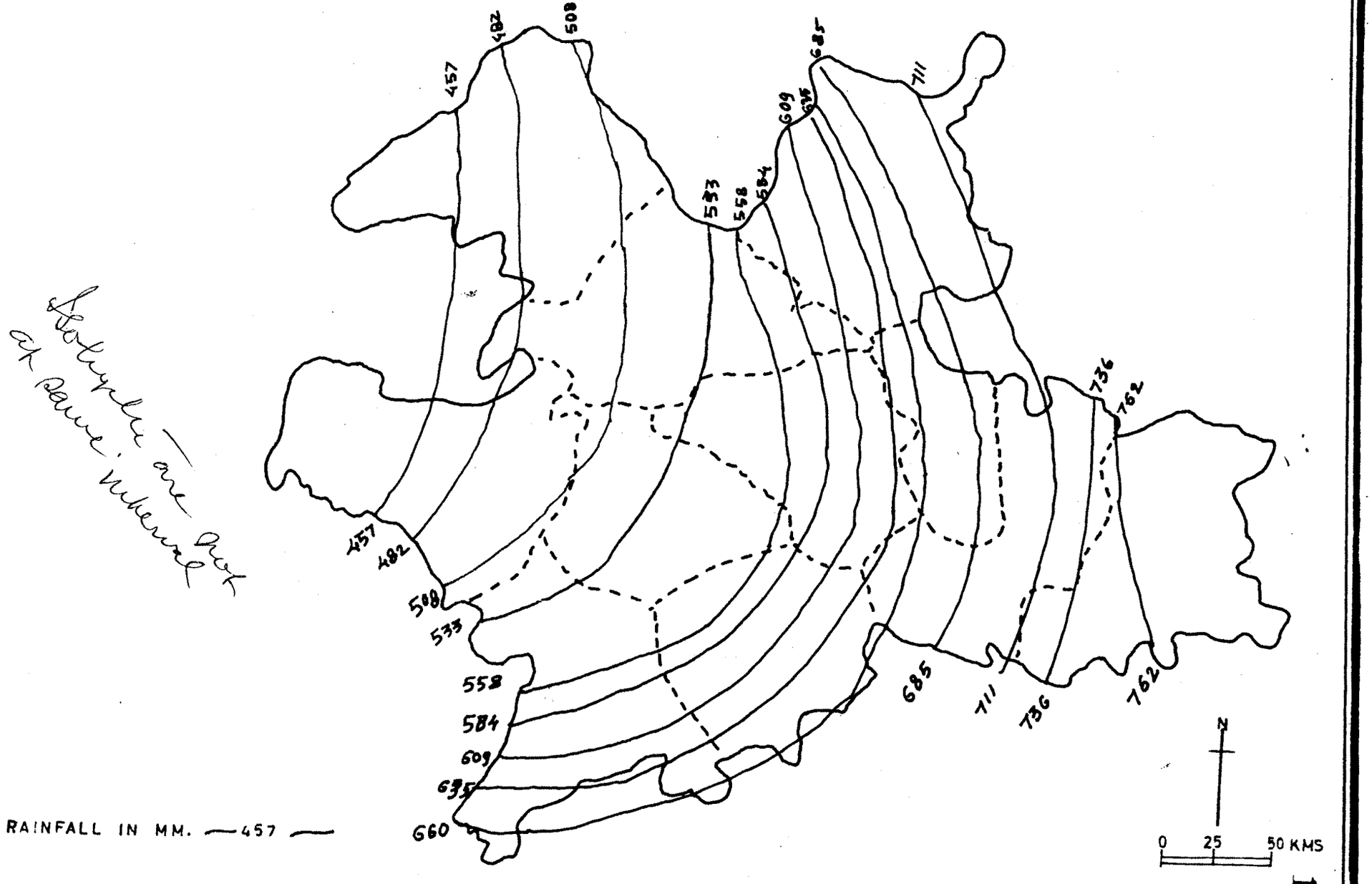
There are also annual changes from the normal rainfall. Fig.In.4 shows the annual variation of rainfall from normal for selected stations namely Karmala, Pandharpur, Barshi and Sangola in the district. The total annual rainfall at the stations varies from year to year and this deviation of annual rainfall from the normal during the period under investigation can show the uncertainity and ill-distribution of rainfall.

Seasonal distribution of rainfall :

The seasonal distribution of rainfall is shown in Fig.In.5A The main rainy season is from June to September and very large percentage (70 to 80%) of annual total rainfall over the region is received during this southwest monsoon season (Fig.In.5).September is relatively the month of maximum rainfall throughout the district. By the end of September the south west monsoon lossess its strength and gives way to the northeast monsoon. During December & February there is some rainfall and it is nearly uniform being 1 to 2 percent of the annual rainfall (Fig.In.5C). In hot season 2 to 4 percent rise in rainfall is shown in the region (Fig.In.5D).

This rainfall is useful for agriculture but is greatly limited by this normal concentration into a few months. The rainfall is not sufficient to meet the annual water need for successful

AVERAGE ANNUAL RAINFALL



Isohyets are drawn at 25mm intervals

16

FIG. In.3

ANNUAL RAINFALL VARIATION IN SOLAPUR DISTRICT

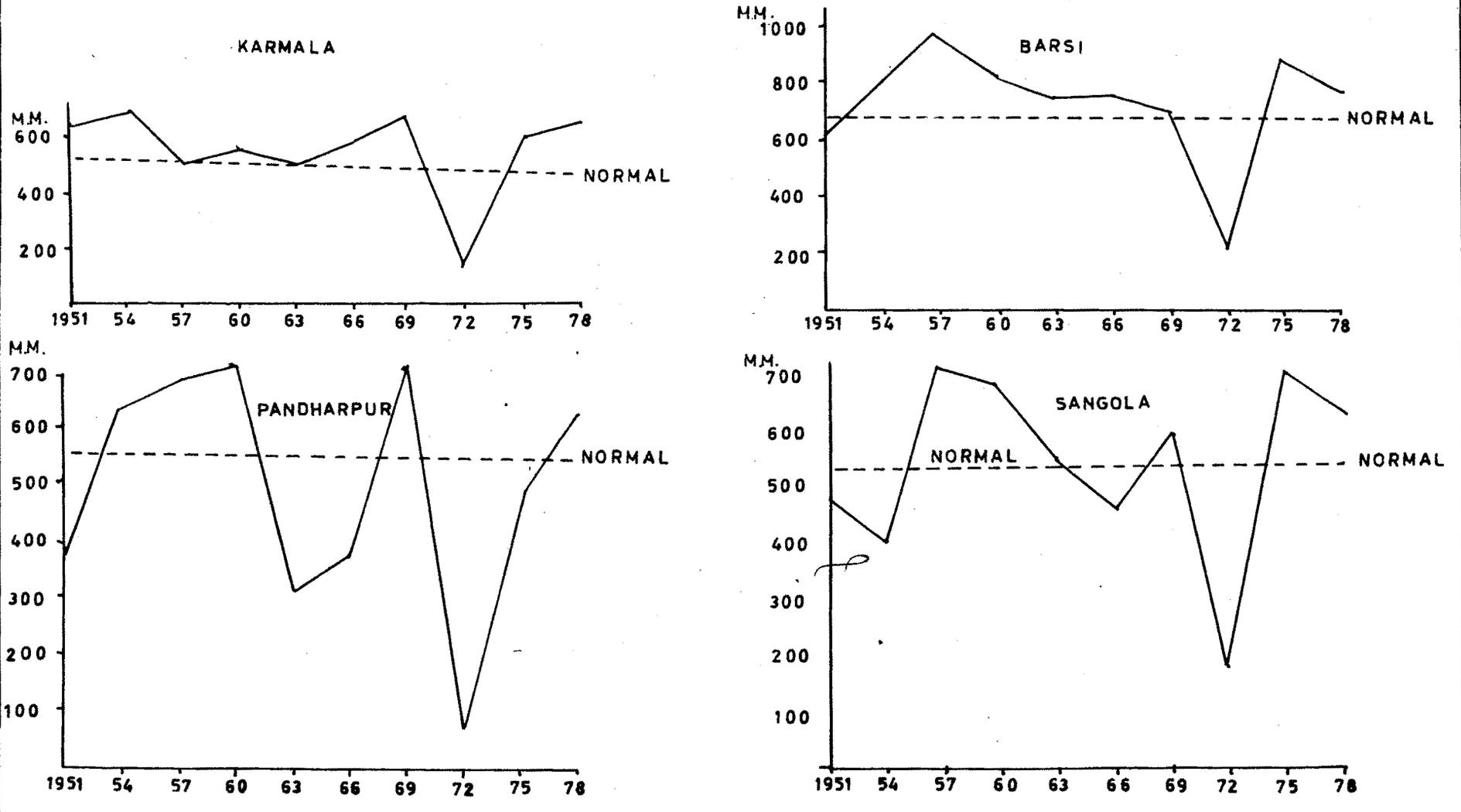
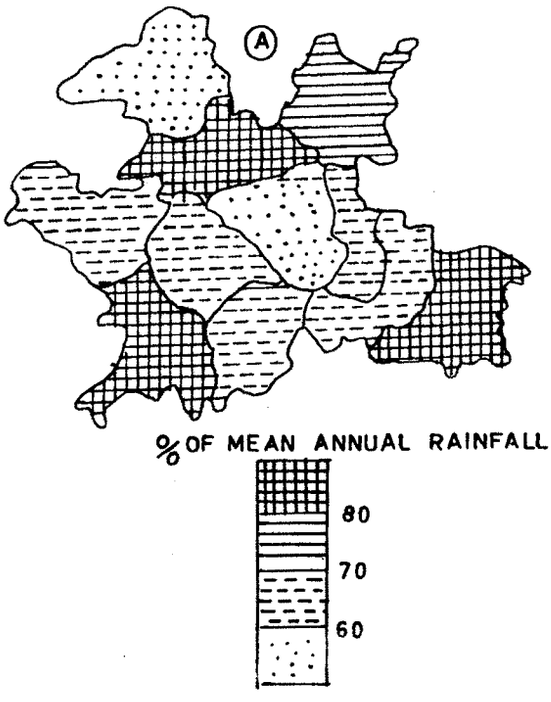


FIG 1n.4

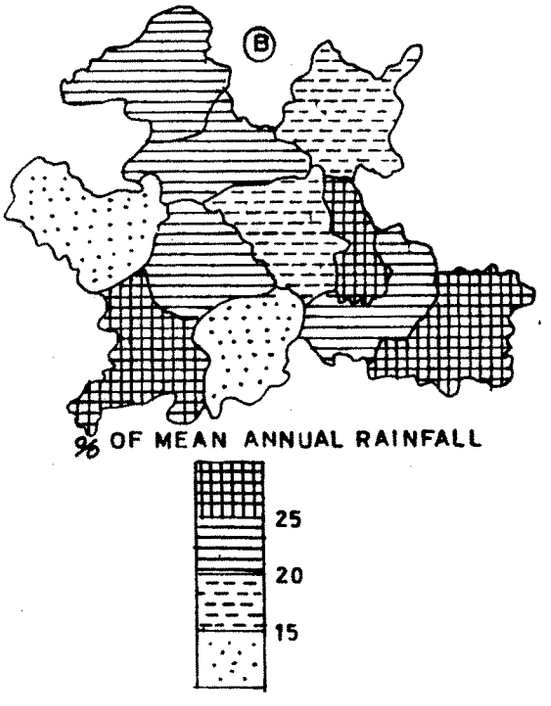
RAINY SEASON

JUNE TO SEPTEMBER



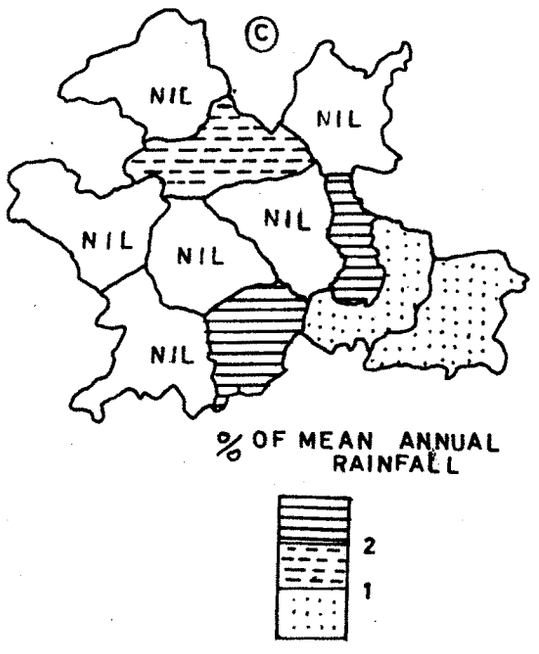
POST MONSOON SEASON

OCTOBER & NOVEMBER



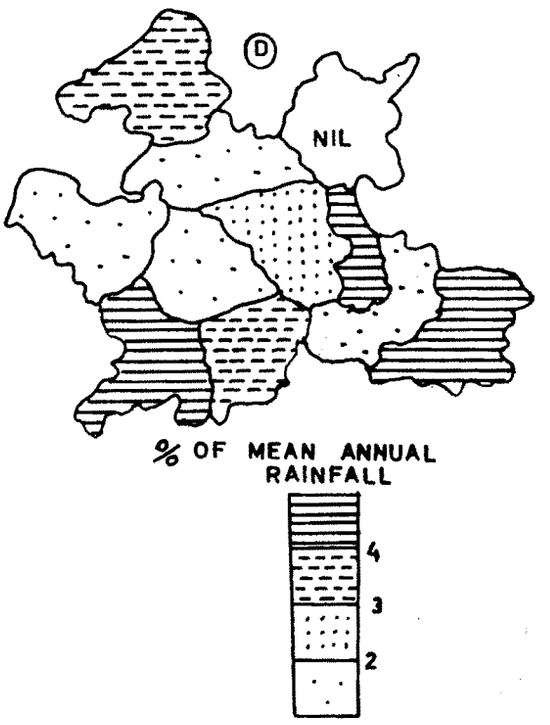
COLD SEASON

DECEMBER TO FEBRUARY



HOT SEASON

MARCH TO MAY



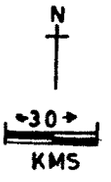


FIG. In. 5

crop production. It is not well distributed and received at the time when required most.

Intensity of rainfall :

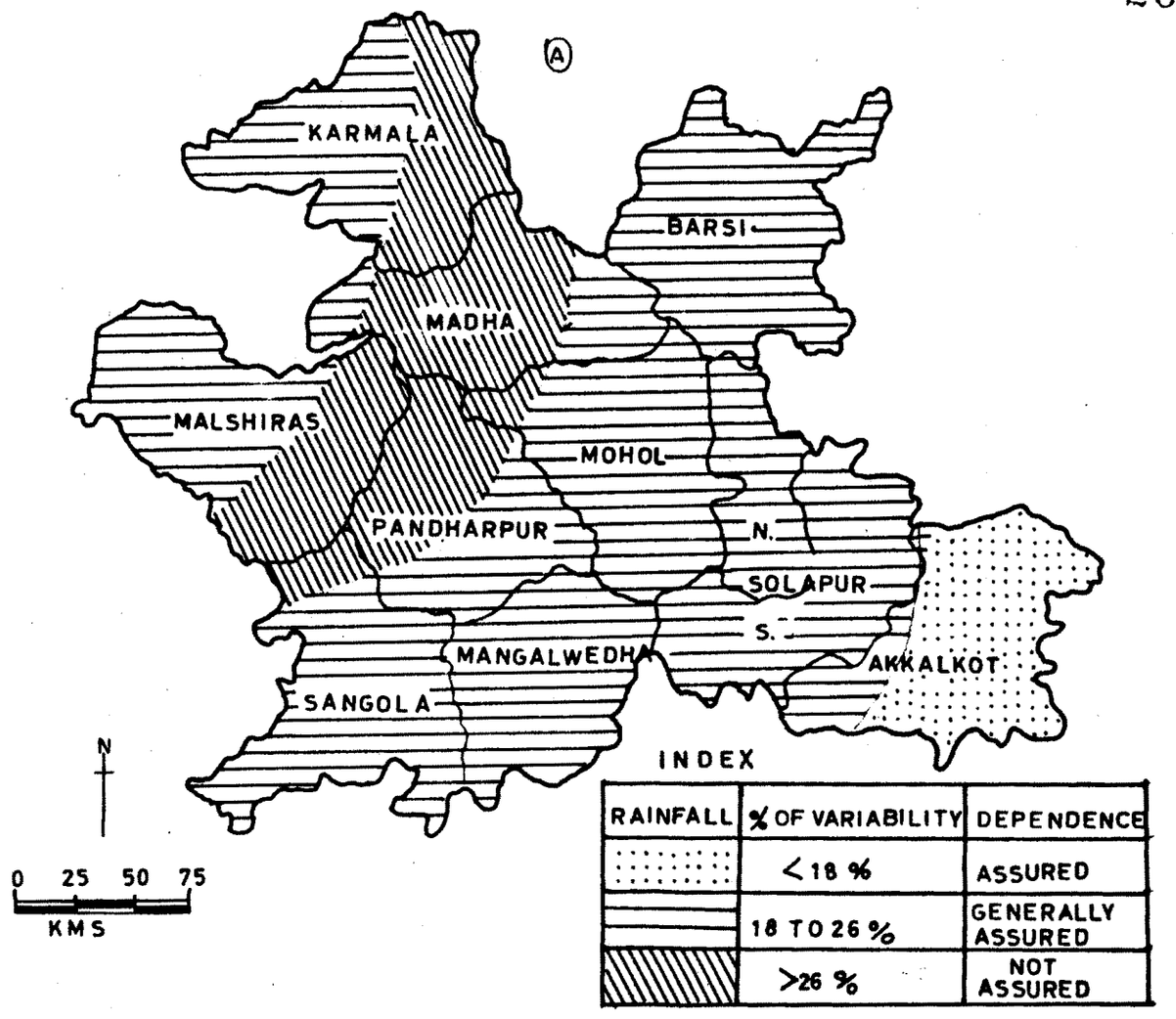
Rainfall intensity is used in this investigation in the sense of rainfall per rainy day in 24 hours period. The intensity of rainfall is shown in Fig.In.6C.

The intensity of annual rainfall varies from above 20 mm. to below 15 mm. It is over 20 mm. in Malshiras and Sangola taluka and 15 mm. to 20 mm. in remaining talukas excluding Mohol taluka. Only Mohol taluka and middle part of the district it is below 15 mm. per rainy day. Thus, the intensity of rainfall is maximum in the west and decreases towards the east.

Rainfall variability :

The rainfall reliability is measured by the co-efficient of variability. The annual co-efficient of variability thus, indicates the reliability and irregularity of rainfall. The higher the co-efficient of variability, the lower is the assurance of rainfall. Fig.In.6A records the average annual rainfall variability in the region. It is over 26 percent in the north west, middle part of the region and so is the low reliability of rainfall (not assured) on the otherhand rainfall reliability is greater in eastern part where the co-efficient of variability is under 18 percent (assured). Areas of medium degree of reliability of rainfall is with 18 to 26 percent of co-efficient of variability (generally assured). In

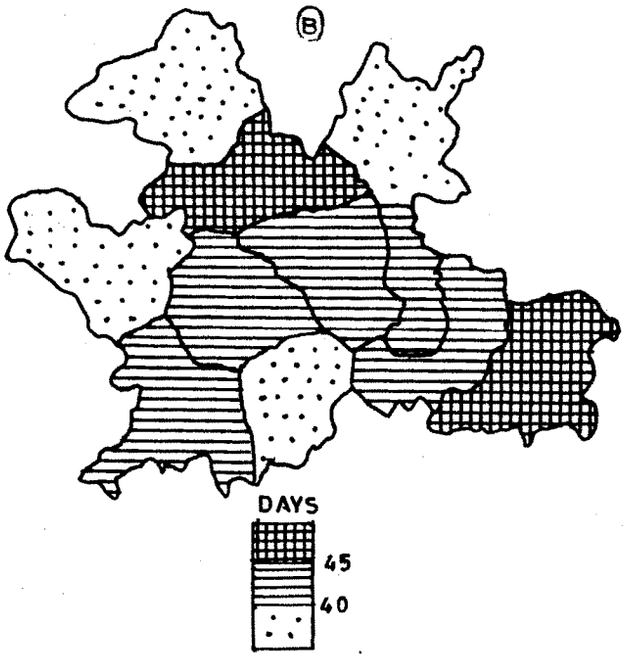
RAINFALL VARIABILITY



INDEX

RAINFALL	% OF VARIABILITY	DEPENDENCE
	< 18 %	ASSURED
	18 TO 26 %	GENERALLY ASSURED
	>26 %	NOT ASSURED

NO. OF RAINY DAYS



INTENSITY OF RAINFALL

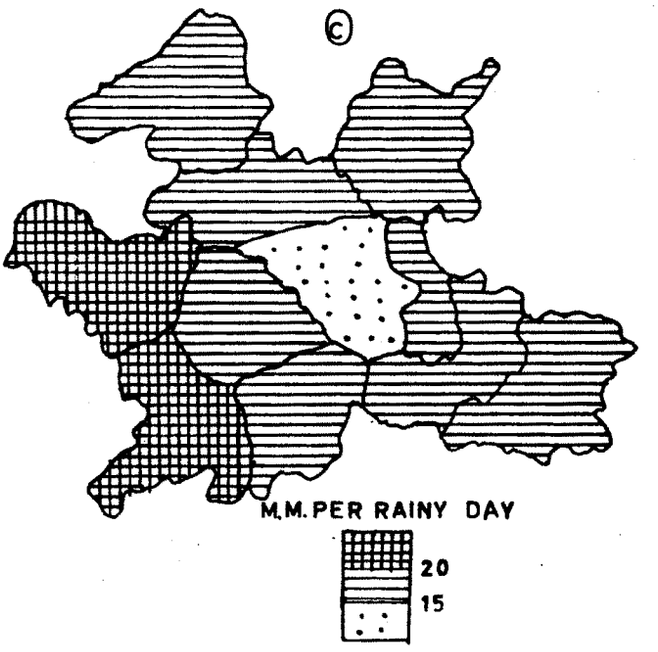


FIG In. 6

general the degree of reliability of rainfall is more in eastern part than in the middle western part and middle northern part of the region (Fig.In.6A).

E. SOILS :

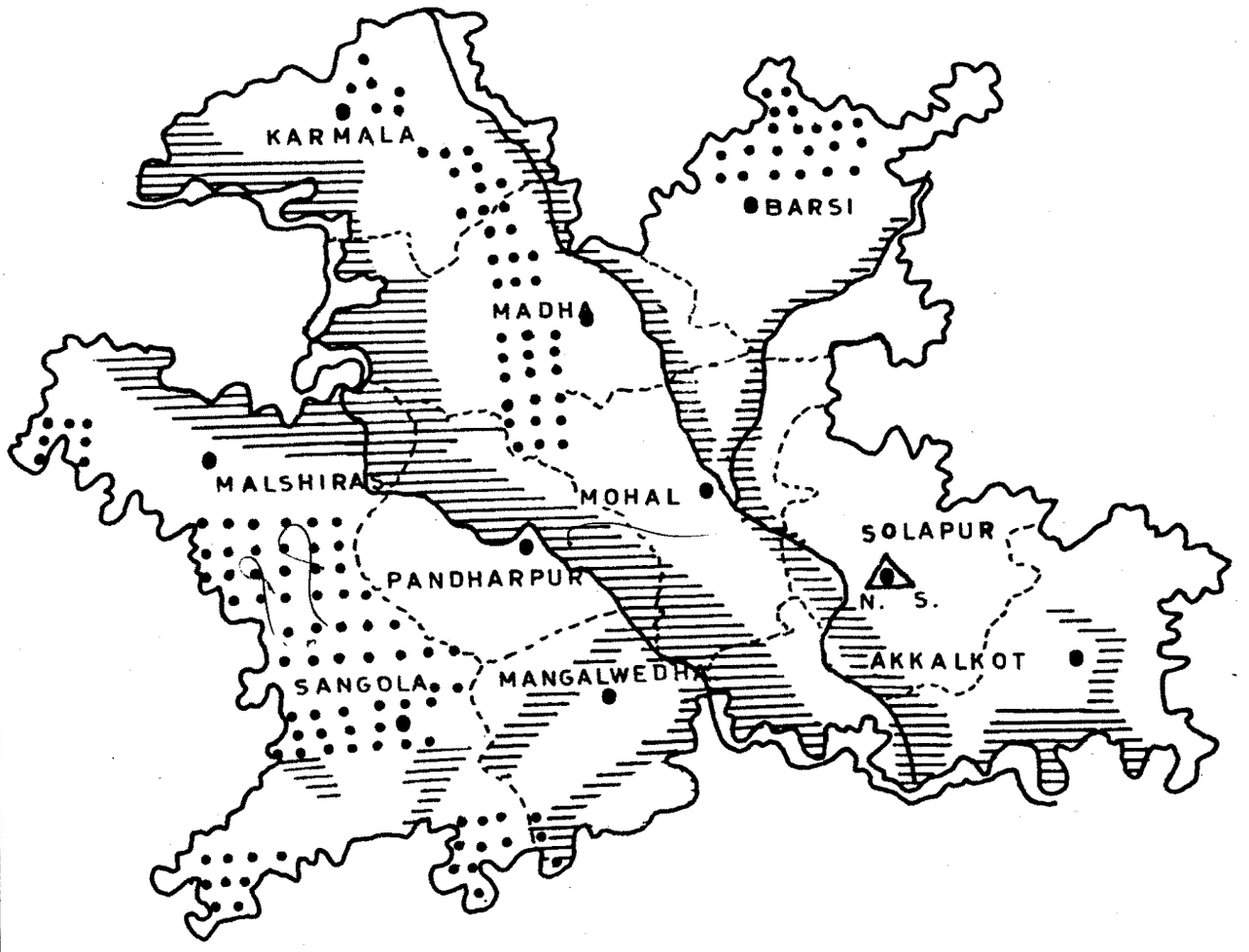
On the whole, soil constitutes the physical basis of our agricultural enterprise (Bennet,1939). Farming is a business and good soil is a part of the farmer's stock in trade. Spatial distribution of soil types and fertility are presented in this part. A little data on the soils of Solapur district is available so the present discussion of soils is largely based on the district gazetteer, the district census handbook and underground water survey agency report only.

The part of Solapur district mainly occupies the basins of Nira, Bhima, Man and Seena rivers and consequently it consists of undulating plains intercepted with a few scattered hills in Malshiras, Karmala and Barshi talukas. Most of the areas consist of low uplands seperated by valleys.

The soil in the district is mainly derived from the Deccan trap. The soils are practically under lain by decomposed basaltic rocks locally known as 'Murum'. The soils of Solapur district can be divided broadly in the three major groups based upon the physical characteristics (Fig. In. 7).

i) Shallow soil
ii) Medium black and
iii) Deep black soil

SOLAPUR DISTRICT SOILS



N

0 15 30 KMS

INDEX

	SHALLOW SOIL
	MEDIUM BLACK SOIL
	DEEP BLACK SOIL
	RIVER
	TALUKA PLACES

FIG. In.7

i) Shallow soil :

The murmad soils are shallow, course and contain partially decomposed parent material. They occur on hill slopes and are severaly eroded. These are brick red in colour, ferrugenous and clayey in nature and indicate the presence of resicular or zeolitic trappean units immediately below them.

Shallow soil is depicted in Fig.In.8A. It is mostly found on the border of north and western part of the region i.e. in Barshi, Karmala, Malshiras and Sangola taluka (above 3 percent). In middle part of the district, there is medium shallow soil, viz. Madha, Pandharpur, Mohol and Akkalkot talukas (2.50% to 3%). Rest of the talukas have below 2.5% area covered by shallow soil. The total area covered by shallow soil is 4,403 sq.kms. and this constitutes about 30 percent of the total soil cover of the district.

ii) Medium black soil :

Medium black soils have developed along the secondary drainage system of the district and also along the intermediate areas. It is also located along the small plateau regions located in isolated patches in various part of the district. The capacity of internal drainage of such soils is fairly good. The total area occupied by such soils is about 6,776 sq.km. and constitutes about 45 percent of the total soil cover in the district. It is found in every talukas ranging below 3.50 percent to above 4.50 percent. Particularly northern and western talukas are under this soil cover (Fig.In.8B).

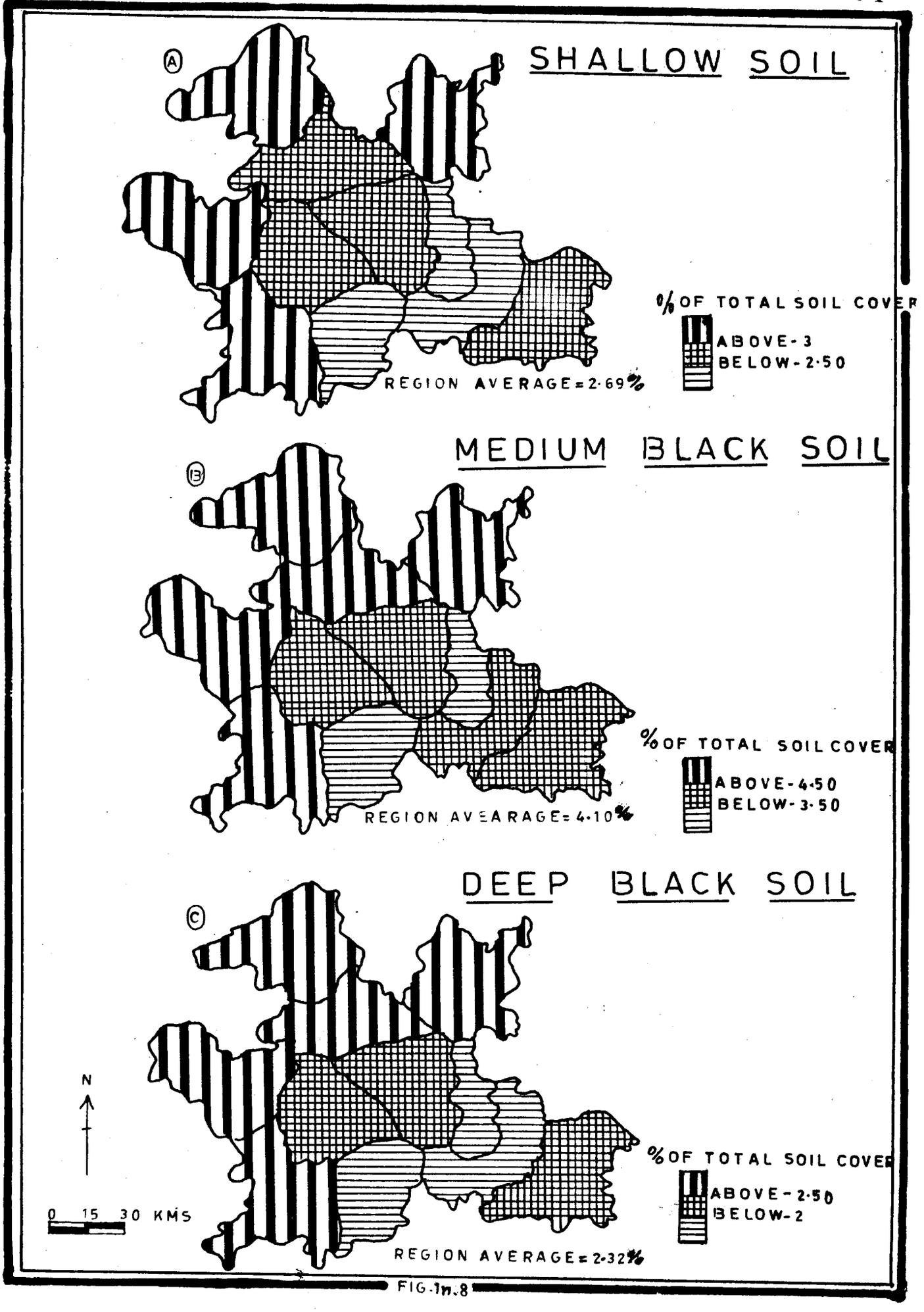

A
SHALLOW SOIL
% OF TOTAL SOIL COVER
ABOVE-3
BELOW-2·50
REGION AVERAGE=2·69%
B
MEDIUM BLACK SOIL
% OF TOTAL SOIL COVER
ABOVE-4·50
BELOW-3·50
REGION AVERAGE=4·10%
C
DEEP BLACK SOIL
% OF TOTAL SOIL COVER
ABOVE-2·50
BELOW-2
REGION AVERAGE=2·32%
N
0 15 30 KMS

FIG. No. 8

iii) Deep black soil :

The deep black zone generally develop along the lowest reaches of the valleys and are found along the banks of Bhima, Sina, Man and other important drainage systems. These are developed in the form of narrow strips. The total area occupied by such soil type is about 3,842 sq.kms. and constitute about 25 percent of the total soil cover. These soils have considerable capacity for the retaintion of moisture.

An isolated 8 to 20 metre thick alluvial patches occured on the bank of Bhima in Pandharpur taluka and 10 to 20 metre along the bank of Man in Sangola and Pandharpur talukas.

This soil is mainly found in Barshi, Karmala, Madha, Malshiras and Sangola (above 2.50 percent). In Mohol, Pandharpur and Akkalkot, there is 2 to 2.50 percent of the total soil cover of the region. Other talukas record below 2 percent of the total soil cover of the district (Fig.In.8C).

Deep black and medium black soil is seen in the western part of the region. This soil of the region is deficient in nitrogen and have low to medium reserves of Phosphorus and Potassium. The soils of river valleys are fertile and have considerable potentials for crop growing.

FERTILITY (NPK) STATUS OF SOILS :

Soil fertility refers to the nutrients present in the soil. In fact the plant requires number of raw materials for

the usual growth and yield. Out of them, Nitrogen, Phosphorous and Potash are of much importance and their quantities in soils usually determine its fertility.

The present discussion of these nutrients in the soils of the region is based on the map provided by broad soil zones of Maharashtra Research Bulletin 21.

The black soils of the district are poor in Nitrogen content and their response for the nitrogenous chemical fertilizers is good. On the otherhand, laterite soils are relatively rich in nitrogen content. In case of phospharous, most of the soils are fairly rich. But, the shallow soils are relatively poor in the phospharous content, hence, their response to the phospharous fertilizers is always good. All the black soils are rich in potash content, particularly in the brown soils. In laterite soils, potash content is relatively very low. Table In.3, shows the distribution of these three nutrients.

The western part of the region has shallow soil cover, which is generally infertile, and poor in potash content but fair in nitrogen and phosphorous contents. Medium and deep black soils are mainly found in the level ground and along the river valleys. Fertile in phosphorous and potash contents but poor in nitrogen. These soils have considerable potentials for agricultural crops.

The soils of the district are clayey, moderately alkaline in reaction and contain moderate amount of calcium carbonate.

They are well supplied with nitrogen but are low in phosphorous and potash.

Table In.3 : Fertility status of soil in Solapur district.

Particulars	Very Shallow	Shallow	Medium	Deep Black	Very Deep Black
Nitrogen (percent)	0.05-0.10	0.10-0.50	0.05-0.08	0.07-0.08	0.08-0.09
Phospheric acid (Mg percent) (P 205 available)	0.00-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00
Potash (Mg percent Kzo available)	10-15	15-20	20-30	20-25	25-30

SOURCE : Soil survey office, Solapur; Government of Maharashtra.

2. RESEARCH DESIGN :

A) OBJECTIVES OF THE PRESENT STUDY :

The study is primarily concerned with the different aspects of agriculture in South Maharashtra's Solapur district. It requires a set of maps in order to understand and analysis the agriculture of district. But agricultural survey is not merely the mapping of the analyses of the factors which bring out the agricultural pattern. The specific objectives of the present study are :-

i) To map and describe the different agricultural aspects of the region.

ii) To analyse the pressure of population, farm workers and land systems of the region.

iii) To categorise the general landuse and cropping pattern through the maps and to analyse the same in the light of environmental factors.

iv) To measure the changes in landuse pattern during the last 27 years.

v) To delimit the agricultural productivity regions and to study the pattern of agricultural marketing.

vi) In addition an attempt is made to examine the technological factors leading to agricultural development.

vii) To analyse the geographical pattern of livestocks and availability of fodder resources.

viii) Finally, an attempt is to investigate some of the aspects of drought prone agriculture of district.

B) SOURCES OF DATA :

It is not possible to investigate the spatial pattern of agricultural aspects before 1951-53. Because many changes in the administrative boundaries of the region took place. Hence, an attempt is made to examine the agricultural pattern that have occured during the last 27 years (1951-53 to 1976-78) for which a uniform data at taluka level are available.

(i) Primary source :

The statistics are collected personally from different sources. The landuse, crop hectarage and land holding size is collected from the official documents of Mamledar offices. Information collected through personal correspondance on various aspects of landuse, irrigation and land holdings have also been added to this body of data.

(ii) Secondary source :

The secondary sources include the published reports and abstracts such as socio-economic review and district statistical abstracts, census handbook and gazetteer of Solapur district. They provided a rich background material and also vast amount of information about soil, yield and production, crops, seeds, fertilizers etc.

C) METHODOLOGY :

The statistical information is sought for taluka through several methods of data collection and observation. Each taluka headquarter is visited by the author to collect the data about farm population, livestock and fodder, crop yield and technological determinants of agriculture.

The grouping of items is done on the basis of the proportion of the area occupied by the crops. Crops which cover a very minor proportion of cropped area are grouped under the heading of miscellaneous crops. To eliminate the effects of weather and to

attain a more reliable picture of the changes, three year averages are used such as 1951-53 and 1976-78.

Analysis have been undertaken with both absolute numbers and percentage values. Crop ranking and combination techniques are applied to delineate the crop and livestock regions. Technological determinants of agricultural development have been assessed through the maps.

Observations made during the field work helped to synthesize the statistical analysis. The essential data so obtained are presented in the form of tables, graphs, digrams and maps. These in themselves will provide correct explanations. Most of the maps are chloropeth in which areal difference in the importance of particular elements are shown by the differences in the density of shading. The choice of class interval is as per range of percentage values.

D) PREVIOUS WORK DONE :

Geographical investigation of the agricultural phenomena pertaining to this district is very less. A detailed work based on taluka level data showing the agricultural pattern and changes therein has not been previously done. But present study is an attempt in that direction.

E) OUTLINE OF THE WORK :

The entire study is arranged into eight chapters. The first chapter deals with the discussion of population growth,

pressure of population on agricultural land, farm workers, land-ownership and tennure, land holding size and consolidation of holdings. The second chapter is devoted to the technological determinents of agricultural development. It analysise the irrigation, farm implements and machinary, improved seeds, fertilizers, agricultural credit, and roads which leads to the agricultural development in the region.

Significant aspects of present study have been included in the third and fourth chapters of the work. General landuse of the region is discussed in the third chapter. In each case temporal variations that have occured during the last 27 years are briefly outlined. The first section of fourth chapter discusses the cropping pattern and changes therein. In the second section aspect concerning agricultural crop regions is included.

The fifth chapter is devoted to discuss the agricultural produce and marketing. The yield and out-turn of principal crops and crop productivity levels based on Kendal's and Bhatia's methods are analysed. The sixth chapter is on livestock distribution and fodder supply. The seventh chapter deals with the drought prone agriculture and analyses the rainfall, agriculture, water availability period and measures to overcome drought conditions. The last chapter is conclusion.

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