CHAPTER - II

PHYSIOGRAPHIC AND SOCIO-ECONOMIC DETERMINANTS AS BASIS FOR SUGARCANE CULTIVATION AND SUGAR INDUSTRY

2.1 PHYSIOGRAPHIC DETERMINANTS :

The availability of sugarcane is major locationalizational factor for the establishment of sugar industry. The cane cultivation depends on various factors. The importance of physiography, drainage, climate and soil in cane cultivation is described in the following pages.

2.1.1 Physiography and drainage :

The physiography has greatly influenced the socio-economic life of Maharashtra. Though two outstanding division like vast plateau sloping eastwards and narrow coastal lowland to the west are dominant; physiographically the land of Maharashtra can be grouped into following divisions (Fig.2.1).

1) The Konkan lowland
2) The Sahyadri ranges
3) The Deccan plateau
4) The Wardha-Wainganga Valley and
5) The Tapi-Purna basin.

1) The Konkan lowland :

The narrow strip of land between the Arabian sea on the west and the Sahyadri ranges on the east is called Konkan. The zone falls into three longitudinal sub-divisions, the coastal belt, the middle tract and the foot hills of the Sahyadri. It's rivers flow transversely. Rivers namely Surya,

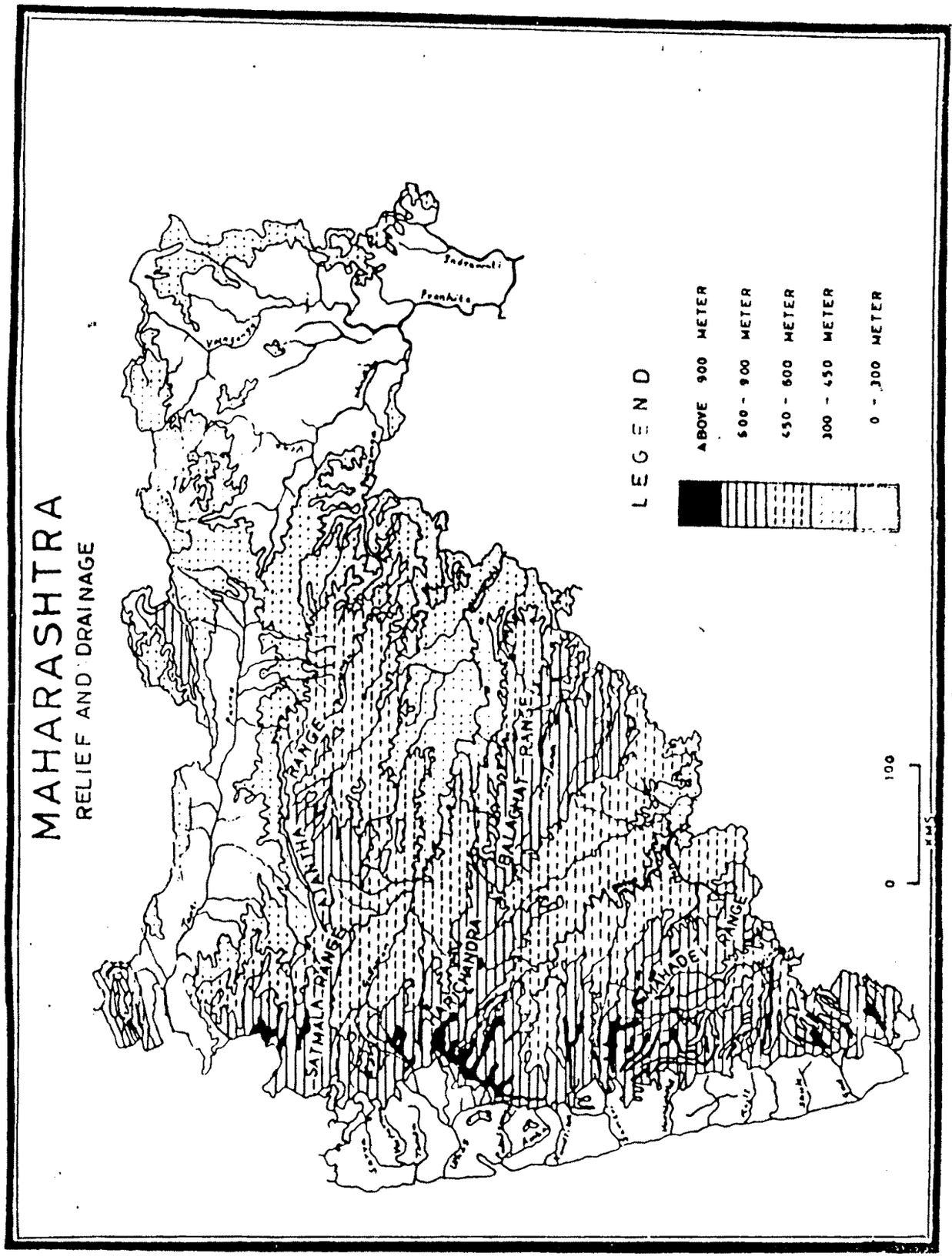
MAHARASHTRA
RELIEF AND DRAINAGE
LEGEND
ABOVE 900 METER
600 - 900 METER
450 - 600 METER
300 - 450 METER
0 - 300 METER
SATMALA RANGE
BALAGHAT RANGE
0
100
KMS

Fig-2.1

Vaitarna, Tansa, Amba, Kundalika, Savitri, Vashishthi, Kajali, Shuk and Gad are the main rivers of this division. During the monsoon they are ranging torrents, while in other part of the year, they are either rivulets or mostly dry. This zone does not offer favourable physiographic conditions for cane cultivation because flat alluvial plains with developed irrigation facilities, a basic requirement for cane cultivation are absent.

2) The Sahyadri ranges :

The Sahyadri forms the watershed between the east flowing streams and the west flowing streams. Sahyadri with an average height of 1200 meter runs. Southwards along the western edge of the Deccan plateau from near the Tapi mouth and extends much further beyond the southern limits of the state. In contract to its steep western face the range slopes gently east and along the Maharashtra plateau. The steep slopes in the hilly regions are unsuitable for cane cultivation due to poor soils and absence of irrigation facilities. It's three main transverse spurs demarcate the major river basins of the state namely Tapi-Purna, Godavari and Bhima-Krishna. The Thalghat, Borghat, Kumbharli, Amba, Phonda and Amboli are important passes at the heart of the Sahyadri through which communication lie between the plateau and the littoral part of the state.

3) The Deccan plateau :

It is bounded by the Sahyadri running north-south to the west and the Satpuda running east-west to the north. The plateau is deeply dissected by the eastword flowing Godavari, Bhima and Krishna and their tributaries providing rich back-ground for sugarcane cultivation. The plateau falls in height to less than 300 meters both towards the north and the east.

4) The Wardha-Vainganga valley :

In the district of Gadachiroli, to the extreme eastern boundary of the state, there occurs a series of detached low hills about 500 meters in elevation. It has also an interior alluvial lowland drained by the Wardha-Vainganga-Pranhita rivers. The undulating topography, poor soils and partly scarcity conditions have created hurdles for cane-cultivation in this zone.

5) The Tapi-Purna basin :

The Tapi-Purna basin stretching latidunally across northern Maharashtra ranges named in by the Satpuda in the north and the Satamala, the Ajantha in the south. This rift valley slope from east to west. The Purna, the Bhogavati, the Vaghur, the Girna and the Bori all join the Tapi when it enters Dhule district. The slope is the main obstacle in this zone for extensive cane cultivation.

2.1.2 Climate :

The climatic determinants of plant growth are rainfall, temperature, wind and light. Sugarcane is on the field for varying periods of 12 to 22 months in the region under study and grows through fluctuations of rainfall, temperature, humidity, wind and sunshine. In particular, the yield and quality of sugarcane is largely influenced by rainfall and temperature (Parthsarthy, 1972).

Temperature

The temperature in the states changes from season to season and from place to place. In cold season mean daily maximum temperature is 28°C in the coastal belt which rises upto 30°C to 33°C in inland part. In hotest month of a year the mean daily maximum temperature recorded falls between 35°C to 43°C in Vidarbha and 30°C to 33°C along the coast. In rainy season daily maximum temperatures recorded fall between 29°C to 31°C in coastal area and 29°C to 38°C in the interior parts of the region. During the post-monsoon period, the mean daily maximum temperature are 29°C to 34°C in the interior and 29°C to 31°C in coastal division.

Temperature for cane growth has a lower limit (above 10°C) below which growth ceases and also sucrose (inversion) gets damaged, which in turn inhibits crystallization during manufacture of sugar (Smith,1978). As such the temperature in the region is highly favourable for cane cultivation throughout the year.

Rainfall

The major rainfall received in Maharashtra comes from south-west monsoon. June, July, August and September are the rainy months where 70 percent of the annual rainfall of a year is concentrated. The regional variation in the distribution rainfall are obvious. The Konkan has an average of 267 cms. Deccan plateau records 25 to 50 cms. Marathwada 60 cms. and Vidarbha 100 cms (Pawar,1985).

Sugarcane is essentially a tropical plant loving warmth and moisture for its growth. The production fluctuates very widely if the crops are rainfed, whereas fluctuations are less in the irrigated areas (Jadhav,1984). In view of the spatio-temporal distribution of rainfall, except the month of July and August, rainfed cane cultivation is impracticable. Hence in the study region, sugarcane cultivation is possible if perennial sources of irrigation are available.

2.1.3 Soils :

In Maharashtra's peninsular soil there is a mixture of different rock materials. The fertility of the alluvial soils depends upon the chemical constituents of the rocks from which they are derived (Sahastrabudhe et al. 1969). The Indian Council of Agriculture Research, has divided the soils of Maharashtra into following main classes -

(i) Regur soil,

(ii) Laterite soil,

(iii) Red soil,

(iv) Alluvium soil and

(v) Coastal alluvium soil.

(i) Regur soil (Black soil) -

It is spread all over the northern central districts of Maharashtra. It has been derived from the old lava deposits and it is among the most fertile soils. They are rich in the iron, lime and alumina. They are poor in phosphorus and organic materials. Such soils are suitable for cane cultivation in general.

(ii) Laterite soil :

This soil is composed of a little clay and much gravel of red sandstone rocks. It is very poor in phosphoric acid which is the most important plant food for plants like cashewnut and mango. This soil, located particularly in the Western Ghats in the districts of Ratnagiri, Sindhudurg and western parts of Kolhapur and Satara, is unsuitable for cane cultivation.

(iii) Red soil :

Red soil is not always necessarily red in colour though frequently it is light red to brown. Generally it is deficient in phosphorus, lime, nitrogen and organic materials. It is observed in uplands and hills covered by the Vindhyan and Cuddapah formation and gneisses. This soil is sandy loam in texture.

In the Wainganga, Wardha valley and adjacent areas soil is sandy and red. The sugarcane does not respond well in such soil.

(iv) Alluvium soil :

This soil is formed by the transportation of the streams and rivers and deposition over the flood plains or along the coastal belts. It represents the vast tract of Tapi, Purna, Godavari, Bhima, Krishna and the tributaries plains. It is most suitable for growing sugarcane in particular.

(v) Coastal alluvium soil :

It extends in varying width between the Arabian sea and the Western Ghats hills along the west coast. In Maharashtra, Konkan coastal lowlands are covered by a mixture of coastal and river alluvium and used for raising rice and vegetables. The soil becomes sandy along the immediate shores of the sea and is devoted to palmgroves and casuarina plantations that act as wind breaks.

2.2 SOCIO-ECONOMIC DETERMINANTS :

The socio-economic basis like population, cultivators, size of holdings, irrigation and farm technology are also equally important in determining the nature and extent of cane cultivation.

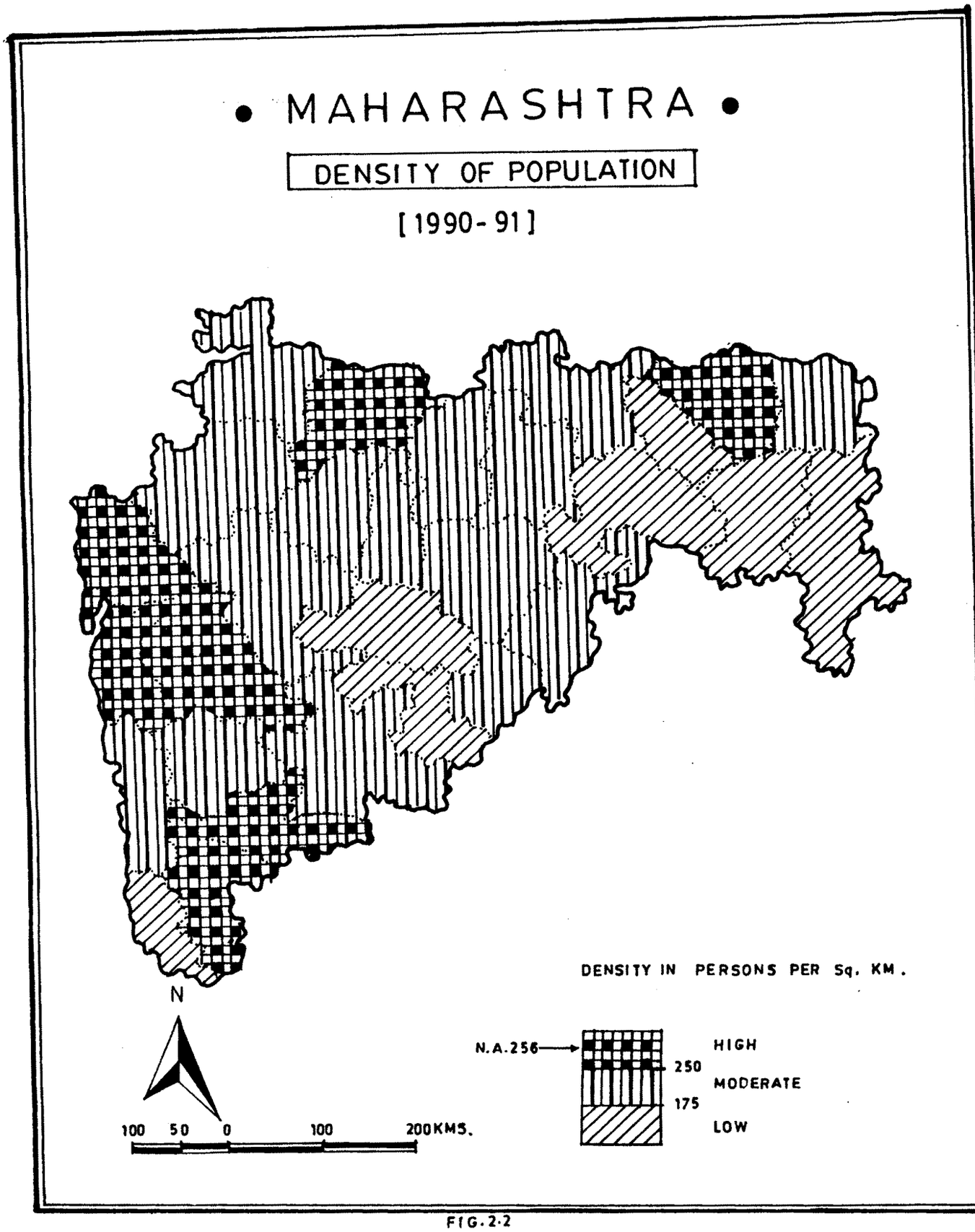
• MAHARASHTRA •
DENSITY OF POPULATION
[1990-91]
N
100 50 0 100 200KMS.
DENSITY IN PERSONS PER Sq. KM.
N.A.256
250
175
HIGH
MODERATE
LOW

FIG. 2·2

2.2.1 Pattern of population density :

Average density of population in the state is about 256 persons per sq.km in 1991 (Fig.2.2). The high density of population (over 250 persons per sq.km) occurs in the districts of Bombay, Thane, Raigad in Konkan region and Pune district etc; where urbanization has taken place due to industrialization. The high density zone is also confined to southern part (Sangli and Kolhapur district) of the state along with the district of Jalgaon and Nagpur.

The low density zone (below 175 persons per sq.km) covers districts of eastern part of the state namely, Wardha, Yeotmal, Chandrapur and Gadchiroli. Besides this, it occurs in the districts of Beed, Osmanabad and Sindhudurg etc. These are economically backward districts of the state where the agriculture is at substance level and industrialisation is yet to be started.

The remaining districts of the state come under the moderate density of population (between 175-250 persons per sq.km). In general the regional pattern of the density of population is influenced by physical, socio-economic and organisational factors.

2.2.2 Cultivators :

Cultivators make decisions consciously or rationally about the kind of farming to be undertaken, the combination

of enterprises in the farming system, the kind and quantity of different inputs and the trading of the surplus produce. The decisions of cultivators regarding the agricultural practices are determined by the size of the holdings, the tenure, consolidation of land holdings and regime of ownership (Singh,1976). The average density of cultivators to total cultivated area has been decreased from 47 per 100 hectares in 1960 to 38 in 1985.

They are highly concentrated (above 60 cultivators) in area having high rainfall and assured water supply areas in Konkan region, Kolhapur, Western parts of Sangli and Satara districts. The Eastern parts of Bhandara and Chandrapur districts have also recorded high concentration. This fact can be well attributed to the less cultivated area as compared to total number of cultivators.

The moderate concentration of cultivators (between 20-60) is confined to Dhule, Jalagaon, Nasik, Ahmednagar, Pune, the parts of Satara, Sangli, Solapur, Osmanabad, Beed, Nanded and Parbhani district. The districts of Bhandara, Chandrapur and Gadchiroli have attained same proportion. This may be due to assured rainfall and fertile alluvial river tracts. The rest of Vidarbha and Marathwada have been characterised by low concentration. These regional variations may be attributed to the size of holding which is further related to physical and demographic attributes (Patil,1989).

2.2.3 Size of holdings :

The size of holdings has become a serious problem in the region under study. It restricts the adoption of new technology and power to be used. The size of holdings is associated with the pressure of population, economic requirements, the fertility of land and historical traditions (Singh and Dhillon,1984). The size of the farms decides the degree of risk that a farm operator may bear.

In Maharashtra State, as in the rest of India, a definite standard size of the farm suitable for definite type of farming cannot be maintained because of the increasing burden and dependency of agricultural population on arable land and the working of the law of succession. In Maharashtra State, the average size of holdings per cultivator is about 2.70 hect. The size of holdings has always come down because each successor has insisted on having share from each location and piece of land, resulting in further fragmentation. It is a wasteful method of land utilization and many improved agricultural practices cannot be adopted (Randhawa,1974). This has became one of the constrains in adopting modern technology, particularly on cane farms.

2.2.4 Irrigation :

Irrigation is one of the important inputs and socio-economic basis of agriculture. Availability of perennial

water for irrigation encourages farmers to adopt more scientific techniques and intensive cultivation. " Due to irrigation farmers can make additional investment in cattle, farm implement on more valuable crops like sugarcane and the total employment of farmers and labourers," (Gadgil,1961).

The need for irrigation -

As a rule, the lower the rainfall the greater is its variability and the more is the need for irrigation. A variability of 20 percent implies a great risk in farming (Williamson 1925). In case of Maharashtra, 20 to 25 percent co-efficient of variability of rainfall is observed in the eastern five districts of Vidarbha and western parts of the state comprising parts of Satara, Sangli, Poona, Thane, Raigad, Ratnagiri and Sindhudurg districts. This is the region of slightly high reliability of rainfall and moderately low need of irrigation. On the contrary very high variability (over 30 percent) is confined to the central part of the state stretching in north-south direction. Here agriculture without irrigation becomes uneconomic and famine can be apprehended at any time (Pawar and Shinde,1986). The variability below 20 percent is observed only in South Konkan, along Western Ghats and in Eastern Vidarbha. These are the only areas of high reliability of rainfall in the state, where need of irrigation is relatively low.

Sources of irrigation -

Source of irrigation in the region are largely affected by physical factors such as topography, soil and presence of surface water and groundwater. Presently, the state has different sources of irrigation viz., well, canal, tank and other sources.

As such well irrigation sharing about 54 percent of total irrigated area is mominant source in upland districts of plateau region. It is followed by canal irrigation which shares about 23 percent of total irrigated area in the state confined to the lower parts of river basin viz., Krishna, Bhima and Godavari etc. Tank irrigation sharing 15 percent of irrigated area ranks third. Its concentration is found in eastern parts of Maharashtra. The other sources of irrigation (in which lift irrigation is dominant) though shares 10 percent irrigated area, provides a rich background for cane cultivation after canal source in region.

Above these sources together facilitate the 19.57 lakh hectares of land, which was just 5.09 lakh hectares in the year 1950-51.

The intensity of irrigation -

The intensity of irrigation (i.e. percent of net area irrigated to net area sown) in the state as a whole is about 13.1 percent which was only 5 percent during the year 1960-61. But this is less than the national average (30.7 percent).

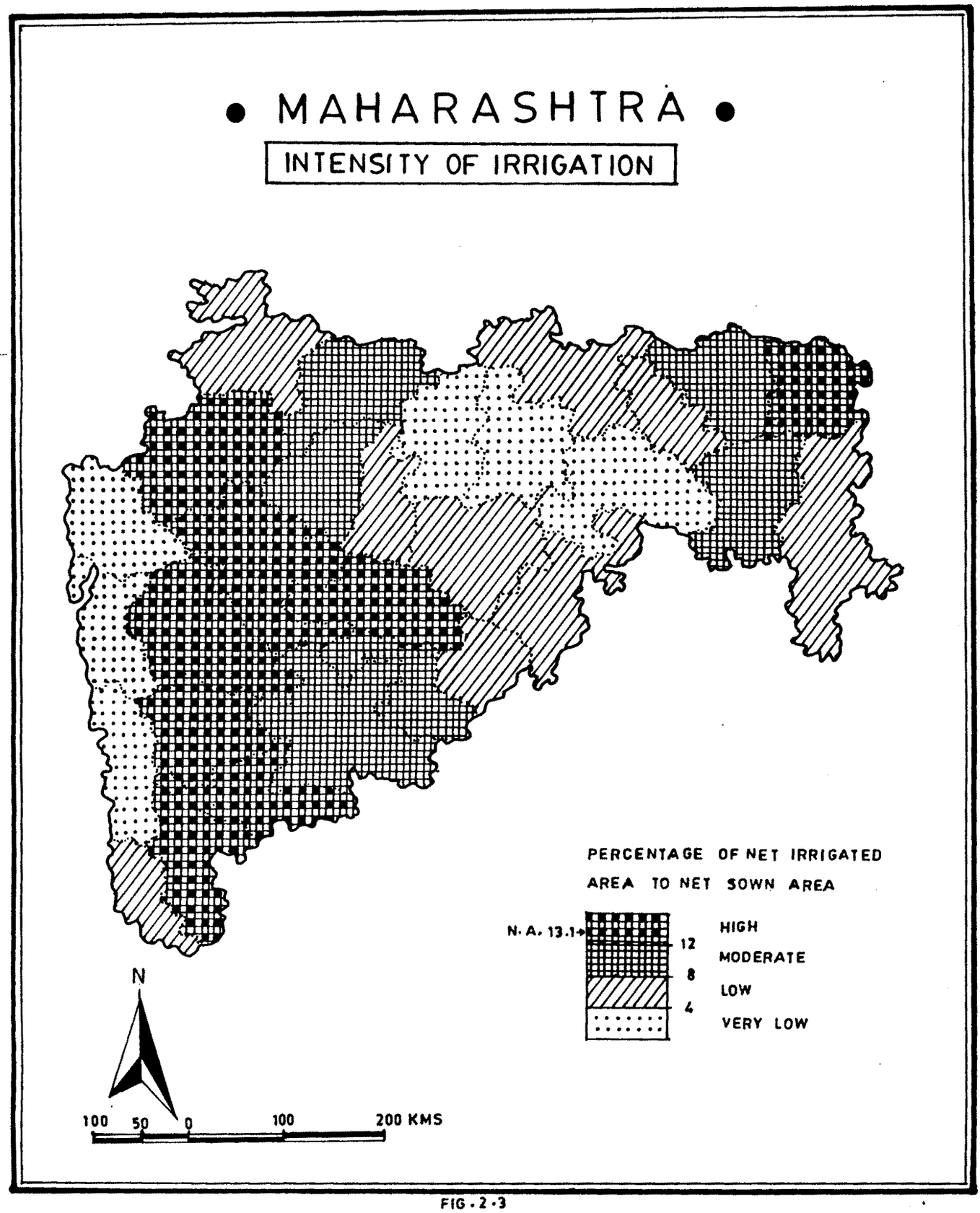
MAHARASHTRA
INTENSITY OF IRRIGATION
PERCENTAGE OF NET IRRIGATED
AREA TO NET SOWN AREA
N. A. 13.1
12
8
4
HIGH
MODERATE
LOW
VERY LOW
N
100 50 0 100 200 KMS

FIG. 2.3

However, it varies considerably in different parts of the state (Fig.2.3). The areal distribution of the intensity of irrigation reveals that it is relatively high (above 12 percent) in western upland districts namely Ahmednagar, Pune, Kolhapur, Satara, Sangli and Nasik. Here canal and lift irrigation is developed considerably. It also exists in the central part of the state. The moderate intensity of irrigation (8 to 12 percent) prevails in the central part of Maharashtra comprising the drought prone area where need of irrigation is high. The wells are the major source of irrigation in this part of the state (Gaikwad and Pawar,1992). A belt of low and very low intensity of irrigation (4 to 8 and under 4 percent) is noted in littoral districts of west and much of the districts from Vidarbha region. This may be attributed firstly to relatively lesser need of irrigation in the western parts and secondly the relative low development of water resources in Vidarbha region.

Sugarcane cultivation and irrigation -

A good supply of water during the main period of growth is very important if sugarcane is to flourish (Jadhav, 1984). Without water supply every plant cannot grow. " An insufficient supply of water invariably leads to failure of the harvest but where irrigation is regularly practised, good harvest can always be relied upon," (Eugen,1969). Among various inputs of sugarcane, irrigation is regarded as an

essential ingradient for augmenting cane productivity. Sugarcane is a long standing crop and consumes lot of water throughout the year.

2.2.5 Farm technology :

Farm technology is very essential factor for the proper growth and production of sugarcane. The farmers still make use of traditional techniques which have obstructed the introduction of improved technology in many parts. Attitude of the farmer is also a significant factor, which determines the adoption of innovation in agriculture (Jadhav,1984). The numerical strength of improved implements may affect the nature and intensity of cane cultivation. Besides, sugarcane cultivation has enabled farmers to purchase improved implements like tractors, motor pump, crushers, oil engines, fertilizers etc. In order to augment the productivity of cane, the use of these implements has become inevitable.

Wooden plough is a traditional implement which is widely used by the farmers in the hilly parts of the west. However, frequent ploughing with wooden plough is adopted for sugarcane cultivation as it needs deep ploughing for penetration of root system. Iron plough facilities deep ploughing as compared to wooden plough. According to their capacity for deep ploughing, the iron ploughs are drawn either by two, four or more pairs of bullocks depending on the type of soil. The heavy iron ploughs

are preferred in medium to deep black and alluvial soils. As sugarcane is grown in such soils, the use of iron plough is a common phenomenon.

Mechanisation of agriculture is taking its roots where sugarcane, a cash crop, is grown. The farmers in sugarcane pockets are able to invest more in such improved implements due to their increased incomes from this crop. "Increased application of modern inputs leads to higher level of agricultural production," (Daniel,1976).

Tractor, a labour-saving input, is used for several operations in agriculture. It has become an essential vehicle for the transportation of sugarcane from farms to sugar factories and inputs like fertilizers, manures, required machines etc; to farms. Nevertheless, it is also used for deep ploughing and preparation of furrows required for better cultivation of sugarcane.

2.3 SUGARCANE CULTIVATION :

Sugarcane, though occupies 2.16 percent of the total cultivated area of the state has healthy impact on the economy of the state. It has an important place among the cash crops. Tropical climate, developed irrigation facilities, cooperative movement, government encouragement, reasonable prices, enterprenurial skill of the farmers have all these factors are support to growth of sugarcane cultivation in the State of Maharashtra.

2.3.1 Sugarcane requirement and it's availability :

Sugarcane crop requires certain geographical conditions for its fair growth. Temperatures ranging from 20°C to 26°C are favourable for its growth. The growth of cane, however, ceases at about 10°C and the bud is injured when temperatures exceed 25°C. Hence, the planting of sugarcane is always preferable from mid-February. The Maharashtra State is endowed with such temperature conditions during this period. Rainfall is necessary for augmenting water availability. During pre-monsoon and post-monsoon period, the supply of water is a decisive factor. Sugarcane requires deep, rich loamy soils which are neither too acidic not too alkaline. Since this crop exhausts soils, application of farm yard manures, green manures, oil cakes and chemical fertilizers are essential. The flood plains of river basins in the region possess such soils.

2.3.2 Sugarcane cultivation and cropping pattern :

The Maharashtra grows a variety of crops and its cropping pattern is largely influenced by the climate, soil and topography. However, foodgrains constitute a major produce of agricultural land i.e. 66.73 percent of the gross cropped area during 1990-91. The main food crops grown here are jowar (10.72 percent), pulses (14.97 percent), rice (10.06 percent), Bajara (9.15 percent) and wheat (4.06 percent). The sugarcane comprise 2.16 percent of cultivated area. Further, including sugarcane, fruits and vegetables, condiments and

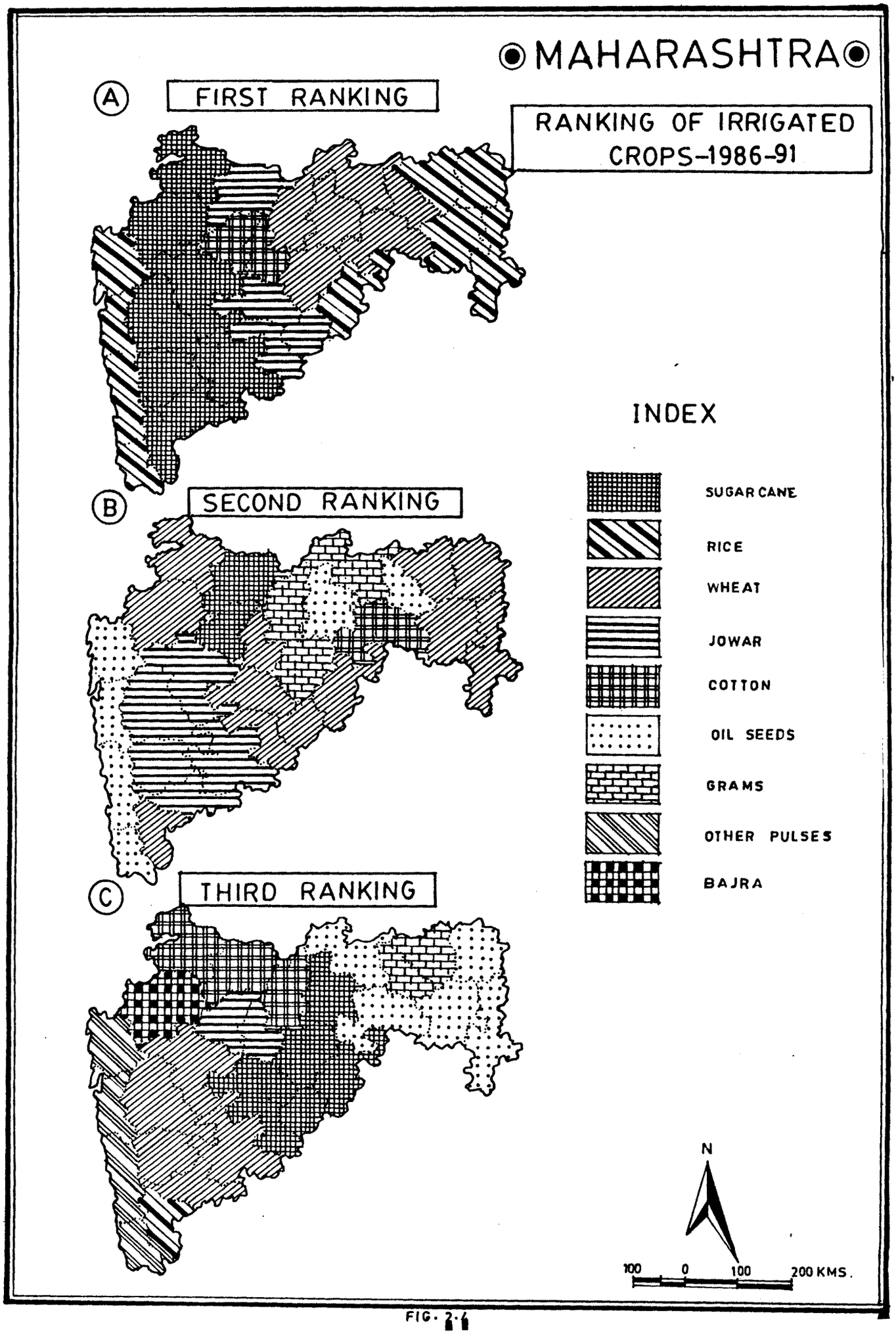
MAHARASHTRA
A
FIRST RANKING
RANKING OF IRRIGATED CROPS-1986-91
INDEX
SUGAR CANE
RICE
WHEAT
JOWAR
COTTON
OIL SEEDS
GRAMS
OTHER PULSES
BAJRA
B
SECOND RANKING
C
THIRD RANKING
N
100 0 100 200 KMS.

FIG. 2.1

spices, the total food crops occupied about 74.50 percent during the same period. Among non-food crops cotton shares (14.22 percent) major area, followed by other non-food crops.

About 60 percent of the cultivated area is occupied by sugarcane in western upland districts, where perennial source of irrigation is available (Fig.2.4 A,B,C). Besides, poor development of irrigation facilities due to rugged terrain has prevented the diversion of land to cash crops. Sugarcane a premier cash crop uses about half of gross area irrigated and ranks first among irrigated crops in Maharashtra.

2.3.3 Sugarcane concentration :

The concentration of area under sugarcane within the limits of Maharashtra State is subject to areal variation and temporal changes too. The Bhatia's (1965) technique has been employed to calculate the concentration index of crop area.

$$\text{Index of crop concentration} = \frac{\text{Area of crop 'a' in an areal unit}}{\text{Total cropped area in an areal unit}} \div \frac{\text{Area of crop 'a' in the region}}{\text{Total cropped area in the region}} \times 100$$

Sugarcane a premier cash crop uses about half of gross area irrigated and ranks first among irrigated crops in the state. However, its spatial distribution differs largely throughout the region. The analysis of the indices thus calculated by Bhatia's Location Quotient Method reveals that relatively significant (over 200) concentration of the cultivated area under

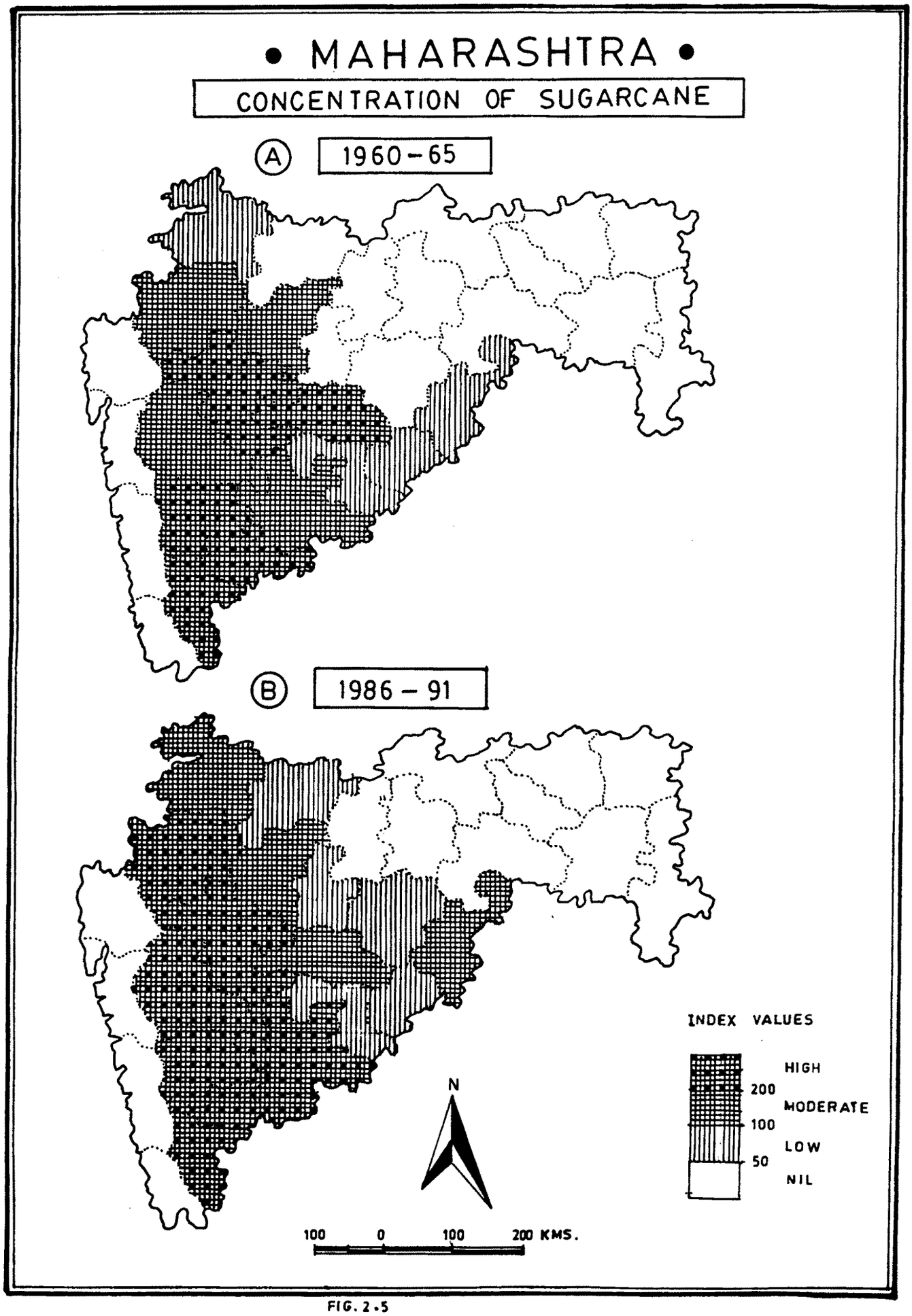
• MAHARASHTRA •
CONCENTRATION OF SUGARCANE
A
1960-65
B
1986 - 91
INDEX VALUES
HIGH
200
MODERATE
100
LOW
50
NIL
N
100 0 100 200 KMS.

FIG. 2.5

sugar is confined to the western upland districts namely, Ahmednagar, Kolhapur, Solapur, Sangli, Satara, Pune and Nasik (Fig.2.5-B). This is the area where irrigation facilities are comparatively more developed and high to very high agricultural productivity in the state is noteworthy (Shinde, et al. 1978). Besides, the fertile alluvial tracts, vicinity of sugar factories and market, well developed network of transportation, suitability of moisture and temperature conditions are other contributary factors which have stimulated the extension of cane cultivation in this part of the state (Jadhav,1984). The moderate (100 to 200) and low (50 to 100) concentration of sugarcane is elongated in north-south direction i.e. from Dhule in the north to Nanded in the south. Elsewhere cane concentration is insignificant which can be well attributed to the poor irrigation facilities, less fertile soils and moisture deficiency in these parts of the state.

The period under investigation has witnessed phenomenal growth in the area under sugarcane which rose from 155,300 hect. (1961) to 444,000 hect. (1991). The significant increase over 25 percent of the cultivated area is confined to the districts of the Ahmednagar and Kolhapur (Fig.2.5 A,B).

2.3.4 Levels of sugarcane productivity :

The production of sugarcane per unit area is also an important aspect of sugarcane cultivation. An increase in area

under sugarcane alone will not solve the problem of sugarcane shortage. In order to meet the demand for raw material of sugar factories and jaggery industry, increase in yield per unit area is necessary (Jadhav,1984). The levels of sugarcane productivity is the manifestation of the integrated impact of factors like physical, social, economic and institutional. An attempt is made to assess districtwise level of agricultural productivity. For an objective measurement of the level of agriculture productivity, the relative crop yield and concentration indices arranged in ranking order and computed into average ranking co-efficient, would give a measure which one may call the crop yield and concentration indices ranking co-efficient (Singh,1984). The procedure is as follows -

(A) $$Yi = \frac{Y_{a_e}}{Y_{a_r}} \times 100$$

Where, Yi - is the sugarcane yield index,

Y_{a_e} - is the average yield per hectare of sugarcane in the unit, and

Y_{a_r} - is the average yield of the sugarcane in the entire region.

(B) $$Ci = \frac{P_{a_e}}{P_{a_r}} \times 100$$

Where, Ci - is the sugarcane concentration index

P_{a_e} - is the percentage strength of sugarcane in the total harvested area in unit, and

P_{a_r} - is the percentage of sugarcane in the total harvested area in entire region.

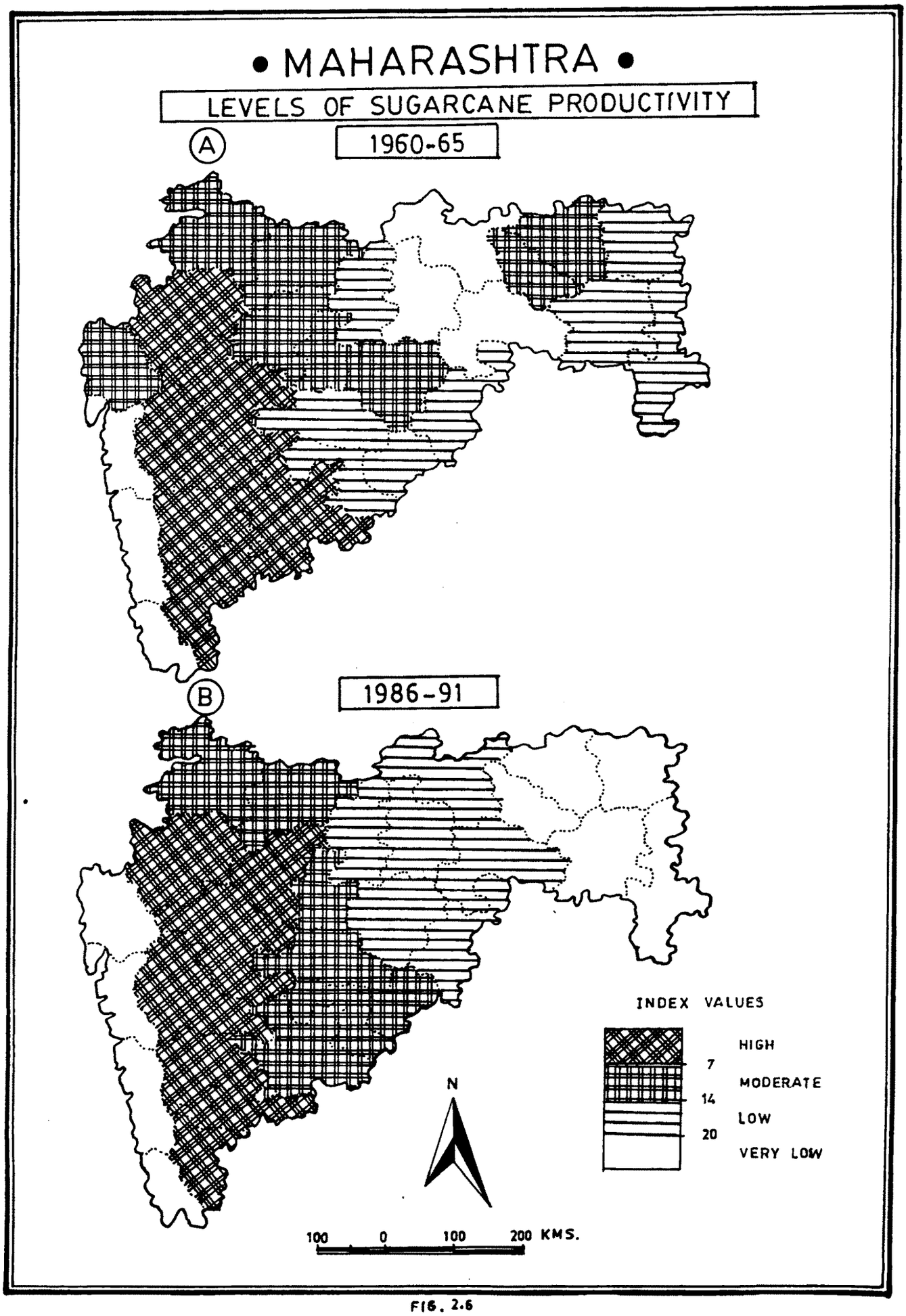
• MAHARASHTRA •
LEVELS OF SUGARCANE PRODUCTIVITY
A
1960-65
B
1986-91
INDEX VALUES
HIGH
7
MODERATE
14
LOW
20
VERY LOW
N
100 0 100 200 KMS.

FIG. 2.6

(C)

$$\text{Sugarcane yield and concentration indices ranking coefficient for sugarcane} = \frac{\text{Sugarcane yield index ranking of sugarcane} + \text{Sugarcane concentration index ranking of sugarcane}}{2}$$

The lower the ranking co-efficient, the higher the level of agricultural (sugarcane) productivity and vice-varsa. Based on the sugarcane yield and concentration indices ranking coefficient for sugarcane, Maharashtra is divided into four zones as high, moderate, low and very low (Fig.2.6 A,B).

1) <u>High level of productivity zone</u> :-

The zone comprises seven western upland districts of Maharashtra namely, Ahmednagar, Kolhapur, Satara, Pune, Nasik, Aurangabad and Sangli and their ranking coefficient is 1 to 7 respectively in 1986-91. This zone comprises 30 percent of geographical area, 57 sugar factories and more than 60 percent area under cane cultivation in the state. Alluvial, loamy to black soils, sustained development of irrigation, heavy application of fertilizers, intensive nature of cane cultivation, role of sugar factories in the supply of various inputs, finance made available by cooperative sector, government policies, large scale use of improved implements in cane farming, have all contributed to higher level productivity of sugarcane. This zone may well be regarded as the "Sugarcane heart land" of Maharashtra.

2) Moderate level of productivity zone :-

The moderate level of sugarcane productivity ranging from 8 to 14 ranking coefficient values is confined to the districts viz. Dhule, Jalagaon, Solapur, Jalana, Osmanabad, Beed and Latur in 1986-91. This zone comprises 24 percent of geographical area, 27 sugar factories and 27 percent area under cane cultivation of the study region. Difficiency of rainfall, inadequate supply of water during lean rainfall months and less application of fertilizers have hampered the cane productivity of this zone.

3) Low level of productivity zone :-

This zone includes six districts namely, Buldhana, Akola, Yeotmal, Nanded, Parbhani and Amaravati. The low level of productivity ranges from 15 to 20 ranking coefficient values. This zone comprises 23 percent of geographical area and 10 sugar factories of the state. All these districts have 7 percent area under cane cultivation. Defficiency of rainfall, meagre water supply and less fertile soils have affected productivity of sugarcane.

4) Very low level of productivity zone :-

This zone comprises eastern and littoral districts of Maharashtra. This zone shares 23 percent of geographical area 3 sugar factories and only 7 percent area under sugarcane

cultivation of the state. The hilly and rugged topography, poor soils, meagre water supply and inadequate application of fertilizers are responsible for very low level of sugar-cane productivity.

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