

Population Growth and Economic Development in Bihar

**Dissertation submitted to the Jawaharlal Nehru University
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MASTER OF PHILOSOPHY**

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1990

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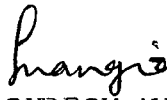


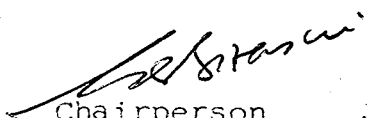
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CERTIFICATE

Certified that the dissertation entitled
"POPULATION GROWTH AND ECONOMIC DEVELOPMENT IN BIHAR"
submitted by Mr. Praveen Kumar in partial fulfilment
of six credits out of total requirements of twenty-
four credits for the award of the degree of Master of
Philosophy (M.Phil) of this University, is his original
work and may be placed before the examiners for evalua-
tion. This dissertation has not been submitted for the
award of any degree of this or any other University to
the best of my knowledge.


(DR. SUDESH NANGIA)
Supervisor


Chairperson

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A handwritten signature in cursive script, appearing to read 'Praveen Kumar', enclosed within a circular scribble.

(Praveen Kumar)

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Chapter I

INTRODUCTION

1.0 Statement of the Problem

Population growth and economic development are two sides of the same coin. Population growth is a natural process and economic development is necessary for the prosperity of the region. The basic aim of planned and sustained economic growth and development has been assured by the state in almost every country of the world. This is now acknowledged as the most important goal of economic policy. This responsibility, however, acquires greater importance in a democratic country wedded to the policy of growth with social justice. The very preamble of the Indian constitution guarantees social, economic and political justice and resolves to create conditions for equality of status and of opportunity for all the citizens.

The study, on population growth and economic development in Bihar, aims at identifying the pattern of population growth and economic development on one hand and the relationship between the two, on the other.

The state of Bihar is considered to be one of the least developed states in India, though in terms of its natural resources it is rated quite rich. For example, situated in the Gangetic plain, it has fertile alluvial

soil. Out of every 100 acres of land in the state, nearly 49 acres are under the plough as against 46 acres in India. Even more in the districts of north Bihar plain, out of every 100 acres of land, nearly 60 to 74 acres are under the plough. Despite vast agricultural lands, agriculture in Bihar suffers due to low irrigation facilities, devastating flood in the low lying areas of North and South plains and drought in large areas of Chhotanagpur plateau.

South Bihar, especially Chhotanagpur plateau which is the richest mineral belt in India, is compared to the 'Ural region' of the USSR. It contains the world's largest reserves of mica and also large quantities of iron ore, coal, copper, bauxite, lime stone, kayanite, chromite, asbestos, clay etc. Thus providing large scope for the development of heavy metallurgical and other industries in the region. Although varying degree of industrialization has taken place in this region, it is not up to its fullest potentialities.

Bihar, with a population of 69,914,734¹ persons and a density of 402 persons per square kilometre, is the second most populous and the third most densely populated state of India. Thus it is also very rich in human resources. But only 30 per cent of the total population of Bihar

1. District Census Handbook, Part XIII A & B, Giridih district, Census of India, 1981.

consists of workers as against 34 per cent for the country as a whole. Nearly 70 per cent of the workers are engaged in primary activities in Bihar as compared to 60 per cent of the country. The high percentage of workers in secondary and tertiary sector is generally regarded as an indicator of economic development. But in this case also we find that the position of Bihar is below the country's level. For example, in Bihar the percentage of workers engaged in secondary and tertiary sectors is 9.66 and 7.11 respectively as against 16.7 and 11.2 respectively for the country as a whole. Thus it is found that Bihar is lagging behind in respect of workforce, although it is one of the most populous states of the country. Urbanization and literacy are also generally regarded as indicators of economic progress. In Bihar the urban population constitutes only 12.47 per cent of the total population and the extent of literacy is 26.20 per cent.

Thus in spite of rich agricultural land, water, mineral and human resources, Bihar rates low in economic development and progress.

1.1 Introduction to the Area

The state of Bihar extends approximately from 21° 58' 10" north to 27° 31' 15" north latitude and 83° 19' 50" east to 88° 17' 40" east longitude.² It is

2. Government of Bihar (1972), Bihar Through Figures, Directorate of Statistics and Evaluation, Secretariat Press, Patna.

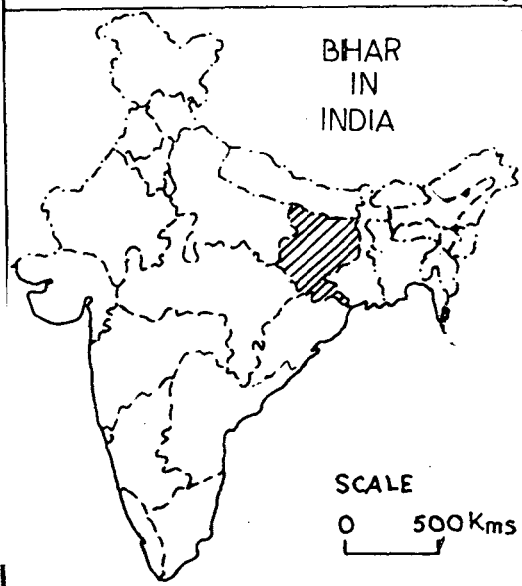
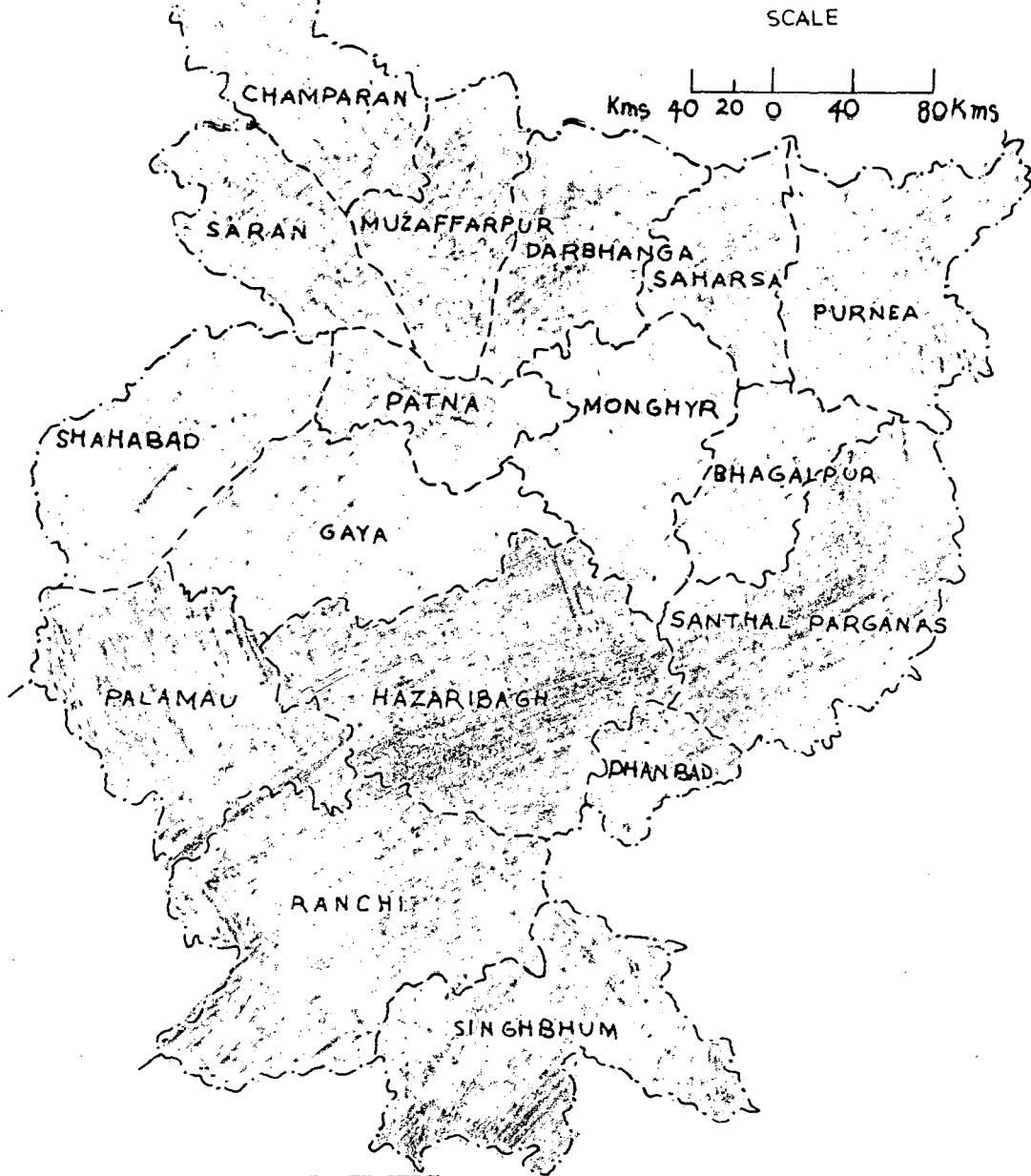
a land locked territory with an area of 67,196 square miles (173,876 square kilometres).³ It has a common boundary with Nepal in the north, West Bengal in the east, Orissa in the south and Uttar Pradesh and Madhya Pradesh to the west.

According to 1981 Census, the state of Bihar, with a population of 69,914,734 (70 million approximately), is the second most populous state after Uttar Pradesh (110 million approximately) and with a density of 402 persons per square kilometer, it is the third most densely populated state in India after Kerala and West Bengal (654 and 614 persons per square kilometer respectively). It occupies about 5.3 per cent of total area of India whereas its share of total Indian population is about 10.20 per cent.

Bihar is the only state where the Indian plain and plateau really meet. The state, therefore, is geographically representative of the two major Indian physical units - the young unstable alluvial Indo-Gangetic plain and the ancient rigid crystalline peninsular upland of granite, gneiss and schists rich in mineral resources. A little portion of new folded

3. Government of Bihar (1980), Bihar Statistical Hand Book, Directorate of Statistics and Evaluation, Secretariat Press, Patna.

BIHAR - THE STUDY AREA



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NORTH BIHAR PLAIN



SOUTH BIHAR PLAIN



CHHOTANAGPUR PLATEAU



mountains (Himalayan Siwaliks), is also represented in the extreme north-western part of this state. The state of Bihar, thus, can be divided into the following three physiographic regions:

- i) Himalayan foothills
- ii) The Gangetic plain
 - a) North Bihar plain
 - b) South Bihar Plain
- iii) Southern hills and plateaus.

(1) Himalayan Foothills

This is a narrow hilly region in the extreme north-western part of Bihar in Champaran district. This is a part of well known Siwalik range of the Himalayan foothills, which was formed during tertiary time. This region covers an area of about 364 square miles.⁴

The Himalayan foothills is roughly delimited on the south by 500 feet contour line. The region consists of two hill ranges - the Ramnagar Dun and Sumeswar Range - with intervening valleys, all parallel to the Nepal border in a north-west to south-east direction. The Ramnagar Dun or Dun Range is about 32 kilometer along and comparatively lower than the Sumeswar Range which runs along 72 kilometers at an average attitude of

4. Enayat Ahmad (1965), Bihar - A Physical, Economic and Regional Geography, Ranchi University Press, Ranchi.

about 1500 feet (about 450 metres) above sea level. The whole of this region is made up of relatively young, sedimentary rocks of late tertiary time (sandstones and pebbles).

(ii) The Gangetic Plain

The second major physiographic region of Bihar is the Gangetic plain which covers an area of about 79,600 kilometer or about 45 per cent of territory of the state. It is roughly delimited in the south by 150 meter contour line. On the basis of differences in relief features the Gangetic plain has been divided into two parts⁵ (by river Ganges).

a) North Bihar plain

b) South Bihar plain

(a) North Bihar Plain: The entire plain area lying north of River Ganges is known as North Bihar plain. Politically it comprises the districts of Chapra, Sitamarhi, Siwan, East Champaran, West Champaran, Vaisali, Muzaffarpur, Darbhanga, Saharsa, Madhubani, Purnea, Samastipur, Begusarai and Khagaria. It accounts for about 27.96 per cent of the total area of the state and about 66.81 per cent of the total area of the Gangetic plain. It is

5. National Council of Applied Economic Research (1959), Techno-Economic Survey of Bihar, vol.1, Leader's Press (p) Ltd., Asia Publishing House, New Delhi.

composed of highly fertile alluvial soil and thus provides for a strong agricultural base. The whole of this area is almost a dead level plain. The imperceptible general slope is from the north-west to the south-east as shown by the courses of the rivers. From the north western to the south-eastern corner of North Bihar Plain the slope is roughly 100 feet to 250 miles. The region is drained by snow fed perennial rivers (the tributaries of Ganges) namely Gondak, Burhi Gandok, Gagra, Bagamati, Kosi etc.

(b) South Bihar Plain: The plain area lying south of River Ganges and north of 500 feet contour line is known as south Bihar plain. Politically, it comprises the districts of Patna, Gaya, Nalanda, Aurangabad, Rohtas, Bhojpur, Munger and Bhajalpur. It covers about 13.89 per cent of the total area of the state and about 33.19 per cent of the total area of the Gangetic plain. This plain is irregularly defined in the south because of the approach of the southern hills and plateaus. It gradually tapers from a wide base in the west to a narrow tongue on the north of the Raj Mahal hills. Its surface rises rapidly away from the river Ganges than the north Bihar plain. It is largely made up of the alluvium brought from the southern hills and plateau. Whereby, providing sound agricultural base. Its general slope is from the south west to the north-east. It is also drained by many

rivers like Sone, Punpun, Morhar, Phalgu, Chandan etc.

- As we move towards south, outliners of ancient crystalline rocks appear as low and high hills, for example Pirhari Hills (361 feet) near Bihar-Sharif, the Barabar Hills in Gaya district, the Rajgir hills (1462 feet) which extend continuously towards Gaya and the Kharagpur hills (500 to 1000 feet) in Munger district.

(iii) The Southern Hills and Plateaus

It comprises the districts of Palamau, Hazaribagh, Ranchi, Singhbhum, Dhanbad and Santhal Parganas. It accounts for about 57.60 per cent of the total area of the state. The whole area south to the 500 feet contour line constitute hills and plateau region of south Bihar. All this tract except the Kaimur Plateau of Sahabad and the Rajmahal Hills of Santhal Parganas is known as Chotanagpur plateau. There are four plateaus in Chhotanagpur region. These are:

- i) Higher Ranchi Plateau (2500 to 3600 feet above sea level) composed of Deccan lava.
- ii) Lower Ranchi Plateau (about 2000 feet above sea level) made up of mostly granite stone and gneisses.
- iii) Lower Chhotanagpur Plateau (about 1000 feet above sea level) composed of granite gneisses, schists and other Dharwar rocks, and

iv) The lowest Plateau having uniform surface formed by the river valleys, plains (500 to 1000 feet above sea level) composed of granite and gneisses and partly of schists etc.

The basaltic Rajmahal Hills which were formed towards the end of Gondwana period and the Kaimur Plateau of Vindhyan period composed of sand stones belong to the fourth erosion level or the lowest plateau. The highest point in Bihar is formed by the isolated conical hill of Parasnath rising up to 4480 feet above sealevel, which is situated in the eastern part of Hazaribagh district or Chhotanagpurst plateau region.

The whole of this region is drained by three main rivers - Damodar, Baraker and Suburnrekha - which directly flows to the Bay of Bengal. The Damodar river flows from west to east through the middle of Chhotanagpur. And thus, provide enough scope for hydroelectric generation and irrigation in the region. Baraker flows in easterly direction while Suburnrekha to south easterly direction, thus, indicating the general slope of this region towards east and south-east direction. The valley belt of Damodar consists of softer rocks known as Gondwana while the rest of Chhotanagpur plateau is composed of hard crystalline rocks of granite, gneisses and schists and is, therefore, rich in mineral resources. It contains

the world's largest reserves of mica and also large quantities of iron ore, coal, copper, bauxite, limestone, Kyanite, Chromite, asbestos, clay etc. and thus provides enough opportunities for the development of heavy metallurgical and other industries in the region. As the hills and plateaus are covered by forests, this region is also very rich in forest resources.

In spite of all these natural endowments the state of Bihar remains underdeveloped. Thus there exists a paradox, "A region rich in natural resources but poor in economic development."

1.2 Objective of the Study

- (a) To study the pattern of population growth.
- (b) To study the pattern of economic growth - essentially the growth in agriculture, industry and infrastructure
- (c) To identify the relationship between the pattern of population growth and that of economic development
- (d) To determine the level of development of districts and group them together into regions accordingly.
- (e) To identify the factors that contribute to disparities in level of development between regions.
- (f) To suggest patterns of integrated development of Bihar in an intra regional and inter regional context.

Administrative Division of Bihar

During 1961 and 1971 also, there were only seventeen districts in Bihar. But at present there are thirty one districts. The administrative consideration play an important role in making development plans. Thus a region which is not administratively viable would be hardly of any use. Therefore, in the present study district has been selected as unit area. The availability of data also act as an important constraint in the choice of regions. As the data are not available in terms of new thirty one districts, the old seventeen districts have been selected for the present study and grouped into the following districts.

<u>District Code No.</u>	<u>For 1961, 1971</u>	<u>For 1981</u>
1	Patna	Patna Nalanda
4	Gaya	Nawadah Gaya Aurangabad
32	Sahabad	Bhojpur Rohtas
8	Saran	Saran Siwan Gopal Ganj
11	Champanan	East & West Champanan
14	Muzaffarpur	Muzaffarpur Samastipur Vaisali

18	Darbhanga	Darbhanga Madhubani Sitamarhi
23	Munger Saharsa	Munger Saharsa Begusarai
24	Bhagalpur	Bhagalpur
21	Purnia	Purnia & Katihar
25	Santhal Pargana	Santhal Pargana
29	Palamu	Palamu
26	Hazaribagh Dhanbad	Hazaribagh Dhanbad Giridih
30	Ranchi	Ranchi
31	Singhbhum	Singhbhum

1.5 Database and Methodology

The present methods of planning in Bihar are scheme based and not area based. For example, there are separate plans for industrial, agricultural, transportation, production, etc. development. Sometimes on the basis of one variable, area is divided into developed and undeveloped. As we know that backwardness is a multidimensional problem covering not only industries but also, agrarian, social, economic and political structure. If at a time only one variable is taken and development plans made, there would be an over all development of the region. For an overall development or balanced development of a region all possible

variables contributing to the development would be considered at the same time. The time constraints inhibit intensive study. Do this study is, therefore, a preliminary attempt and yet, a necessary step in the analysis of the problem. These variables have been classified into following three broad categories.

- i) Agricultural
- ii) Industrial
- iii) Infrastructural

The First Group in Agriculture (Variable)
Consists of the following Variables

- G₁ - Persons per hectare cropped area
- G₃ - Persons in agriculture & cultivators
- G₄ - Persons engaged in primary sector
- G₈ - Per hectare yield of crops in rupees
- G₉ - Gross irrigated area to total gross cropped areas
- G₁₀ - Fertilizers used per 10,000 hectare cropped area
- G₁₁ - Tractors used per 10,000 hectare cropped areas
- G₁₂ - Pumpsets used per 10,000 hectare cropped areas
- G₁₃ - Number of cultivators per 10,000 population
- G₁₄ - Number of agriculture labours per 10,000 population
- G₁₅ - Number of persons engaged in livestock, forestry and hunting per 10,000 population.
- G₂₃ - Workers engaged in agriculture sector per 10,000 total workers
- G₂₄ - Workers in primary sector per 10,000 of total workers

2. The "Industrial" Variable

- G₂ - Number of total workers engaged to total population
- G₅ - Persons engaged in manufacturing sector
- G₆ - Persons engaged in secondary sector
- G₁₆ - Workers in mining and quarrying to 10,000 general population
- G₁₇ - Workers in household industries to 10,000 population
- G₁₈ - Workers in other than household industries to 10,000 population
- G₁₉ - Workers in construction to 10,000 population
- G₂₅ - Workers in manufacturing to 10,000 workers
- G₂₆ - Workers in secondary sector to 10,000 workers
- G₃₈ - Number of factories functioning per 10,000 population
- G₃₉ - Number of factories functioning per 10,000 population

3. "Infrastructural Socio-economic" Variable

- G₇ - Persons engaged in tertiary sector
- G₂₀ - Persons engaged in trade and commerce to 10,000 population
- G₂₁ - Persons engaged in transport, storage and communication in 10,000 population
- G₂₂ - Persons engaged in other services to 10,000 population
- G₂₇ - Workers in tertiary sector to 10,000 workers
- G₂₈ - Population growth rate
- G₂₉ - Density of population per sq. km.
- G₃₀ - Number of females per 1000 males
- G₃₁ - Percentage of literates to total population
- G₃₂ - Percentage of urban population to total population
- G₃₃ - Number of vehicles on per 100 km of PWD road

- G₃₄ - Number of vehicles per 10,000 of population
- G₃₅ - Number of trucks per 10,000 of population
- G₃₆ - Number of buses per 1 lakh of population
- G₃₇ - Number of hospitals per 1 lakh of population
- G₄₀ - Percentage of female workers employed by factories to total number of factories
- G₄₁ - Number of female workers per 10,000 workers

The varying density of population in a region does not run without logic or reasoning. It is due to certain physical, social and economic factors. In the present study the density of population has been included only with a view to examine (or observe) its distributional pattern and relationship with the factors contributing to the development of Bihar. The rest of the variables of groups have been selected on the basis that they indicate the levels of socio-economic development of a region.

In pursuance of the main objective of working out the levels of economic development, districtwise data on all the variables mentioned above have been collected for three time period 1961, 1971 and 1981.

At the outset, it is important to point out that all the indices chosen are more or less essential and upto the standard requirement. On the contrary one is compelled to abandon certain more obvious and 'significant' indices (e.g. per capita consumption of power, per capita income) merely because at the paucity of data. The analysis is based on the premise that a society endowed with the potential of

human and natural resources if provided with certain degree of agricultural, industrial and infrastructural facilities is bound to have certain degree of economic development.

For computing the composite index of the level of economic development for each unit (that is district) simple ranking method (principle component method) has been applied.

Construction of Composite Index

At the first step in our study the composite index for each sector has been calculated with the help of the selected indicators under each sector. This sectorwise composite index would enable us to know the position of different districts in respect of different sectors. As our study is based on the analysis of data for three time periods, the sectorwise composite index can give more information about the relative changes that took place in different sectors during the decades under study. Next, the composite index for the overall economy has been calculated by taking all the sectors into account for all the three time periods.

It may be mentioned here that there are various methods of constructing composite index of the levels of development of a region. In this study, ranking method has been used to present inter-district disparity in Bihar. However, no weight was assigned to the variables in this method. The lacunae of absence of weights for the variable, or the use normalised matrix (x) and the correlation

matrix $R (= \frac{X^1 X}{n})$ by matrix $A (= \frac{X^1 X}{n})$. Normalised matrix can be obtained by simply dividing the column data by their respective means. We, then, follow the same steps as explained above to get the final weights and the final weights are ultimately multiplied with the normalized data to get the final composite index. This method is often known as maximising the sum of squared projections.⁶

In this section, the sectoral development indices⁷ have been obtained by applying Kandall's methods of maximising the sum of squared projections which is identical statistically to the first principal component of variables considered in each economic sector.

A full fledged component model may be put as follows.

$$Z_j = a_{j_1} P_1 + a_{j_2} P_2 + \dots + a_{j_i} P_i + \dots + a_{j_m} P_m \dots \dots (1)$$

Where $Z_j = \frac{X_j - \bar{X}}{s X_j}$ or standardised variable

$P_i = (i = 1, 2 \dots m)$ are the principal components .

$a_{j_i} = j = 1, 2 \dots n$ are the coefficients or factor loading of $i = 1, 2 \dots m$ the j^{th} variable relating to i^{th} component

The each component explains certain portion of variance of i^{th} variable. To put it other way, each principal component

6. Amitabh Kundu, "Construction of Indias for Regionalisation: An enquiry into the methods of Analysis," Geographical Review, vol. 37, no.1, March 1975.

7. M.G. Kandall, "The Geographical Distribution of Crop Productivity in England," Journal of Royal Statistical Society, vol.102, 1939, pp.21-48

is a linear combination of weighted variable. This can also be written as:

$$P_i = \sum_{j=1}^n a_{ij} X_j \text{ where } a_{ij} = \text{factor loading of 'j' variable} \\ j = 1, 2, \dots, n \text{ or}$$

$$P_i = a_{1i} X_1 + a_{2i} X_2 + a_{3i} X_3 + \dots + a_{ni} X_n \quad (2)$$

$$P_i = 1, 2, \dots, m \text{ (components)}$$

a_{ij} = factor loading of jth variable on ith component,

X_j = variables.

In this model, we have used to delineate homogenous regions and to identify typological dimensions. The total variance is thus explained here in terms of 'm' components.

For purpose of constructing of equal weights is sought to be corrected by the more rigorous principal component analysis, which together with discriminant function, yields a more rigorous system of composite classificatory indices.

Although the principal component analysis is a powerful tool with immense utility in the regionalization, it has been pointed out that this method is not as objective as it appears to be.⁸ Subjectivity enters at various levels right from the process of selecting variables and unit areas to the cartographic portrayal of final results.

The mathematical steps that have generally been followed in the principal component analysis are as follows:

8. W. Isard, D.F. Brahmall and D.O. Price, "Factor Analysis with Particular Reference to Regional Delineation", in W. Isard, ed., Methods of Regional Analysis: An Introduction to Regional Sciences (New York, 1960), Appendix B, pp.293-305.

(i) The given data matrix is standardized to get the correlation matrix $R (= \frac{\sum x_i^2}{n})$. Standardization means subtraction of the column mean from the individual values for all the observation given in the column and then provide them by the respective column standard deviation. The standardization of raw data eliminates the biasness of scale and the data becomes comparable. Then with the help of the characteristic equation $(R - I) K = 0$, we get the eigen values (values). Taking the highest eigen value which explains the highest variation one get the corresponding eigen vector (k). This eigen vector represents the weights. These weights are finally multiplied with the standardised matrix to get the final composite Index.

The logic behind this method is that it enables us to determine the vector known as the first principal component (linearly dependent on variables) having the maximum sum of squared correlations with the constituent variables. However, this principal component analysis is not very suitable in underdeveloped countries to measure the levels of development as we are to face the problem of 'negative weights' and 'weights' are determined strictly on the basis of correlation i.e., higher the inter-relation, higher shall be the weight. But it is to be noted that negative weights are found mainly due to the negative elements in the correlation matrix which

are quite natural in the developing country like India. However, it is quite difficult to explain its correlation with the purpose. Similarly, there cannot be any a priori justification of assigning higher 'undue weights' to highly correlated variables that undermines the other variables.

Thus, our emphasis lies on the technique which can present a picture closer to reality. The problem of 'negative weight' and 'undue importance' to a particular indicator can be solved by replacing the standardized matrix (X) by the composite index of development, we have taken only the First Principal component into consideration. By definition, First Principal Component, is that linear combination of weighted variables which explains the maximum variance. Then:

$$P_1 = Q_{11} x_1 + Q_{21} x_2 + \dots + Q_{n1} x_n$$

The measure of the first component can also be written in the following way:

$$P_i = \frac{Q_{j1} x_j}{1}$$

where Q_{j1} ($j = 1, 2 \dots n$) are the factor loading.

Z_j = standardised variable i.e. $\frac{X_i - \bar{X}}{x_i}$ and

1 = eigen value (largest characteristic root).

The composite Index 'I' either at the sectoral level or at the aggregate level, is nothing but the

First Principal Component itself. Thus:

$$I_1k = P_1k \quad k = 1, 2 \dots k \text{ observation.}$$

A simpler measure adopted to arrive at I_1k or P_1k in the study is =

$$I_1k = Qj_1 \times \frac{X_{jk} - \bar{X}}{x_j}$$

Thus

I_1k = composite index value of k^{th} observation

Qj_1 = Factor loading at j^{th} variable

X_{jk} = j^{th} variable on k^{th} observation and

x_j = standard deviation at j variable.

Where

V_w = weighted coefficient of variation

Y_i = Index of i^{th} district

\bar{Y} = average index of the districts

P_i = population of the i^{th} district

P = total population of all the districts.



Sources of Map

TH-7001

In this study, the levels of economic development of all the districts of Bihar have been shown by separate map for each year and for each development indices. Like, agricultural, industrial, infrastructural and overall development have been shown by separate maps for every year viz., 1961, 1971 and 1981. There is also a map which shows the study area and location of study area in India.

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Measures of Regional Disparities

Regional disparity can be measured with the help of simple coefficient of variation. But to get on accurate picture of the degree of disparity, it is perhaps better to include the normalised distribution of population⁹ into account. So, in order to estimate and compare the prevailing regional disparities in different sectors of the economy under study at three points of time the weighted coefficient of variation¹⁰⁰ has been calculated with the help of the following formula:

$$V_w = \frac{\sum (Y_i - \bar{Y})^2 \cdot P_i/p}{\bar{Y}} \times 100$$

1.6 Plan of the Study

The present study aims at district level analysis of population growth and economic development. The dissertation has five chapters in all.

9. T.Watanbe, "Economic Aspects of Dualism in the Industrial Development of Japan," Journal of Economic Development Cultural Change, vol.13, no.3, April 1965, pp.301-5.
10. J.C.Wilhiamson, "Regional Inequality and the Process of National Development: A Description of Patterns" in N.Neeleman, ed., Regional Analysis, p.11.

The first chapter deals with the statement of the problem and introduction to the area. It also contains objectives of the study and methodology. After literature surveyed, hypotheses have been formulated in this chapter.

The second chapter is about population profile which contains introduction and is followed by information about density, growth rate, sex ratio, literacy rate and urban population.

The third chapter deals with various aspects of economic development. It has an introduction and states the methodology used in the study. It also contains the correlation analysis of the variables related to agricultural development, industrial development and infrastructural development. It also includes summary which contains relationship between economic development and agricultural development, industrial development, infrastructural development.

The fourth chapter deals with population and economic development and patterns of association. It analyses the relationship of population with agricultural development, industrial development and infrastructural development. Various demographic aspects

of population have also been discussed in this chapter such as density, urban population, literacy rate, sex-ratio and growth rate.

The fifth chapter is the summary which enumerates the conclusions drawn and suggests certain strategies for the development of Bihar.

1.7 Literature Survey

Literature on population growth and economic development is available both at international and national level. A few studies have been reviewed in the following pages to obtain guidelines for the present exercise.

Studies on International Level

The population problem, since it was significantly posed at the beginning of the 19th century, has always been closely related with economic development. Originally it was put specifically in terms of population and food supply and their unequal rates of growth. But soon the canvas widened with the growth of overseas communication and trade. First, agriculture production as a whole and later total production of goods and services came to be considered as the more relevant variables in the context of population. Among the classical economists, Malthus systematically brought out the inter-connection between

population and food supply. He summarised this idea "population, when unchecked goes on doubling itself every twenty five years, or increase in Geometrical ratio."¹¹ While food production by any imaginable "exertion of mankind" is unlikely to increase at a similar rate."¹² This leading to a state of over population. This stage is known through the existence of certain symptoms such as poverty, epidemic diseases and floods. Obviously, Malthus could not find the great developments in technology which took place in the periods following the last two decades of the nineteenth century.

Theoretically, there are always several types of relationship between a rising population and economic development.

The relationship between agriculture and population continued to attract attention and around the early years of 20th century it came to be crystallized in conjunction with theory of optimum population, into the concept of optimum density per unit of area,¹³ in any particular

11. Malthus, T.R., Essay on the Principle of Population (1798), Everyman edition, 1960, Chapter I, p.8.

12. Ibid., p.10.

13. Myrdal, (Gunnar), Population: A Problem for Democracy, Cambridge, 1940.

context. The discussion during the 1920s was, mainly focussed on over population since the population was growing very rapidly. Robbins thought that there would be insufficient savings for such a growth rate of, population. In 1948, United Nations¹⁴ provided data for a large number of countries on rural and urban population. Again on 1952 the demographic year book,¹⁵ Contained rural-urban breakdowns of population for 160 countries and an introductory chapter on "urban trends and characteristics." In these demographic year books, the analysis never focuses specifically on the trends and conditions of population growth and urbanization, but rather on urban rural differentials. The basic importance of these yearbook is that these publications had actually stimulated research on population.

Hoyt (1962)¹⁶ was the first scholar who made extensive use of data previously published by the United Nations and International population and urban research world urbanization 1950-70: Volume I basic data for cities, countries

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14. United Nations (1948), Demographic Yearbook, New York United Nations, 1949.
 15. United Nations (1952), Demographic Yearbook, New York, United Nations, 1953.
 16. Hoyt Homer, World Urbanisation: Expanding Population in a Shrinking World, Washington, Urban Land Institute, 1962.

and region was the second major effort in the study of urbanization, done by Kingsley Davis¹⁷ in 1949. This volume constitutes a source book of worldwide statistics on urban and rural population, on the number and size of cities, and on indices of urbanization and development, all made comparable in regard of time.

In 1972, Davis¹⁸ published his second volume which represents a comprehensive effort to analyze the level and trend of world urbanization. In this volume Davis tried to focus on the relation between world urbanization and the growth of the world urban and rural population, the distribution of population among cities of various sizes and the effects of cultural and economic development on urbanization. Berry (1962)¹⁹ pointed out that economic association of the region exist between the level of economic development of a country and degree of urbanization. These two things are the basic criteria for the overall development of

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17. Davis Kingsley, World Urbanization 1950-70, vol.I, basic data for cities, countries and regions, Berkeley Institute of International Studies, University of California, 1949.
 18. Davis Kingsley (1972), World Urbanization 1950-71, vol.II, Analysis of Trends, Relationship and Developments, Berkeley, Institute of International Studies, University of California,
 19. B.J.L.Berry, "Some Relation of Urbanisation and Basic Pattern of Economic Development," in F.R. Bryce, ed., (1962), Urban System and Economic Development, Eugene Oregon, 1962.

any country or region. Berry²⁰ in his another study noted the rank size distribution, and says that cities perform essentially the same set of functions as centres of transport routes, as Centres of primary or secondary economic activities or as central places preparing tertiary economic functions.

In the 1930s Keynes²¹ resurrected Malthusian principle of effective demand in a fashion alien to Malthus. He thought a situation of declining population along with a slower rate of invention than in the past century and an end of colonial expansion would adversely affect aggregate demand and marginal efficiency of capital. This view was also held by Marxist authors,²² who argued that a small consuming population is actually an impediment to the functioning of capitalist system.

The theory of demographic transition was first proposed (to reduce the growth rate of population) in the 1930s and 1940s. The studies of demographic transition during this period, mainly in Europe and

20. B.J.L. Berry, City Cize Distribution and Economic Development, in Economic Development and Cultural Change, IX, July 1961, p.575.

21. J.M.Keynes, General Theory of Employment, Interest and Money, New York: Harcourt, 1935.

22. P.M.Sweezy, Theories of Capitalist Development, London: Dennix Dobson, 1952.

North America, had emphasized the role of industrialization and urbanization in reduction of growth rate of population (by reduction in fertility through spread of birth control practices. But with the demographic transition taking place, in countries like Republic of Korea, Sri Lanka, Malaysia, which are characterised by agricultural rather than industrial development, the compulsive link between industrial development and demographic transition snapped out the debate opened out on whether development of agriculture or otherwise was not a necessary condition for bringing out demographic transition. It was soon clear that demographic transition had been almost with exception preceded by rapid and extensive development, not necessarily industrial, thereby suggesting that agricultural development can also be considered as effective agent of demographic transition.

In the wake of peace, after the second world war, soon followed the spread of public health and medical facilities. This lead to a fall in death rate throughout the world. With fertility continuing to remain at high level, the rates of population growth accelerated thus accentuating the food problem. It appeared as if the developing areas were back in Malthusian trap. The

debate began to be shifted from population and food supply to population growth and greater productivity in agriculture.²³

The high priority accorded to socio-economic development by countries that have achieved political independence sent a new dimension to the population problem. Whether the developing countries should concentrate on the agriculture development to meet the challenge of population explosion or should go in for industrialization as the best strategy for development, became the question of heated debate²⁴ and become entangled in the controversy regarding balanced versus unbalanced growth.²⁵ The concern for productive employment of the existing and rapidly growing labour force give rise to a whole debate of disguised and structural under employment in agriculture. This issue was also raised whether disguised unemployment

23. Theodore W. Shultz, Economic Crisis in World Agriculture, Ann Arbor Michigan, University of Michigan Press, 1965. Simon Kuznets, Demographic Aspect of Economic Growth in United Nations, Department of Economics and Social Affairs, Proceedings of the III World Population Conference, Belgrade, 1965, vol. I, New York, United Nations, 1966, p. 310.

24. Thomas Balough, Economics and Poverty, London: Weidenfield and Nicholson, 1966.

25. A. O. Hirschman, Strategy of Economic Development, New Haven, Yale University Press, 1958.

constituted a potential that could be profitably utilized for agricultural and other development. Coale and Edgar (1972)²⁶ pointed out that disguised unemployment was in fact only a reflection of population growth in excess of development of resources and that it was a hindrance rather than a help to development. The harmful effect on economic development of rapid population growth and population pressure through its adverse effects on savings and per capita income were emphasized by other. Hicks²⁷ noted that the danger of under-population (too small a population) for economic efficiency and of over-population (too large a population) are both real danger although arise from different causes.

While explaining the relationship between population pressure and land use, Ricardo²⁸ simply accepted the theory of population of Malthus so as to develop the theory of rent further. He explained that increase in population leads to more extensive land utilization as people move from superior to less superior and ultimately to marginal

26. Coale, Ansley and Edgar Hoover, Population Growth and Economic Development in Low Income Countries, Princeton; Princeton University Press, 1972.

27. Hicks, J.R., The Social Framework, London: Oxford University Press, 1965.

28. Ricardo, David, Principles of Political Economy and Taxation (London, 1821), III edition, p.47.

lands. As a result the superior lands will get surplus which the landlord can appropriate by way of rent of land.

Another relationship between population growth and land use have been brought out by Ester Boserup.²⁹ She maintained that population pressure (density) had played a constructive role in furthering agricultural and economic development. This view was in contrast to those argued that rapid population growth has adverse effect on economic development. Historically, the follow period has been decreasing as the population goes on increasing.

Further, she also deals with technical progression and regression depending on the density of population as she says "the growth of population is a major determinant of technological change in agriculture development."³⁰ Sparsely, settled population do not go in search of techniques unless population pressure works. Besides, she has also analysed how with growing population, when pressure on land increased, it led to the growth of societies having private ownership of property i.e. slavery, feudalism and capitalism.

29. Boserup, Esther; The Conditions of Agricultural Growth: The Economics of Agrarian Change Under Population Pressure (London: George Allen Unwin, 1965).

30. Ibid., p.56.

Habakkuk (1971)³¹ pointed out that role of technological change in economic development of the Third World, quantitative growth of population is considered as the greatest hindrance to development. High population growth rate as the most important factor of industrial development. Population control is the means for achieving higher productivity and economic development in the Third World. This would help in examining the fact that higher population growth leads to industrial development.

Easter Boserup³² (1981) has attempted to develop the idea that 'population change' is a major determinant of technological change and technological change is major determinant of demographic change. Population growth has resulted in changes in land use patterns from long fallow to short fallow to annual and multiple cropping, to increase the productivity. This study reveals that higher population pressure helped in increasing the agriculture productivity. Population growth thus resulted in changes in cultivation practices from extensive to intensive cultivation and changes in tools and implements - from wooden to iron and steel, plough and to mechanical one. This would help in determining the effect at high population growth rate on agriculture.

31. Habakkuk, J., Population Growth and Economic Development since 1750, Leinster University Press, 1971.

32. Boserup (Ester), Relationship between population growth technological change and economic development in 'Population and Technology', Blackwell Oxford, 1981, pp. 309-310.

Hirschman³³ (1975) pointed out that of all the instruments and strategies, provision of infrastructure facilities have come to be seen as the most effective means of initiating and sustaining economic growth at regional level. It may be inferred that the infrastructure plays an important role in economic development. It may help in examining the fact that to which extent infrastructure helps in economic development in Bihar.

Maitra³⁴ (1988) studied the relationship between population growth and technological change in recent approaches to development. Population growth plays a positive role in the early stage of technological change it generated indigenously by more productive use of human and natural resources and changes in organisation of production. The indigenously developed technology takes care of country's historical needs and factor endowments. Population growth is considered as a hindrance and not as conducive to indigenous technological growth and economic development.

Marxist View

Marx³⁵ has argued that population processes are related to the social organization. The marxist approach

33. Hirschman, A.O., "The Strategy of Economic Development", New Haven, Yale University Press, 1975.

34. Maitra (Priyatosh), "Recent Approaches to Development and Population Growth and technological Change", in The Indian Journal of Economics, vol.LXVIII, January 1988, No.270.

35. Marx, Karl, Capital, vol.I, (New York: The Modern Library, 1906), p.693.

was contended, in large part as a refutation of the theory of Malthus. Marx began by rejecting the Malthusian notion of a universal law of population, a position in line with fundamental assumption of Marxist Theory that all social laws are historically relative. In an often quoted phrase, Marx asserted that, "every special historic mode of production has its own special law of population, historically, valid within its limit alone." Given this position, Marx limited himself to developing a mode of population applicable to capitalist society. Over-population, according to him, is necessary because surplus population constitutes the reserve army of labour upon which the capitalist economic system relies.

Whereas, traditional Marxist social analysis has stressed the importance of the social relations of production within a given society, much recent marxists analysis has emphasized the impact of capitalist societies on economies of the currently developing societies.³⁶ This general line of thought has inspired some Marxist demographers to re-examine the accepted view of population. Imperialism, they have argued, has fundamentally transformed the economies of developing nations. The greatest obstacle to the development of Third World countries lies in fact in their dependence on the western developed countries and their own social economic system.

36. Frank, Andre Gunder, Capitalism, Underdevelopment in Latin America (New York: Monthly Press Review, 1969).

National Level

Mitra³⁷ has subscribed following reasons for a continuous rapid growth rate. Around 1950 it was usual to argue that the improvement in the population growth since 1920 was primarily due to supposed improvements in sanitation, public health and medical care. More recent investigation, however, seem to indicate that the share of these latter causes has been larly exaggerated and that this improvement was perhaps due more to improvements in employment, nutrition and food availability than to medical facilities. Transport and communication improved, particularly road and rail communication, enhanced Government's ability to despatch food with greater expedition at short notice to distressed areas agrarian and socio-economic reforms, including improvements in agricultural and industrial activity, and the growing ability of Indian people to resist imperial exploitation were perhaps responsible for creating a climate of confidence favourable for population growth.

Chandrasekhar³⁸ has enlisted a number of reasons to explain the recent population growth. He writes "a part of the explanation of the country's population growth

37. Mitra, Ashok, Population Growth, Nutrition and Food Supplies, Country Monograph Series

38. Chandrasekhar, S., Infant Mortality Population Growth and Family Planning in India, The University of North California Press, 1972, p.251.

is to be found in here formerly relatively high birth ratio and recently rapidly declining death ratio. These in themselves are products of the nation's age and sex composition....."

On another occasion he writes "as long as India continues to be predominantly an agrarian economy based on traditional immechanized subsistence agriculture with only small beginning a modernization through the so called green revolution, the need for a large rural labour force will continue to exist. This need is largely responsible for the desire for sons which has become through the centuries a fixed social and cultural attitude,"³⁹ which ultimately leads to higher population growth rate. This would help in analysing the population growth rate during 1961-71 and 1971-81.

Another important factor, according to him is the beginning at the health revolution in India, perhaps the major decisive factor behind the population growth in India due to decline in the nation's death rate.⁴⁰

39. Ibid., p.252.

40. Ibid., p.253.

Gyanchand⁴¹ (1939) discussed the growth of population between 1881 to 1931. in all the states of India. The growth of population in the districts of Muzaffarpur, Darbhanga, Saran and Patna were the highest during 1881. The population of these four districts was 28 per cent of the total provincial population in 1881, but reduced to 22 per cent in 1931. The population of Chhotanagpur, which is less than one fourth as thickly populated as these districts, has increased in the same period (1931) from 27 per cent of the provincial total in 1881 to 34 per cent in 1931. This would help in the present study to discuss the growth of population in the districts of Bihar plain and plateau.

Tewari⁴² (1970) described the trend, pattern and sufficiency of agriculture development vis-a-vis population growth from 1951 to 1966 in Uttar Pradesh. He divided the state into five regions - Himalayan, Western, Bundelkhand, Central and Eastern to study the pattern and growth of crops. He also discussed the utilization of land resource with increasing population pressure. The conclusion is that agriculture productivity 'per unit of population' increase is very crucial. A slow rate of progress in agriculture will not leave much after consumption by an agricultural population which is increasing

41. Gyan Chand, India's Teeming Millions: A Contribution to the Study of the Indian Population Problem, George Allen & Unwin Ltd., London 1939.

42. Tewari, R.N., Agriculture Development and Population Growth (An Analysis of Regional Trends in U.P.), Sultan Chand & Sons, Daryu Ganj, Delhi (1970).

fast. The development of Uttar Pradesh depends upon the agriculture. This may help in discussing the role of agriculture in the economy of Bihar.

Jain⁴³ (1966) in his study on 'state growth rates and their components' has pointed out that decennial growth rate of population from 1901-51 was between 11 and 14 per cent and the growth rate during 1951-61 was 21.5 per cent which was much more than in earlier decades.

The growth rate in Assam was 19 per cent since 1921 whereas the growth rates of Kerala, Mysore, Gujrat, Rajasthan could not maintain a steady pattern and suffered from fluctuations from one census count to another. The states with long time trend of low growth rates were Jammu and Kashmir, Himachal Pradesh and Uttar Pradesh. Uttar Pradesh and Bihar had total population of 73 million and 46 million respectively in 1961. Bihar recorded exceptionally sharp growth during 1951-61.

Kundu and Moonis Raza⁴⁴ (1975) pointed out that larger urban centres have been growing faster while the medium towns and the smaller ones have either stagnated or decayed overtime. The proportion of urban population

43. Jain (S.P.), "State Growth Rates and their Components:" In Bose Ashish (ed.), Patterns of Population Growth Allied Publishers, Delhi 1966.

44. Kundu A. and Moonis Raza, Urbanisation and Development in India, India and The Soviet Union, Allied Publication, New Delhi, pp.111-12.

in large urban centres has been increasing while that of smaller towns is declining leading to serious distortions in the spatial organization of urban settlements in the country. This type of urban growth that has been taking place in the weak economies of the Third World Countries has been termed as "urban accretion". This is defined as "the distorted growth of urban centres in relation to their own economic bases on the one hand and to the regional economy on the other.

Bhalla and Alagh⁴⁵ (1979) reported that there is a large concentration of output in the high productivity districts and that simultaneously these are the very districts which make use of the major proportion of modern inputs. Less than half of the cultivated area in India produce two thirds of total output, but at the same time holds three fourths of fertilizers, tractors and irrigation engines and accounts for more than three fourth of total irrigated area of India. It may help to discuss the disparities in the levels of agricultural development.

Chattopadhyay and Moonis Raza⁴⁶ (1975) discussed different methods like ranking method, principal component

45. Bhalla, G.S. and Alagh, Y.K. (1979), Performance of Indian Agriculture: A Districtwise Study, pp.14-19.

46. Chattopadhyay (Boudhayan) and Raza (Moonis), Regional Development: Analytical Framework and Indicators. Indian Journal of Regional Services, 1975.

analysis and methods of multivariate analysis, their uses and limitations in their paper on regional development. The paper has been useful in developing methodology for the present exercise.

Prakash Shri⁴⁷ (1977) pointed out that economic planning can become a living reality and in order that plan may contribute to accelerate the pace of economic development. It is certain that minimum social facilities should be provided. The success of a regional development planning programme is contingent on the infrastructures and social facilities. Whenever social facilities have been provided to the rural settlements for the development of rural areas are not enough to serve all villages of the districts. In contrast, there is connection of social facilities and improved amenities in the towns which has led to growing social disparities between rural and urban areas.

Singh⁴⁸ (1976) studied the contribution of agriculture in the economic development of Bihar during 1961-71.

47. Prakash Shri, Regional Inequalities and Economic Development with special reference to Infrastructural Facilities in India, Indian Journal of Social Science, vol.IX, no.2, 1977, pp.172-73.

48. Singh, Rama Shankar, Regional Variation in Agriculture and Patterns of Change (1960-61, 1970-71) A Case Study of Bihar, Centre for the Study of Regional Development, School of Social Sciences, JNU, New Delhi 1976.

He discussed agriculture structure land use pattern, productivity and irrigation facilities in his studies. He concluded that there is large variation in the levels of agriculture productivity. South Bihar plain has highest productivity; whereas it is low in north Bihar plain and very low in Chhotanagpur plateau. He also added that high density of, population and low productivity have aggravated the problems of Bihar. This would help in discussing the agricultural development in Bihar.

Bhattacharjee and Shastri⁴⁹ (1976) pointed out that the growth of population speeded up after 1951. The increase in population during 1951-61, was 21.6 per cent whereas it was 24.8 per cent during 1961-71. The growth rates during 1951-61 and 1961-71 were very high when compared to 5.4 per cent and 43.7 per cent during 1901-21 and 1921-51 period respectively. During 1951-71 the death rate declined by 42 per cent whereas birth rate declined by only 5.5 per cent.

Mehta⁵⁰ (1978) has done studies on population growth. Neglecting international migration, he divided demographic variables into primary and secondary. The primary variables

49. Bhattacharjee and Shastri, Population in India, Vikas Publishing House Pvt. Ltd., New Delhi

50. Mehta B.C., Regional Population Growth: A Case Study of Rajasthan, Jaipur, Research Books, C-150, Sunder Marg, Tilak Nagar, 1978.

are population, population growth rate, density, sex ratio and rural urban spacing. The secondary variables are fertility mortality, differential of fertility and mortality. The socio-economic variables are based on education, industrialization, agriculture productivity and density of population. He used multi variate regression for his studies. He concluded his studies by saying that (a) agriculture is highly uncertain, unproductive (b) wide regional differentials in the distribution of population in Rajasthan (c) modern factors like industrialization and urbanization are still very weak. (d) Sex ratio is lower than India (e) dependency ratio is higher and still increasing. This study would help in discussing the socio-economic variables of the study.

Pathy⁵¹ has tried to show, with the help of selective statistics that the density of the highly advanced countries is larger compared to less developed countries. Here, density has been calculated with respect to total geographical area and useable land. He tries to bring out the point that third world countries are not over populated rather many of these countries can safely accomodate a larger population than at present. He argues that "their backwardness is not the result of the high rate of population growth but of colonial and

51. Pathy, J., "Population and Development" in Economic and Political Weekly (Bombay), vo. XI, no.30, 24 July 1976, p.1130.

neo-colonial exploitation, indigenous archaic modes complex with feudal and semi-feudal and bureautic capital formation.

In this context there are several authors⁵² who have tried to view the problem in a different way, which has considerable appeal to common sense. This is that at micro level an increase in number of family members constitute a utility rather than a disutility to the household. More recently the labour input of children in agriculturally based population⁵³ has been examined in quantitative terms and it has been shown that children do make a contribution to the household at early stages.

Of all such writers Mamdani states the case most forcefully. Analysing the social structure of a village in Punjab, he concludes that for most groups higher rather than low fertility would constitute rational economic

52. (i) Valasoff, M., Labour Demand and Economic Utility of Children: A Case Study of Rural India in Population Studies (London), vol. 33, p.415, 1979.

(ii) Merelatur, Eva, "Economic Motive for family Limitations", Population Studies (London), vol.27, 1972, pp.383-405.

(iii) Cain, M.T., "The Economic Activity of Children in a Village in Bangladesh," Population and Development Review, 1977, pp.201-227.

53. Nadkarni, N.V., "Over Population and the Rural Poor", Economic and Political Weekly, vol.XI, no.31-33, August 1976, pp. 1163-72.

behaviour. For an agricultural labourer with no land, for instance, income "will depend upon the amount of work his family can contact for during the busy season. A large family means greater income during busy season and higher savings for the slow season."⁵⁴

He argues that the caste and occupational structures of the village are important determinants of the villages' perceptions of the costs and benefits of children. According to him reproduction cannot be understood unless we analysed it as the result of social relations with themselves must be placed in the context of a system of oppression - imperialism.

Swamy⁵⁵ (1974) pointed out that population growth would increase poverty and it means a decline in standard of living. But on the other hand, he described the benefits like increase in the proportion of younger generation in the total population and assurance of demand for the product. He was in favour of autonomous decline in population growth rate with continuing economic development, pressure develop to limit family size. The first

* 54. Mamdani, M., The Myth of Population Control, New York, Monthly Press Review, 1972, p.94. The Ideology of population control in Economic & Political Weekly, vol.XI, no.33,33, August 1976, pp.1141-48.

55. Swamy, Subramanian, "Population Growth and Economic Development, in Population in India's Development 1947-2000, Ashish Bose, Ashok Mitra, P.B. Desai, J.N. Sharma (eds.), Vikas Publishing House (P) Ltd., Delhi, 1974, pp. 211-219.

broke on population growth is applied autonomously by the knowledge that hedging against the risk of infant mortality is necessary. The other factors which may help in autonomous decline in population growth rate are increase in the literacy rate, increase in urban population and by raising the status of women. It may help in the present study to see how far these factors affect the population growth rate.

Batra⁵⁶ (1978) discussed changes in the composition and character and distribution of population during the period from 1951 to 1971. He has done national level analysis by taking these variables sex ratio, percentage distribution of population working and non-working population and all the nine industrial category of workers. This study relates population growth in India with these above mentioned variables and reaches at conclusion that the change in the structure of labour force i.e. a shift from agriculture to manufacturing industries, services, trade, finance etc. has been seen by many economists as an indicator of the country's progress. But, India's experience in this respect doesn't appear favourable when compared with that of other countries. This would help in the present study to see the shift of workers.

56. Batra, V.P., The Economy and Human Resources, BR Publishing Corporation, Delhi, 1978, pp. 88 to 100.

Kundu and Raza⁵⁷ (1982) found a positive correlation between the growth of large cities, population and industrial workforce during the sixties, since the larger cities have a developed industrial base. The confidence in the causal relationship further was strengthened with the increase in urban population and share of non-agricultural sector during 1971-81 at the macro level.⁵⁸ However, the regional pattern of economic development and urban population do not confirm to this generalisation,⁵⁹ as is evident in the case of Orissa, Rajasthan, Andhra Pradesh and Madhya Pradesh while talking about the process of urbanization in India. Ashok Mitra⁶⁰ clearly discards the belief that India is overurbanized and he maintains, if anything, it is over ruralised since our rate of development of urban population is one of the lowest in the world. This would help in discussing the urban population of Bihar.

57. Raza, Moonis and Kundu, Amitabh, Indian Economy, New Delhi, 1982.

58. Kundu, Amitabh and Sharma, R.K., "Industrialization, Urbanization and Economic Development", Urban India, vol. 3, no.1, 1983, p.52.

59. Ibid., pp.53-54.

60. Mitra, Ashok, "Urbanization, City Structure and Urban Land Policy", Urban India, vol.3, no.1, 1983, p.26.

Visaria and Visaria⁶¹ (1981) stated that the size of the state varies in terms of area and population. The states of north-eastern region are small in area and have population between 30,000 and 2.1 million in 1981. The remaining states have population between 4.3 and 110.9 million. Uttar Pradesh, Bihar, Maharashtra, West Bengal, Andhra Pradesh, Madhya Pradesh and Tamil Nadu account for 66 per cent of total population of India. Of all the union territories, only Delhi has 6.2 million persons.

During 1971-81, the growth rates of Tamil Nadu, Kerala and Orissa were below 20 per cent. Haryana, West Bengal, Madhya Pradesh, Maharashtra and Gujrat had lower growth rates than what they experienced during 1961-71. Uttar Pradesh, Rajasthan, Bihar, Karnataka, Andhra Pradesh and Punjab have registered an increase in their growth rates during 1971-81 by 5.7, 4.6, 2.6, 2.2, 1.9 and 1.3 per cent over the 1961-71 growth rates. In India migration has not played a significant role in altering the population size.

Sinha and Zacharia⁶² (1984) have observed that the rapid or slow growth of population is a regional problem.

61. Visaria and Visaria, L, "Indian Population Scene after 1981 Census - A Perspective", Economic and Political Weekly, vol.XVI, nos. 44-46, (Annual).

62. Sinha, V.C. and Zacharia, E., Elements of Demography, Allied Publishing Delhi.

Of the fifteen major states in India, Tamil Nadu had lowest growth rate of 17.2 per cent and Rajasthan had highest growth rate of 32.4 per cent during 1971-81. The growth rates in Assam and Gujrat were always above the national average since 1901, whereas the rest of the states had fluctuating growth rates.

The extent of interstate variations are very wide and it is increasing in some of the states in which the population pressure is high. In spite of heavy immigration from high pressure states the population growth rate has not reduced.

The present study of population growth and economic development in Bihar is set against the background of these developments. The regions covered by the present study had in recent past experienced and are currently experiencing fast rate of population growth but at the same time they are also feeling the impact of new and important developments in agricultural and non-agricultural sector particularly industrial and infrastructural development. It was, therefore, natural to think of a comparative study of changes in both population and economic development.

1.7 Hypotheses

After the literature surveyed and general observations, the following hypotheses can be formulated.

- (i) Population growth is inversely proportional to economic development.

- (ii) Literacy rate is directly proportional to economic development
- (iii) Percentage of urban population is directly proportional to economic development
- (iv) Agriculture development is directly proportional to economic development.
- (v) Industrial development is directly proportional to economic development.
- (vi) Infrastructural development is directly proportional to economic development.

Chapter II

POPULATION PROFILE

2.0 Introduction,

One never ceases to recapture the romance or feel the catch in the throat whenever one recalls that moment in history when "we, the people of India, having solemnly resolved to constitute India into a Sovereign Democratic Republic" adopted the Constitution for ushering in a federal polity to operate parliamentary democracy at the union and state levels. Soon came the First Five Year Plan to proclaim in its very first sentence that "the central objective of planning of India at the present stage is to initiate a process of development which will raise living standards and open out to the people new opportunities for a richer and more varied life."¹

The basis for securing this objective must ever remain, as spelt out in the plan "(a) a large measure of agreement in the community as to the end of policy (b) effective power, based on the active co-operation of citizens, in the hands of the state; and earnest and determined exercise of that power in furtherance of these ends; and (c) an efficient administrative set up, with personnel of requisite capacity and quality."²

1. Planning Commission, First Five Year Plan, 1952.

2. Mitra, Ashok, and Bose, Ashish, Population in India's Development 1947-2000, Vikas Publishing House Pvt. Ltd., Delhi.

India was the first country in the world which adopted family planning in the first five year plan. But the trends of population growth cannot be altered quickly, and any reduction in birth ratio may well be neutralised by a corresponding reduction in death rates. On the other hand, with family planning on a nation wide scale, there is no reason why the rate of growth cannot be brought down 1 per cent per annum or even low. The pressure of population is already so high that a reduction in the rate of growth must be regarded as a major desideratum.

The population problem has become one of the most fundamental of all human problems. Therefore, the studies on population have assumed great importance in recent times. The impact of population growth on economic development and social change in overpopulated underdeveloped countries needs a thorough study for effective policy measures.

In this chapter, various demographic aspects of population are discussed in detail for 1951-61, 1961-71 and 1971-81. They are density, growth rate, sex-ratio, literacy rate and urban population. The component of population change are fertility, mortality and migration. In this study population growth rate has been selected as an indicator of population change.

The high rate of population growth is bound to effect adversely the rate of economic development and living standard per capita. Population growth thus presents a very serious challenge.

2.1 Density of Population

One of the most important aspects of a geographical study of population is the examination of the distribution and density of population. This is all the more important in the understanding of population problems in a densely populated area with predominantly rural economy, like Bihar.

Although Bihar occupying only 5.3 per cent of the total Indian territory, it contains about 10.40 per cent of the Indian population. Bihar, with a density of 402 persons per square kilometre, is the third most densely populated state in India after Kerala and West Bengal. In Bihar the density of population has registered a positive rate of growth during 1961-71 and 1971-81, as a result it has increased from 267 in 1961 to 324 persons in 1971. It has further increased from 324 in 1971 to 402 persons per square kilometre in 1981. The increasing trend in density of population³ is observed in all the districts of Bihar during 1961-1971 and 1981.

3. See table 2.2.1

North and South Bihar plains are more densely populated than Chhotanagpur plateau, even within these regions there are some districts which have very high density of population, while others have relatively low density of population.

North Bihar plain is the most densely populated part of the state. South Bihar plain is comparatively less densely populated than its northern counterpart. Among the districts of Bihar, Patna has shown the highest density between 1951-61 to 1961-71 and 1961-71 to 1971-81. During this time period Patna (534-643 and 643-950) is followed by Muzaffarpur (525-618 and 618-756), Saran (516-616 and 616-757), Darbhanga (508-603 and 603-744) and Munger (326-397 and 397-491). Patna with 950 persons per square kilometre, is the most densely populated district of Bihar. Because, it is the capital of the state. In the districts like Muzaffarpur, Saran, Darbhanga and Munger, the density of population is high, because these districts are located mainly in north Bihar plain which is famous for fertile alluvial soil with its greater productivity, on the other hand, in almost all the districts of Chhotanagpur, the density of population is low, Dhanbad being the sole exception. Dhanbad, with 706 persons per square kilometre, is the most densely populated district of this region. It is the only

Table 2.3.1

Density of Population per Sq. Km.

		1961	1971	1981
Bihar	(0)	267	324	402
Patna	(1)	534	643	950
Gaya	(4)	296	361	443
Sahabad	(32)	283	348	422
Saran	(8)	516	616	757
Champaran	(11)	327	385	477
Muzáffarpur	(14)	525	618	756
Darbhanga	(18)	508	603	744
Munger	(23)	326	397	491
Bhagalpur	(24)	303	370	469
Purnia	(21)	280	358	457
Santhal Pargana	(25)	189	226	262
Palamu	(29)	94	119	150
Hazaribagh, Dhanbad	(26)	167	213	287
Ranchi	(30)	117	142	168
Singhbhum	(31)	152	181	213

- Source: i) General Population Tables, Part II A, Vol.4, Bihar, Census of India, 1961.
- ii) General Population Tables, Part IIA, Series 4, Bihar, Census of India, 1971
- iii) Final Population Tables, Census of India, 1981, Series 4, Bihar.

district in which mining and industrialization have made visible impact on the population density. Those districts which have very low density are Palamu (94-119-150) in the years 1951-61/1961-71/1971-81, followed by Ranchi (117-142-168), Singhbhum (152-181-213) and Santhal Pargana (189-226-262). The density of these districts are below the state average. Palamu, with 150 persons per square kilometre, is the most scantily populated district of this region as well as that of the state. In all the districts of Chhotanagpur the density of population is very low, because of hilly terrain, less fertile soil, low percentage of cultivated area, less irrigation facilities and a very high percentage of forest cover.

2.2 Population Growth Rate

An idea of Bihar's tremendous manpower can be had from the census of 1981, according to which the state's population is 69,914,734 - a staggering figure to most of us, indeed, because while Bihar covers only 5.3 per cent of the Indian territory, it has 10.4 per cent of the country's population.

According to table 2.3.1 during 1971-81, the decennial growth rate of Bihar was 24.06. Among the districts of Bihar during 1951-61 and 1961-71 all district have shown an upward trend except Munger,

Hazaribagh and Dhanbad, which showed a decline from 24.76 to 22.15 and from 32.79 to 26.20. Most of the districts have shown around 1 to 2 per cent increase per decade. The growth rate of Bihar also showed an increase from 19.77 to 21.33 between 1951-61 and 1961-71, followed by 24.06 between 1971-81. Some districts have shown higher growth rate between 1951-61 and 1961-71. They are Patna from 18.0 to 20.58 followed by Bhagalpur (20.0 to 22.21), Purnia (25.60 to 27.60) and Singhbhum (17.0 to 18.92). Patna has shown the highest growth rate during 1951-61 and 1961-71.

But between 1961-71 and 1971-81, the population growth rate has increased rapidly in some districts of Bihar. Patna showed an increase from 20.58 to 31.02 between 1961-71 and 1971-81, followed by Hazaribagh (26.20 to 34.72), Muzaffarpur (17.54 to 26.77), Champaran (17.86 to 24.13) and Bhagalpur (22.21 to 25.36). Some districts have also shown decline in their growth rate, viz., Ranchi (22.11 to 17.58), Santhal Pargana (19.13 to 16.65), Singhbhum (18.92 to 17.39) and Sahabad (22.81 to 21.19), during the same period. Rest of the districts have shown 1 and 2 per cent growth rate per annum.

The reasons for increase in growth rate are migration and natural increase. The districts which

Table 2.3.1Population Growth Rate

		1951-61	1961-71	1971-81
Bihar	(0)	19.77	21.33	24.06
Patna	(1)	18.00	20.58	31.02
Gaya	(4)	21.00	22.19	22.75
Sahabad	(32)	21.00	22.81	21.19
Saran	(8)	18.00	19.29	22.10
Champaran	(11)	16.00	17.86	24.13
Muzaffarpur	(14)	16.00	17.54	26.77
Darbhanga	(18)	17.50	18.60	19.72
Mungher	(23)	24.76	22.15	23.75
Bhagalpur	(24)	20.00	22.21	25.36
Purnia	(21)	25.60	27.60	27.46
Santhal Pargana	(25)	18.00	19.13	16.65
Palamu	(29)	25.00	26.65	27.47
Hazaribagh & Dhanbad	(26)	32.79	26.20	34.72
Ranchi	(30)	21.00	22.11	17.58
Singhbhum	(31)	17.00	18.92	17.39

Source: i) General Population Tables, part IIA, series 4, Bihar, Census of India, 1971.

ii) Final Population Tables, Census of India, 1981 series 4, Bihar.

showed an upward trend, like Patna, Muzaffarpur, Hazaribagh and Dhanbad, are urban centres which also provide job opportunities and better standard of living. Districts showing declining trend are mostly tribal and backward, like Santhal Parganas and Singhbhum. Some districts have large area but only the towns are industrially developed and surroundings are still very backward as in the case of Ranchi, Singhbhum, Palamu and Santhal Parganas.

2.3 Sex Ratio

Sex ratio is an important demographic index which helps in studying the birth rate, death rate, and also availability of manpower. It is an accepted fact that male and female birth rates are not equal. There has been excess of males over females. Sex-ratio is usually expressed as number of females per 1000 males in Indian censuses.⁴

The sex-ratio of Bihar is higher than the country level.

	<u>1961</u>	<u>1971</u>	<u>1981</u>
India	941	930	934
Bihar	994	954	946

4. Census of India, 1981, General Population Tables, Part IIA.

Among the districts of Bihar during 1951-61, the sex ratio was higher in the districts of Saran (1137), Darbhanga (1059), Muzaffarpur (1047) and Gaya (1010). These all are higher than the state average. During the same period (1951-61) sex-ratio is lower in Sahabad (990), Ranchi (987), Palamu (984), Santhal Parganas (980), Champaran (978) and Singhbhum (960). Some districts have shown the lowest sex ratio viz., Hazaribagh (921), Purnea (922) and Patna (937).

But due to some social problems, the trend started changing in the state. Sex ratio started declining in almost all the districts except Purnia which declined between 1951-61 and 1961-71 from 922 to 918 but increased to 926 in 1971-81. This was followed by Munger which registered a marginal increase from 928 to 929 in the period between 1961-71 and 1971-81. During the period 1961-71 to 1971-81 rest of the districts have shown declining trend. Saran declined from 1051 to 1032 and followed by Gaya (972 to 968), Sahabad (947 to 926), Champaran (931 to 919) and Patna (906 to 902). The sex ratio of state also declined from 994 to 954 and further to 946 during 1961, 1971 and 1981 respectively.

Table 2.4.1Sex Ratio

		1961	1971	1981
Bihar	(0)	994	954	946
Patna	(1)	937	906	902
Gaya	(4)	1010	972	968
Sahabad	(32)	990	947	926
Saran	(8)	1137	1051	1032
Champaran	(11)	978	931	919
Muzaffarpur	(14)	1047	989	974
Darbhanga	(18)	1059	983	965
Munger	(23)	973	928	929
Bhagalpur	(24)	951	914	911
Purnia	(21)	922	918	926
Santhal Pargana	(25)	980	959	957
Palamu	(29)	984	963	957
Hazaribagh, Dhanbad	(26)	921	913	910
Ranchi	(30)	987	973	963
Singhbhum	(31)	960	942	942

- Sources: i) General Population Tables, part IIA, vol.4, Bihar, Census of India, 1961.
- ii) General Population Tables, part IIA, Series 4, Bihar, Census of India, 1971
- iii) Final Population Tables, Census of India, 1981, series 4, Bihar

2.4 Literacy Rate

It has been established beyond doubt that literacy is both the cause and the effect of social and economic development. Its development does not in itself cure poverty, hunger and disease, but it is the first and indispensable remedial step. Bihar's economic development is retarded considerably because of its human factor. Efficiency and productivity of the worker in the factory or the farmer in the field are conditioned by his ability to acquire knowledge and skills through education and training and to apply the same in work. Literacy is the necessary foundation for this requirement.

"The number of literates per hundred population of a particular sex and age group is known as literacy rate." In India the definition of literate is as "A person who can both read and write with understanding in any language. A person who can merely read but cannot write, is not literate. It is not necessary that a person who is literate should have received any formal education or should have passed any minimum educational standard. All children of the age of 4 years or less are treated as illiterates even if the child is going to a school and may have picked up

reading and writing a few odd words."⁵

Bihar's literacy rate is much lower than the national literacy rate. India's literacy rate between 1971-81 is 36.23. Bihar's is only 26.20 in the same period. Patna is the only district in Bihar whose literacy rate is 37.33 which is above the nation's literacy rate. There are some districts where literacy rates are as follows in the year 1951-61/1961-71/1971-81. They are Patna (27.0/30.1/37.33), Singhbhum (23.0-25.9-34.59), Sahabad (22.0-24.56-32.58), Ranchi (21.0-23.2-31.41) and Bhagalpur (20.0-21.5-27.48). Rest of the districts have a literacy rate below 20.0 during 1961 and below 30.0 in 1971-81. Almost all the districts have improved in the due course of time but we can see the less improvement in some of the districts. They are Purnia (14.2-15.7-19.77), Santhal Parganas (13.0-15.9-22.26), Palamu (15.0-15.1-20.41) and Champaran (12.0-14.2-19.08) Santhal Pargana and Palamu are tribal dominated districts and they do not have adequate educational facilities. It is the universal right of everyone to get education. Bihar is basically backward in the field of education and we need a proper programme

5. V.S.Verma, A Handbook of Population Statistics, 1978.

Table 2.5.1Literacy Rate

		1961	1971	1981
Bihar	(0)	18.4	19.9	26.2
Patna	(1)	27.0	30.1	37.3
Gaya	(4)	20.0	21.6	29.0
Sahabad	(32)	22.0	24.6	32.6
Saran	(8)	18.0	19.2	24.5
Champanan	(11)	12.0	14.2	19.1
Muzaffarpur	(14)	15.0	17.3	24.7
Darbhanga	(18)	16.0	18.0	21.8
Munger	(23)	16.7	16.7	24.1
Bhagarpur	(24)	20.0	21.5	27.5
Purnia	(21)	14.2	15.7	19.8
Santhal Pargana	(25)	13.0	15.9	22.3
Palamu	(29)	15.0	15.1	20.4
Hazaribagh, Dhanbad	(26)	18.2	20.7	29.1
Ranchi	(30)	21.0	23.2	31.4
Singhbhum	(31)	23.0	25.9	34.6

Sources: i) General Population Tables, part IIA, vol.4, Bihar, Census of India, 1961.

ii) General Population Tables, Part IIA, Series 4, Bihar, Census of India, 1971

iii) Final Population Tables, Census of India, 1981, series 4, Bihar

to eradicate illiteracy from the state because it is a great hurdle in the way of development of the state.

Mass education and literacy are the hallmark of modern society. Recognizing this, developing countries generally, view education as a necessary and basic ingredient of economic and social development planning. In India, the goal of free and compulsory education up to the age of 14 is enshrined in the Directive Principles of the Constitution. A prominent goal of India's plan documents is the achievement of universal availability and equality of opportunity for education as a basic means of promoting the general welfare.

Considerable progress has been made with regard to the attainment of universal literacy.

However, the crude literacy rate was found only 26 per cent according to 1981 census. Progress achieved has also not been uniform from district to district.

2.5 Urban Population

The urban population is that population of a district, which lives in towns and cities. Most of these town and city dwellers are generally engaged in secondary and tertiary activities. It is an established fact that the higher the participation rate in secondary

and tertiary activities, the higher would be economic development. Thus the proportion of urban population or the degree of urbanization in a region is an indicator of the economic development of that region. A true measure of urbanization is, however, given by the percentage of urban population to total population in any area.

It is one of the most important indicator of economic development. But Bihar is very backward in this regard. The performance of our country is not very satisfactory in this regard. Only 23.70 per cent of population lived in urban area during 1971-81. In Bihar the percentage of urban population is only 12.47 which is half of all India average. During the years, the percentage of urban population is increasing but the rate of increase is very slow.

The districts of Patna (20.13-22.54-28.83), Singhbhum (21.50-26.24-32.07) and Dhanbad and Hazari-bagh (13.70-22.88-27.29) appear to be the most urbanized between 1951-61/1961-71/1971-81. Patna, the state's capital, has the highest population among the towns and cities of the state. Dhanbad and Singhbhum have a high urban population on account of important urban industrial centres, like Jamshedpur, Bokaro and other

Table 2.6.1Percentage of Urban Population

		1961	1971	1981
Bihar	(0)	8.43	10.00	12.47
Patna	(1)	20.13	22.54	28.83
Gaya	(4)	7.27	7.63	9.16
Sahabad	(32)	7.22	8.22	10.22
Saran	(8)	4.18	4.20	6.04
Champanan	(11)	4.84	5.21	5.85
Muzaffarpur	(14)	4.58	5.25	6.29
Darbhanga	(18)	4.32	4.43	5.36
Munger	(23)	8.91	9.10	10.22
Bhagarpur	(24)	10.91	10.61	11.72
Purnia	(21)	6.01	6.34	8.38
Santhal Pargana	(25)	5.34	5.76	6.89
Palamu	(29)	4.73	4.69	5.64
Hazaribagh, Dhanbad	(26)	13.70	22.88	27.29
Ranchi	(30)	9.47	13.67	20.92
Singhbhum	(31)	21.50	26.24	32.07

- Sources:
- i) General Population Tables, Part IIA, vol.4, Bihar, Census of India, 1961
 - ii) General Population Tables, Part IIA, series 4, Bihar, Census of India, 1971
 - iii) Final Population Tables, Census of India 1981, series 4, Bihar.

smaller towns around the mines and the industries.

Percentage of Urban Population

	<u>1951-61</u>	<u>1961-71</u>	<u>1981</u>
India	-	19.91	23.70
Bihar	8.43	10.00	12.47

The percentage of urban population in the total population of Bihar, however, is 10.0 against India's 19.99 during 1961-71. During 1971-81, it become 12.47 in comparison to India's 23.70.

The percentage of urban population was lowest in Darbhanga (5.36) followed by Palamu (5.64), Champaran (5.85), Saran (6.04), Muzaffarpur (6.29) and Santhal Pargana (6.89), during 1971-81. During this period excepting the districts like Patna, Ranchi, Dhanbad and Singhbhum, almost all the districts had less than 10 per cent population staying at urban centres.

Summary

Patna, the capital of Bihar, is the most densely populated district of Bihar. In the districts of north Bihar plain like Muzaffarpur, Saran, Darbhanga and Munger, the density of population is high. The reason is fertile alluvial soil with its greater productivity. On the other hand almost all the districts of Chhotanagpur, the density of population is low, Dhanbad being the sole exception. The causes of lower density are as

follows: hilly terrain, less fertile soil, low percentage of cultivated area, less irrigation facilities etc.

It has clearly been shown in table 2.5.1 that there are zones of high and low literacy comprising various districts in clusters. Four districts of South Bihar plain, viz., Patna (37.33), Sahabad (32.58), Gaya (29.0) and Bhagatpur (27.48) and three southern districts of the Chhotanagpur plateau, viz., Singhbhum (34.59), Ranchi (31.41) and Hazaribagh (25.10), have a comparatively high literacy (above the state average) whereas Champaran (19.08), Purnia (19.77) and Palamu (20.41) have shown lower literacy rate during 1971-81.

Thus we come to the conclusion that literacy is a very important input, in the infrastructure for Bihar's economic development. Therefore, there is an urgent need to increase the percentage of literacy in the state.

It is interesting to note that the districts of north Bihar plain containing over 42 per cent of the state's total population, have less than 22 per cent of its urban population. On the other hand, the south Bihar plain and the Chhotanagpur plateau containing barely 31.83 per cent and 28.25 per cent respectively of the total population of the state, have about 38.15

per cent and 40.43 per cent of its urban population respectively.⁶

Thus although fast urbanization is taking place in Bihar, it is at a faster rate in the industrially developed districts of Chhotanagpur plateau than the agricultural districts of North and South Bihar plains. For a balanced urban growth in the state, attempts should be made to develop more and more agro-based industries in the districts of north and south Bihar plains.

The causes of high population growth rate are natural increase and migration. Migration takes place in the regions where job opportunities and better standard of living are available. The districts which showed an upward trend in population growth rate are Patna, Muzaffarpur, Hazaribagh and Dhanbad. Districts showing declining trend are mostly tribal and backward like Santhal Parganas and Singhbhum.

6. R.C. Prasad, Bihar, National Book Trust, New Delhi, 1983.

Chapter III

ECONOMIC DEVELOPMENT

3.0 Introduction

Economic development, in a sense of sustained increase in state domestic product or increase in aggregate or per head, may be considered to depend primarily upon the state's resources, the efficiency with which they are used and the institutional framework within which the economy operates.¹ More specifically the output or product of an economy, given its institutional framework can be seen as a function of the volume of its human, natural and capital resources and their levels of productivity.²

Bihar is overwhelmingly an agricultural state and agriculture is the mainstay of the state's economy as nearly 50 per cent of the state's total income is contributed by agriculture sector. In this chapter all the variables of different sectors like Agriculture, industry and infrastructure, have been taken into account which contribute to economic development.

Methodology

This chapter aims to explain the contribution of agricultural, industrial and infrastructural develop-

1. The Determinants and Consequences of Population trends: New Summary of Findings on Interaction of Demographic Economic and Social Factors, vol.1, population series no.50, UN, New York, 1973.
2. Ibid., p.504.

ment of Bihar. The analysis of correlation, first factor matrix, coefficient of variation and levels of development has been done in this chapter.

On the basis of development indices for different sectors and the economy as a whole, the districts are in general classified into four categories, viz., high, medium, low and very low. The districts under 'very low' category may be considered as backward districts, that of 'low' category may be considered as least developed. Medium category is moderately developed districts and that of high category developed districts.

Agriculture Development

The economy of Bihar is largely based on agriculture but the increasing importance of industry during recent decades have also played a vital role in the development of the region. More than 80 per cent of its people derive their livelihood from agriculture. Bihar plain with its rich and fertile alluvium has been agriculturally famous since time immemorial. Because of physiographic character of the plain, its fertile soil and climatic superiority, Bihar occupies a very remarkable position among Indian states with regard to agricultural potentialities. As a result of presence

of fertile soil in extensive areas with good seasonal distribution of rainfall, the region has been the centre of population concentration since pre-historic times.

The economy of minerals has resulted in an extraordinary pressure on land. Because of the predominance of rural economy, even in large urban communities, there is a significant proportion of workers engaged in primary occupation. Patna, for instance, being the largest city in the state with about more than half a million people has approximately 16 per cent of its working force engaged in agriculture. Similarly, other cities in the plain area, viz., Gaya, Sahabad, Bhagalpur, Darbhanga, Muzaffarpur, Munger and Bihar Sharif have considerable proportion of their people dependent on primary activities.

Agriculture plays crucial role in the development of a state. It generates mass employment in the rural area. In terms of relation between land and the input of human labour, the nature and character of farming is intensive. This is indicated by the fact that in no other state of India, the number of agriculture labour per 100 of net sown area is so high as in Bihar where there are 22 agriculture labourer per 100 acres of net sown area.³

3. E.Ahmed, Bihar: A Physical, Economic and Regional Geography, Ranchi University, Ranchi, 1965, pp.46-47.

The Chotanagpur plateau, on the other hand, is a region of irregular surface and poor soil and is agriculturally less productive than the plain. The land, in general, is less fertile particularly on the upland tracts and population is less dense than in plains and agriculture is less intensive.⁴ Rice is the most important crop in both Bihar plain and Chhotanagpur plateau followed by a large number of crops like wheat, maize, barley, linseed, millets, sugar cane etc. In acreage as well as production rice occupies a predominant position amongst the crops of Bihar.

The supreme economic importance of agriculture may be realised from the fact that about 80 per cent of the population of this state draws sustenance from it. The majority of this vast host have no occupation apart from agriculture, while one in every twenty of these engaged in non-agricultural pursuits supplement his income by owning or tilling some land or by working, at intervals, as a field labourer. It is no exaggeration, therefore, to say that the success or failure of the crops every year is a matter of vital importance. More so because as much as about 90 per cent of the total cropped area

4. R.R.Diwakar, ed., Bihar Through the Ages, Orient Longman, Bombay, 1959, pp.38-39.

here is utilised, for food crops against the national average of only 75 per cent.

The state contributes 8 per cent of the total food grain production, ranking third after Uttar Pradesh (18 per cent) and Madhya Pradesh (10 per cent).

Workers in Agriculture Sector (G_3)

The agriculture sector consists of number of cultivators and agricultural labourers. Workers in agriculture sector have shown positive correlation with persons per hectare cropped area (G_1) .41313 during 1961, .16234 during 1971 and $-.06949$ in 1981. It shows that in 1961, most of the persons were engaged in this sector and the pressure of population was not so high. But in due course of time during 1971 the population increased and the pressure on the land also increased. (It may be seen that during 1961 correlation was .41313, it decreased to .16234 during 1971 and further decreased to $-.06949$ during 1981).

Workers Engaged in Primary Sector (G_4)

Workers engaged in primary sector (G_4) have shown positive correlation with persons per hectare cropped area (G_1) .57338 and .27888 during 1961 and 1971 respectively. But it showed negative correlation $-.06967$ during 1981.

Workers in agriculture sector (G_3) have shown high correlation with workers in primary sector (G_4) during 1961, 1971 and 1981 viz., .86827, .98634 and .98517 respectively.

The relation between workers engaged in primary sector (G_4) and persons per hectare cropped area (G_1) shows that population pressure and dependence on the soil is getting higher than what it was in 1961 and 1971. The population increase is higher than the increase in the cultivated land. That is why the correlation decreased from .57338 to .27888 during 1961 and 1971, and further declined to - .06967 during 1981.

Workers in agriculture sector (G_3) has shown high positive correlation with workers engaged in Primary Sector (G_4) in all the three years of study because the agriculture sector is the major group of primary sector.

Per Hectare Yield of Crops in Rupees (G_8)

Per hectare yield of crops in rupees (G_8) has shown positive correlation with persons per hectare cropped area (G_1) .06206 and .20090 during 1961 and 1971 respectively, but it has negative correlation -.25794 during 1981. It clearly indicates that person per hectare cropped area (G_1) were less and there was still time for improvement during 1961 and 1971. But

during 1981, it shows that if the persons per hectare cropped area (G_1) increases than the yield of crops per hectare in rupees (G_8) would decrease. That is why it may be presumed the population pressure on soil was higher in 1981 than in 1971 and 1961.

Per hectare yield of crops in rupees (G_8) has shown positive correlation with workers engaged in agriculture sector (G_3) and workers engaged in primary sector (G_4), viz., .32370 and .33354 during 1961 and .17245 and .11836 during 1981. But it showed negative correlation with G_3 -.15029 and G_4 -.14995 1971. The result clearly shows during 1961 and 1971, the pressure on the land was not high. During 1961 and 1981, the increase engaged in Primary Sector (G_4) and agriculture sector (G_3) had increased the yield per hectare of cropped area in rupees (G_8) because more land could be brought under cultivation or by using scientific techniques in agriculture.

During 1961 and 1971, the pressure on primary sector and agricultural sectors because most of the persons were engaged in these sectors. But during 1961, the population was not high respect of yield per hectare cropped area in rupees (G_8). During 1971, population increased and the high pressure come on primary sector (G_4) and agriculture sector (G_3), led these two to be

negatively correlated to yield in rupees per hectare cropped area (G_8). But during 1981, pressure of population shifted to secondary and tertiary sector also.

Gross Irrigated Area to Total Gross Cropped Area (G_9)

Gross irrigated area (G_9) shown negative correlation with persons per hectare cropped area (G_1), $-.35813$, engaged in agriculture worker $-.30344$, workers engaged in primary sector (G_4) $-.32984$ during 1961. It has also negative correlation with persons per hectare cropped area (G_1) $-.29001$ and $-.15398$ during 1971 and 1981 respectively. But it has only positive correlation with workers engaged in agriculture sector (G_3) $.00852$ during 1971 and $.11991$ during 1981. Gross irrigated area (G_9) has positive correlation during 1981, with workers engaged in primary sector (G_4) $.06412$ and per hectare yield of crops in rupees (G_8) $.71852$. G_3 and G_3 have very low correlation with G_9 . So it may be attributed that increased irrigation facilities would lead to higher productivity and an increase in per hectare yield of crops in rupees (G_8).

Fertilizers Used Per Hectare Cropped Area (G_{10})

Fertilizers used per hectare cropped area (G_{10}) have shown high positive correlation with workers engaged in agricultural sectors (G_3) $.8826$, Gross irrigated area (G_9) $.56912$ and low positive conclusion

with per hectare yield of crops in rupees (G_8) .23417 during 1961. During 1971, it has high positive correlation with workers engaged in agriculture sector (G_3) .44300, gross irrigated area (G_9) .57767, and positive correlation with workers engaged in primary sector (G_4) .38520. But during 1981, it has shown high positive correlation with per hectare yield of crops in rupees (G_8) .79984 and gross irrigated area (G_9) .87868.

During 1981, high correlation between fertilizers used per hectare cropped area (G_{10}) and per hectare yield in rupees, (G_8) or gross irrigated areas (G_9) clearly indicates that fertilizers and irrigation both are important components for the growth of agriculture. With the use of more fertilizers and better irrigation facilities yield per hectare is bound to increase.

Tractors Used Per Hectare Cropped Area (G_{11})

Tractors used per hectare cropped area (G_{11}) have shown positive correlation with gross irrigated area (G_9) .07717, .33939, .71491 and fertilizers used per hectare cropped area (G_{10}) .23364, .24783, .75922 during 1961, 1971 and 1981 respectively. It has a positive correlation with workers engaged in agriculture sector (G_3), .26521, workers engaged in primary sectors (G_4) .21346 and per hectare yield of crops in rupees (G_8)

.87229 during 1981 only. It has shown a negative correlation with persons per hectare cropped area (G_1), -.07032, -.50008, -.22155 during 1961, 1971 and 1981 respectively indicated that if tractors are available then there is no need of more persons per hectare cropped area. During 1961 and 1971, the use of tractors was not very high. But now a days farmers use tractors which held in reducing the cost of production and increasing the efficiency and productivity with the help of fertilizers and irrigation.

Pumpsets used per Hectare Cropped Area (G_{12})

It (G_{12}) has shown positive correlation with per hectare yield of crops in ruppees (G_8) (.20397, .15403, .53054), gross irrigated area (G_9) (.76835, .71218, .77961), fertilizers used per hectare cropped area (G_{10}) (.82833, .49622, .78119) during 1961, 1971 and 1981, respectively. It has shown positive correlation with all the variables during 1971 and 1981. Pumpset is a necessary requirement to provide irrigation. If irrigation, tractors and fertilizers would be available then definitely the yield of crops would be more.

Table 3.2 shows that variables like workers in primary sector (G_4) .69254, number of cultivators to total population (G_{13}) .66994, workers engaged in agriculture

Table 3.2

Variables of agriculture	1961	1971	1981
G ₁	.42329	-.13917	-.11819
G ₃	.62050	.60820	.41537
G ₄	.69254	.55317	.35785
G ₈	.15127	-.22143	.84167
G ₉	-.84588	.64421	.86321
G ₁₀	-.59629	.77981	.89667
G ₁₁	-.24300	.45604	.89924
G ₁₂	-.78041	.58136	.74989
G ₁₃	.66994	-.73973	-.68322
G ₁₄	.03524	.69678	.49048
% of variance	32.6	33.5	46.5

sector (G₃), .62050 and persons per hectare cropped are (G₁), .42329 had positive relationship with that of composite index of agriculture development during 1961. In principal component analysis, first factor explains 32.6 per cent of total variance during 1961, which has increased 33.5 per cent in 1971 and further increased to 46.5 per cent during 1981. It means that explanatory power of the variation have been increased over the time period. During 1961, gross irrigated area to total gross cropped area (G₉) -.84588, fertilizers used per hectare cropped area (G₁₀), -.59629,

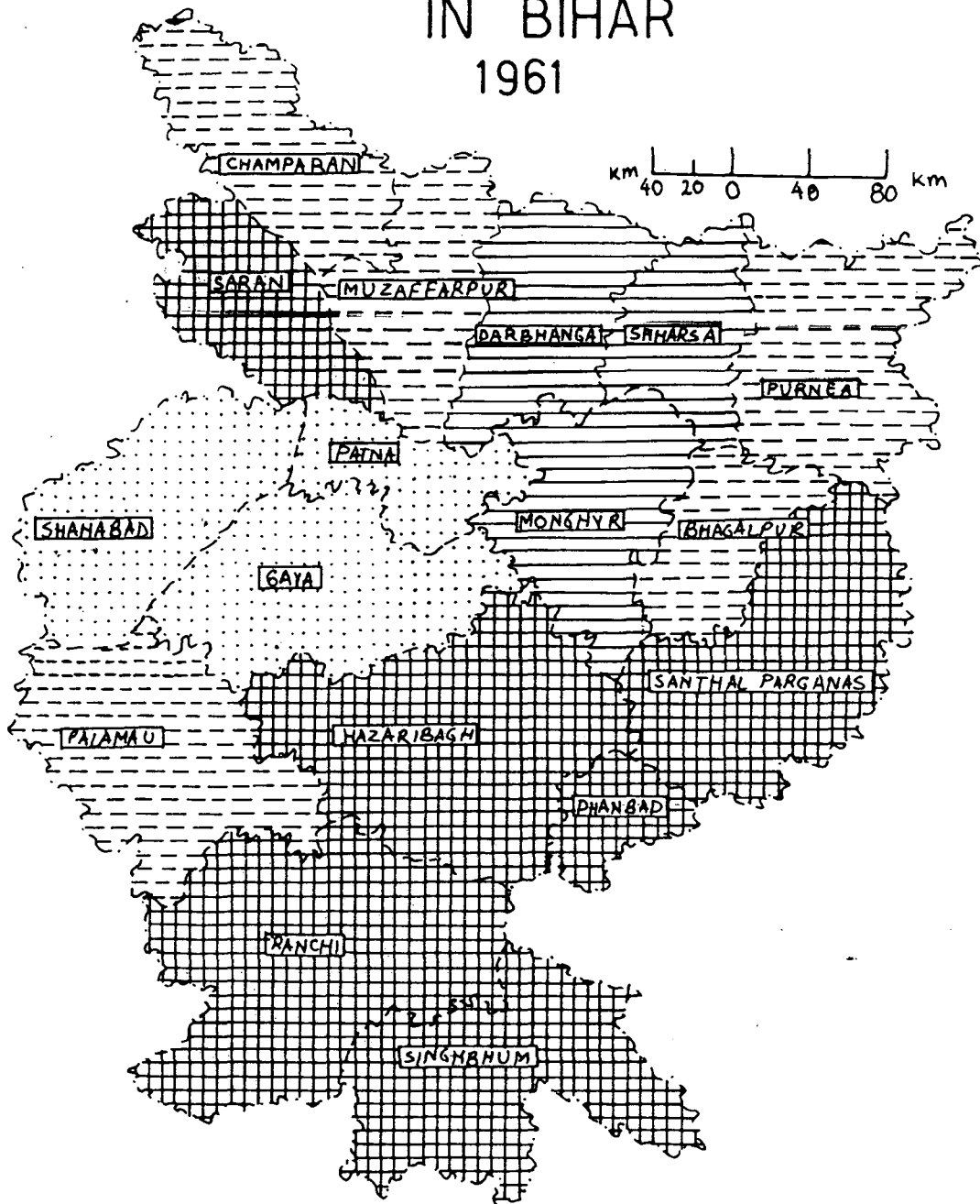
tractors used per hectare cropped area (G_{11}), $-.24300$ and pumpsets used per hectare cropped area (G_{12}), $-.78041$ had negative correlation with the composite index of agriculture development but they become positively correlated viz., (G_9) (.64421, .86321), (G_{10}) (.77931, .89667), G_{11} (.45604, .89924) and (G_{12}) (.58136, .74989) during 1971 and 1981 respectively.

It indicates that during 1961, no modern technology was available. But during 1971 and 1981, use of fertilizers, tractors, and pumpsets helped in the improved performance of the agriculture sector. That is why these variables were negative correlated in 1961, but become highly positively correlated during 1971 and 1981 to the composite index of agriculture development

Levels of Agricultural Development in Various Districts

While analysing the levels of development under agriculture sector, the districts of Hazaribagh, Saran, Santhal Pargana, Ranchi and Singhbhum are found in high category as against Munger and Darbhanga in medium category during 1963. Rest of the districts are found in low and very low category during the same time period. But during 1971, some of the districts which were in the 'very low category' during 1961, are found in high category during 1971 and 1981. They are Patna, Gaya and

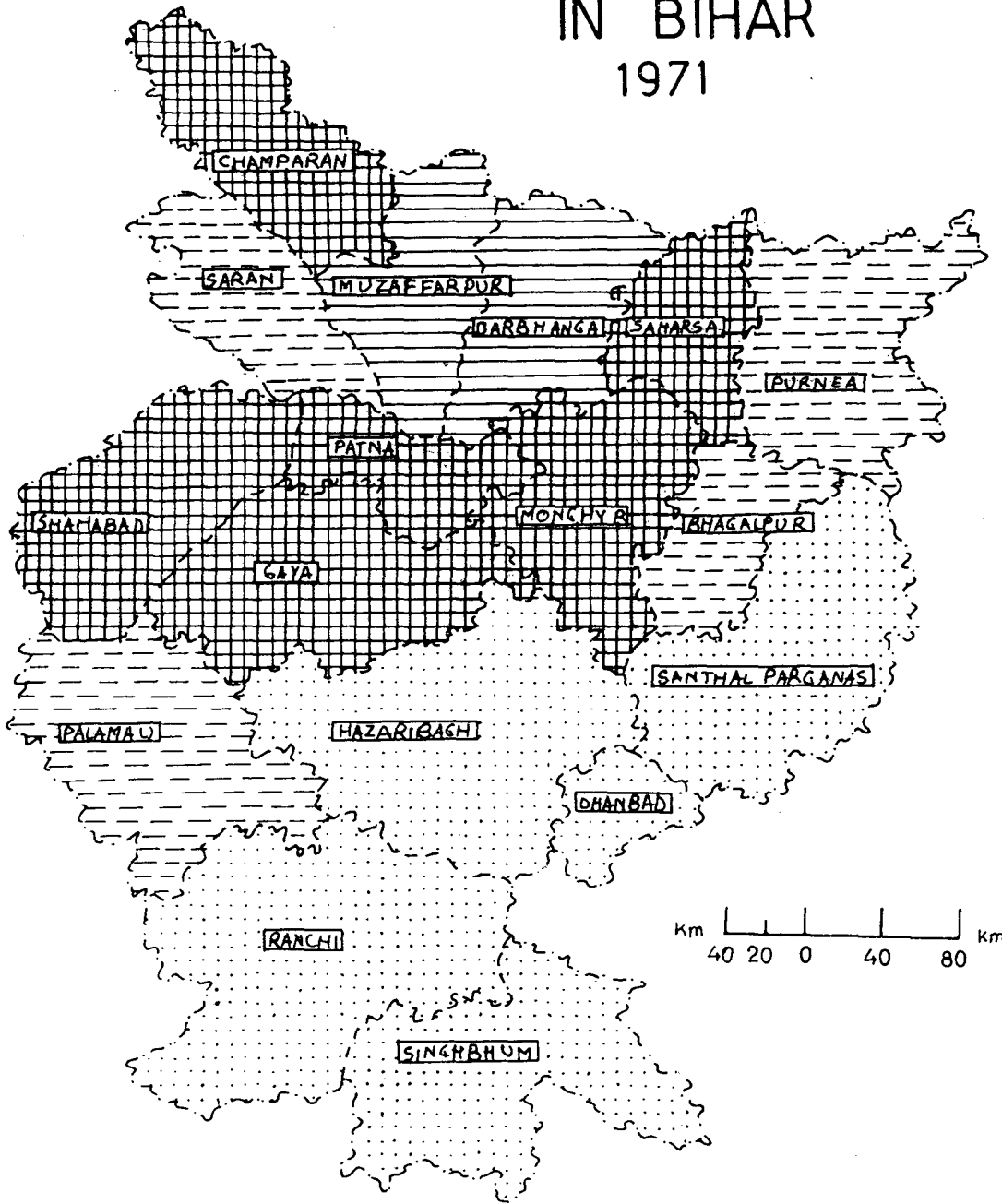
AGRICULTURAL DEVELOPMENT IN BIHAR 1961







LEVELS OF AGRICULTURAL DEVELOPMENT

HIGH		0.6724 & ABOVE
MEDIUM		0.3079 to 0.6724
LOW		-1.0086 to 0.3079
VERY LOW		BELOW -1.0086

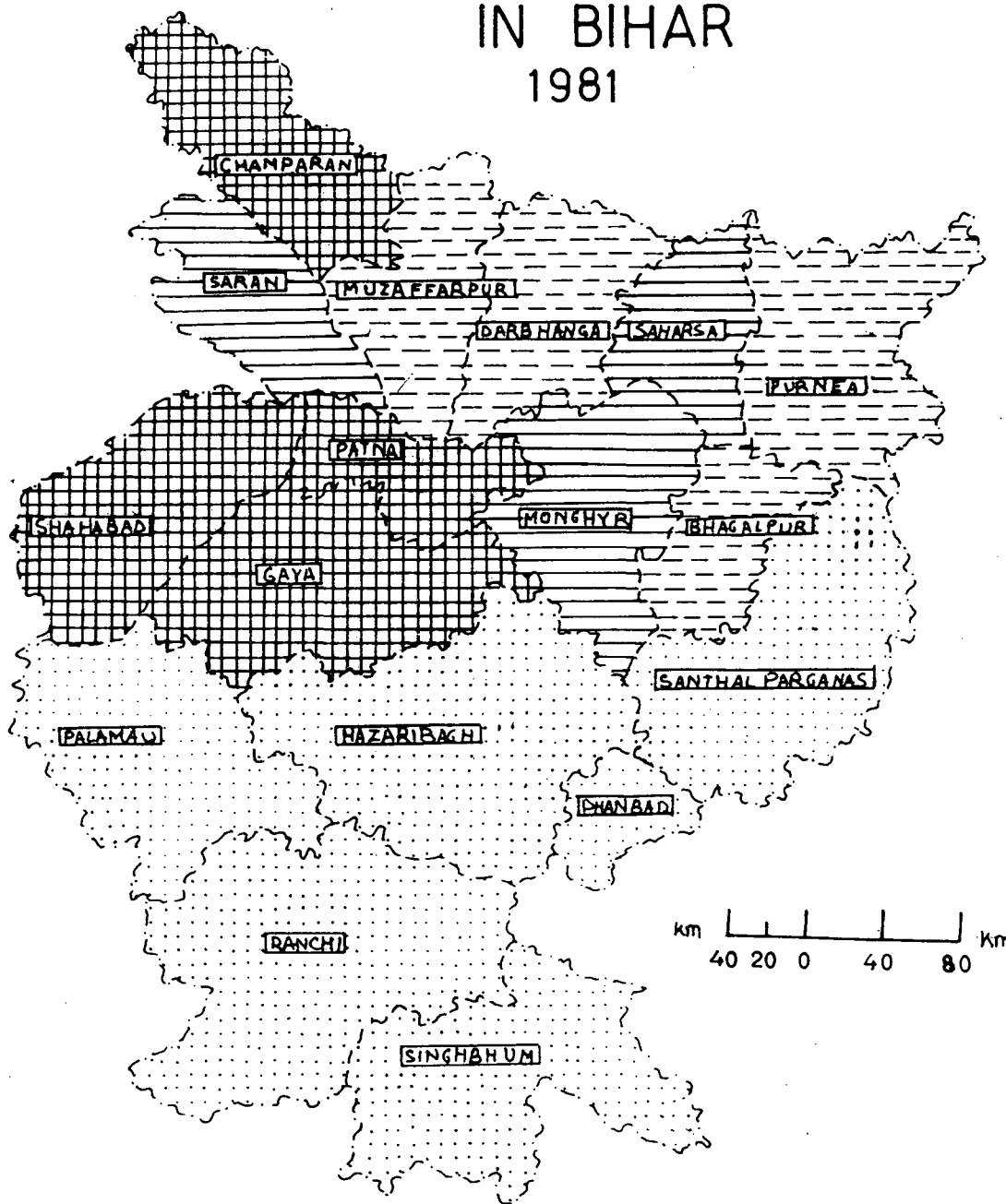
AGRICULTURAL DEVELOPMENT IN BIHAR 1971



LEVELS OF AGRICULTURAL DEVELOPMENT

HIGH		0.6724 & ABOVE
MEDIUM		0.3079 to 0.6724
LOW		-1.0086 to 0.3079
VERY LOW		BELOW -1.0086

AGRICULTURAL DEVELOPMENT IN BIHAR 1981



LEVELS OF AGRICULTURAL DEVELOPMENT





HIGH		0.6724 & ABOVE
MEDIUM		0.3079 to 0.6724
LOW		-1.0086 to 0.3079
VERY LOW		BELOW -1.0086

Table 3.3
Agricultural Growth Among the
Districts

	1961	1971	1981
High .6724 and above	Hazaribagh Saran Santhal- Parganas Ranchi Singhbhum	Sahabad Munger Patna Champaran Gaya	Patna Sahabad Champaran Gaya
Medium .3079 to .6724	Munger Darbhanga	Darbhanga Muzaffarpur	Munger Saran
Low -1.0086 to .3079	Purnia, Muzaffarpur, Palamu Champaran Bhagalpur	Saran Purnia Bhagalpur Palamu	Bhagalpur Muzaffarpur Purnia Dharbhanga
Very Low below -1.0086	Sahabad Gaya Patna	Hazaribagh Singhbhum Santhal- Parganas, Ranchi	Hazaribagh Palamu Santhal- Parganas Singhbhum Ranchi.

Sahabad and Munger which was in medium category during 1961, was found in high category during 1971 but again came in medium category during 1981. Champaran which was in 'low category' during 1961, attained high category during 1971 and 1981. However, Hazaribagh, Singhbhum, Ranchi and Santhal Parganas were found in high category during 1961, joined the "very low category" in 1971 and 1981. The reason is quite clear. The districts of Hazaribagh, Dhanbad, Singhbhum and Ranchi are based in

rich mineral belt. During 1971 and 1981, industries come up in big way in this region. Many coal mines, Iron factories, heavy machineries (HEC, Ranchi, TISCO, TELCO, Bokaro Steel Plant, BCCL, CCL) came up during this time. These districts have not developed in agriculture due to emphasis on industrialization of this area. However, the districts of Sahabad, Gaya and Patna which developed in agricultural field are found in the high category afterwards. The facilities of pumpsets, tractors, use of fertilizer also increased in these areas which increased their agriculture production. Due to the use of modern methods of agriculture these areas have developed themselves. The map clearly shows the levels of development among the districts.

Table 3.4 depicts the co-efficient of variation for various indicators of agriculture developing during 1961. It is observed that there are large variations in such variables viz. G_9 , G_{10} , G_{11} , G_{12} which were identified as most important in the development agriculture. Variations in the levels of agriculture development have decreased during 1961-71 because of the decrease in the co-efficient of variation in most of the variables. The same trend has been observed during 1981 also.

Table 3.4

Variables of agriculture sector	Co-efficient of variation (<u>Standard deviation x 100</u>)		
	Mean		
	1961	1971	1981
G ₁	25.79184	28.76062	33.18312
G ₃	45.31552	36.0982	37.67156
G ₄	52.93521	35.22676	36.33815
G ₈	30.531555	42.0217	17.05685
G ₉	99.03743	87.50531	72.50982
G ₁₀	110.6881	71.17336	64.32432
G ₁₁	85.32093	86.46741	82.762
G ₁₂	110.01109	109.59336	86.69724
G ₁₃	46.23992	19.76744	24.1791
G ₁₄	93.93203	30.43844	38.43175

Ashok Mathur (1983) hypothesised that in the early stages of agriculture development disparities decline.⁵ Our study also confirms the same result.

Industrial Development

Bihar happens to be the richest state in India from the point of view of mineral wealth, accounting 41 per cent of its total mineral production by weight and 30.5 per cent

5. Ashok Mathur, "Sectoral Income Disparities in India: An Inter-regional Analysis, "1956-75", Economic Development Cultural Change, vol.31, nos.1-4, 1983.

by value. The Chhotanagpur plateau, which is the richest mineral belt in the whole of the Indian sub-continent, contains the world's largest reserves of mica and also large quantities of iron ore, copper, bauxite, limestone, Kyanite, China-clay, fire clay etc. Bihar produces 100 per cent mica and apatite, 95 per cent of Kyanite, more than 50 per cent coal, 60.34 per cent of copper, 48.28 per cent of iron ore and accounts for 40 per cent of India's known deposits of coal and cent per cent of cooking coal sixty five percent of India's lac also comes from this state which has rich Uranium and beryl deposits too. Some of which have recently been exploited. There are 26.47 million tonnes of bauxite deposits in Bihar,⁶ of which 16.0 million tonnes are of a high grade, with a metal content of more than 50 per cent other minerals having significant production in Bihar are manganese quartzite, graphite, chromite, asbestos, barytes, dolomite, fellopar, columbite, salt-petre, glass sands, slate, lead, silver, building stones, radioactive minerals like Somarskite, annerodite, pitchblende, tantalise etc. The state, therefore, offers ample scope for the establishment of mineral based industries.

6. R.C. Prasad, Resources and Economy 'Bihar', National Book Trust, India, New Delhi, 1983.

Our knowledge of Bihar's mineral resources is admittedly far from complete as is obvious from the growing number of cases of newly explored reserves. Most of the mineral-bearing areas of Bihar are forest-covered, rugged and relatively remote.

The land put to non-agricultural use accounts for about 7.9 per cent of the total area of the state and includes the space occupied by buildings, factories, rivers, roads, railways, reservoirs, canals etc.⁷

The share of agriculture (in 1961) in total working population was 76.8 per cent, industry 7.7 per cent and mining, quarrying etc., 3.4 per cent.⁸ The number of unemployed are also very high. Not only is the state poor in terms of per capita income but even the distribution of income is uneven. These figures in the matter of population and employment reveal clearly that the industrial development of the state has been poor. The pressure of population on the soil is alarming.

From the point of view of industries Bihar may be regarded as less developed state in comparison to its mineral resources. The village is the main unit of economic life, the village artisans supply the simple

7. Ibid.

8. Ibid.

needs of their neighbours, though a large variety of their products, notably their handwoven cotton cloth, have been supplanted by machine made articles. On the other hand, organised industries and manufacturers of considerable importance have come into existence during the last few decades. A large labour force is employed in coal mines, iron and railway works, household industries, construction, trade and commerce, transport, storage and communications, and labour is becoming more mobile, scores of thousands of able bodied men migrating every year to meet the demand of the manufacturing centres. Machinery is being employed to an increasing extent; factories are springing up in towns; giant industrial complexes, such as the Heavy Engineering corporation, Bokaro Steel, Sindri Fertilizers, Patratu Thermal Power Corporation, Baruni Industrial Complex (HFC, Oil refinery, Baruni Thermal Power Corporation), TISCO, TELCO, Aluminium industry, Copper industry, Jaduguda Uranium mill and mine project and other non-metallic industries.

Workers Engaged in Manufacturing Sector (G₅)

Workers engaged in manufacturing sector (G₅) have shown positive correlation with number of total workers to total population (G₂) .33250 during 1961.

But during 1971 and 1981 workers engaged in manufacturing sector (G_5) showed negative correlation with number of total workers to total population (G_2) $-.08243$ and $-.01275$ respectively. The reason may be that the population increased during 1961-71 and 1971-81 but the workers in manufacturing sector did not increase in that proportion. Because India did not go through industrial revolution. The shift which is taking place here, is from primary to tertiary sector. But for sound economy of a region shift should take place from primary sector to secondary and from secondary to tertiary sector.

Workers Engaged in Secondary Sector (G_6)

Workers in manufacturing sector (G_5) has shown high positive correlation with workers in secondary sector (G_6), $.99683$ during 1961, $.98339$ during 1971 and $.99618$ during 1981. It is because, manufacturing sector is an important part of secondary sector. But workers in manufacturing sector (G_5) has shown declining trend of its correlation with secondary sector (G_6) during 1961-71. It is because, mining and quarrying has been included in secondary sector during 1971.

But number of total workers to total population (G_2) showed positive correlation with workers in secondary sector (G_6) $.30912$ during 1961, $.01900$ during 1981 and

negative correlation $-.06468$ during 1971. The cause may be that the increase in the workers of secondary sector (G_6) may be low in comparison with population growth during 1971. But during 1981, the correlation is very low but it is positive. The reason would be that the increase in the number of workers in secondary sector would be better between 1971-81 than 1961-71.

Workers Engaged in Mining and Quarrying (G_{16})

Workers engaged in mining and quarrying (G_{16}) have shown positive correlation with workers engaged in manufacturing sector (G_5) $.41242$ and workers engaged in secondary sector (G_6) $.55692$ during 1961. Workers in manufacturing (G_5) and secondary sector (G_6) have also shown high positive correlation $.71035$ and $.72740$ during 1971 respectively. But it (G_{16}) showed negative correlation with number of total workers to total population (G_2) $-.03460$ during 1971 but positive correlation $.06058$ during 1981.

It may be said that many industrial establishments and manufacturing units are dependent on raw material which comes from mines. So, the industrial units and manufacturing units are dependent on mines. If the number of workers engaged in manufacturing units and secondary sector increases then the workers in mining and quarrying would also increase.

Workers Engaged in Household Industries (G₁₇)

Household industry is defined as an industry conducted by the head of the household himself/herself and/or by the members of the household at home or within the village in rural areas and only within the precincts of the house where the household lives in urban areas. The household industry should not be run on the scale of a registered factory and should be engaged in production, processing, servicing, repairing and selling (but not merely selling) of goods.⁹ Workers engaged in household industries have shown positive correlation with number of total workers to total population (G₂) .24546, workers in manufacturing sector (G₅) .57570 and workers in secondary sector (G₆) .53755. But during 1971 and 1981, workers in household industries showed negative correlation with number of total workers to total population (G₂)-.20154 and -.30937 respectively. But during the same time 1971 and 1981, workers in manufacturing sector (G₅) (.19324 and .07548) and secondary sector (G₆) (.14737 and .02591) have shown positive correlation.

9. V.S.Verma, A Handbook of Population Statistics Issued on the occasion of the first data users conference for 1991 census, New Delhi, April 18-20, 1988 by officer of Registrar General, Census of India.

But the correlation has shown declining trend between 1961-71 and 1971-81. Because the cost of production of the household industries is higher in comparison with the mechanised factories. These factories are using modern technology and their cost of production is low due to high productivity. So, the household industries are not in a position to compete with industrial giants. Because they are financially sound and efficient in the process of production. So, the number of household industries are declining. It is also clear from the correlation which is declining between workers in household industries and workers in manufacturing or secondary sector.

Workers Engaged in Other Than Household Industries (G₁₈)

Workers in other than household industries (G₁₈) have shown positive correlation with workers in manufacturing sector (G₅) (.32490, .73561, .74389) workers in secondary sector (G₆) (.37443, .68928, .71994), workers in household industries (G₁₇) (.12295, .10764, .20020) and workers in mining and quarrying (G₁₆) (X, .29380, .45591) during 1961, 1971 and 1981.

The positive correlation is due to inter-relation among the variables. These variables are of secondary sector which influences the economic development. They

are also inter-dependent on each other. If there is rise in the number of workers in manufacturing unit like steel plant then it would require more raw material. Raw material comes from mines and quarries. So, it would definitely increase the number of workers engaged in mining and quarrying. During 1961, 1971 and 1981, the correlation showed upward trend for all the variables. So, the relationship among the variables are getting more and more dependent on each other.

Number of Factories Working per 10,000 Workers (G₃₉)

Number of factories working per 10,000 workers (G₃₉) have shown positive correlation with workers in manufacturing sector (G₅) .59087 and .62740, workers engaged in secondary sector (G₆) .60852 and .63185, workers in mining and quarry to total population (G₁₆) .34665 and .67652, workers in household industries (G₁₇) .65748 and .25729 workers in other than household industries (G₁₈) .55398 and .62695 during 1971 and 1981.

Only total number of workers to total population (G₂) showed negative correlation -.25936 during 1971 and positive correlation .01452 during 1981. So, it may be concluded that the increase in the number of factories would also affect the number of workers in different segments of secondary sector like manufacturing, mining and quarrying and household industries.

Table 4.2

Variables of Industrial Development	Factor Matrix (F_1)		
	1961	1971	1981
G ₂	.29966	-.27660	-.15965
G ₅	.87575	.85883	.87930
G ₆	.88071	.85012	.86696
G ₁₇	.72709	.43131	.28414
G ₁₈	.57648	.86495	.90158
G ₂₅	.95477	.92685	.93426
G ₂₆	.94123	.95547	.94178
G ₁₆		.44049	.70377
G ₃₈	.	.87450	.87135
G ₃₉		.85647	.84624
% of variance	61.3	59.4	61.7

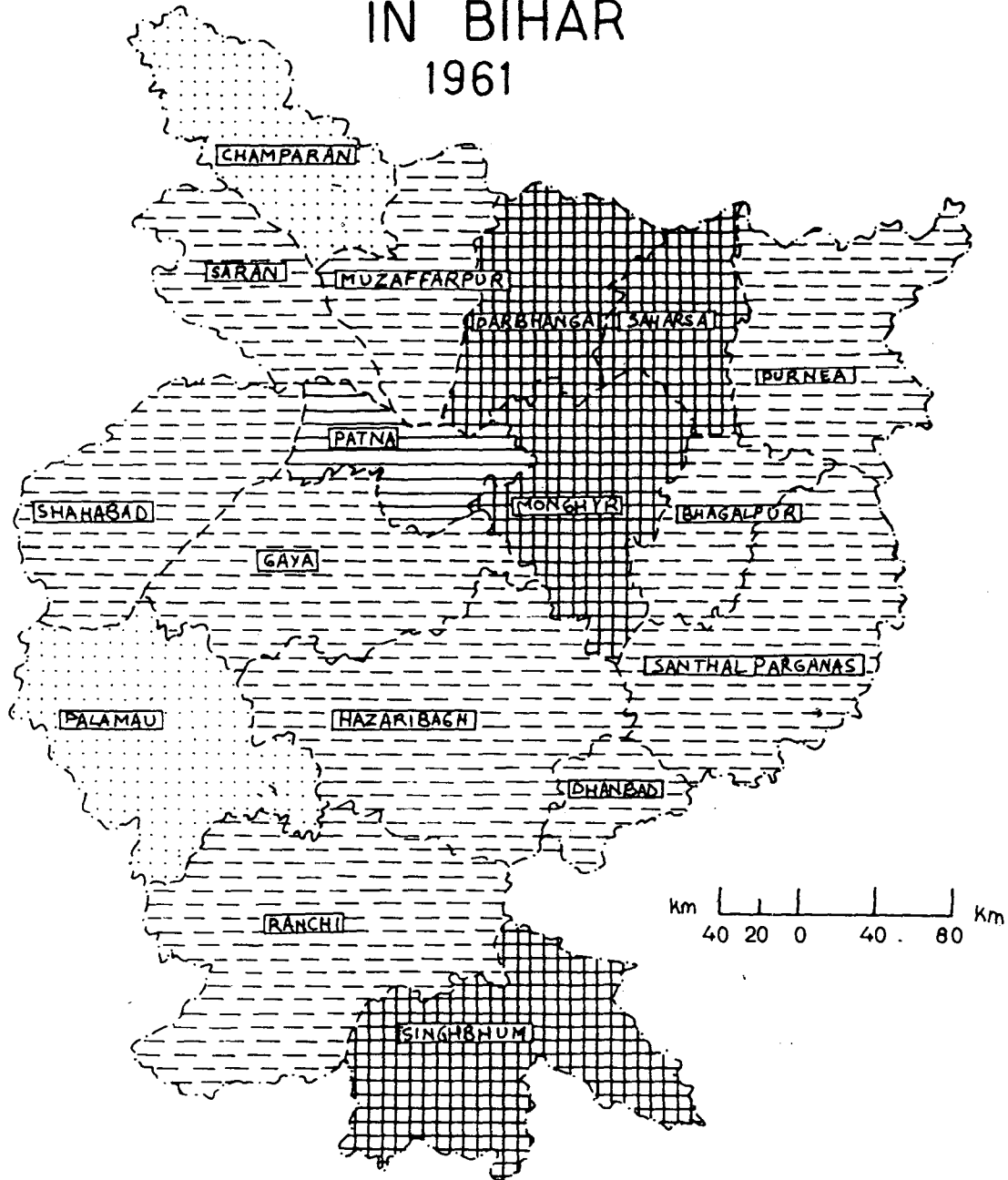
Table 4.2 shows that variables (G₆) .88071, household industries (G₁₇), .72709, other than household industries (G₁₈) .57648, have positive relationship with that of composite index of industrial development during 1961. The first factor explains 61.3 per cent of total variance during 1961, which has been decreased to 59.4 per cent during 1971 and further increased to 61.7 per cent during 1981. It means that the explanatory power of the variables decreased during 1961-71 and further increased during 1971-81, over the time period. Total workers to total population is positively related to the

index of industrial development during 1961 but during 1971 and 1981 it (G_2) negatively related $-.27660$ to the composite index of industrial development. It may be attributed that during 1961, the pressure of population was not so high on the industries and the household industries were also in good shape. But in due course of time, the population also increased and the household industries also started diminishing because heavy industrialization and technological development took place. It has been observed that between 1961 and 1971, the correlation of manufacturing sector (G_5), secondary sector (G_6) and household industries (G_{17}) $.43131$ and $.85883$ declined and further increased between 1971 and 1981 in almost all the variables. It may be attributed that during 1961, it was the time period just after the II Five Year Plan. In II Five Year Plan the emphasis was on industries. During 1971 due to emphasis on agriculture (green revolution) and rise of population may be attributed as the cause of decline of correlation among the variables of industrial development.

The details are given in Table 4.3 of all the three years of study period.

While analysing the levels of development under industrial sector, the districts of Singhbhum, Darbhanga and Munger are found in high category as against Patna

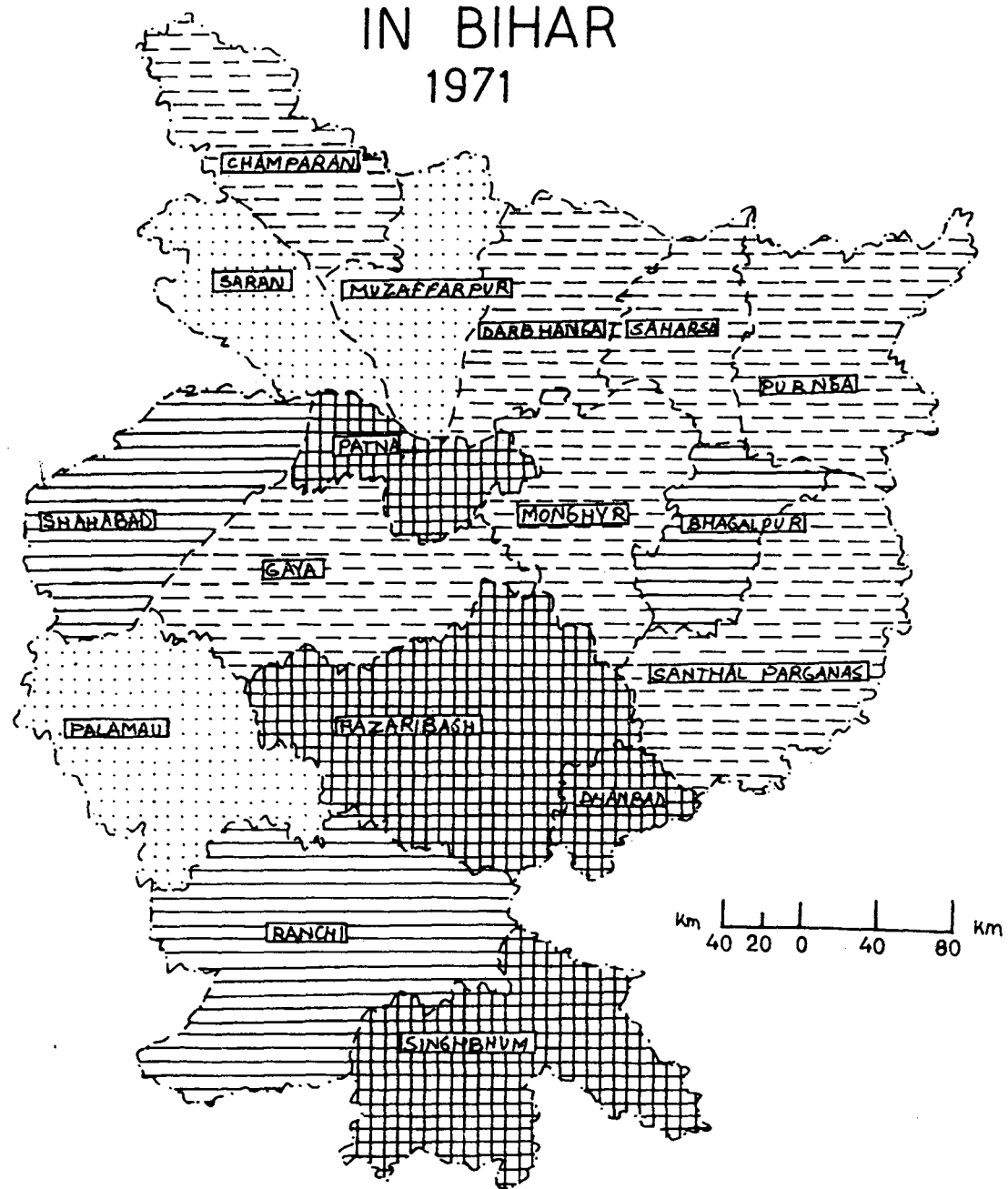
INDUSTRIAL DEVELOPMENT IN BIHAR 1961



LEVELS OF INDUSTRIAL DEVELOPMENT

HIGH		0.68426 & Above
MEDIUM		0.21737 to 0.68426
LOW		-0.7820128 to 0.21737
VERY LOW		Below -0.7820128

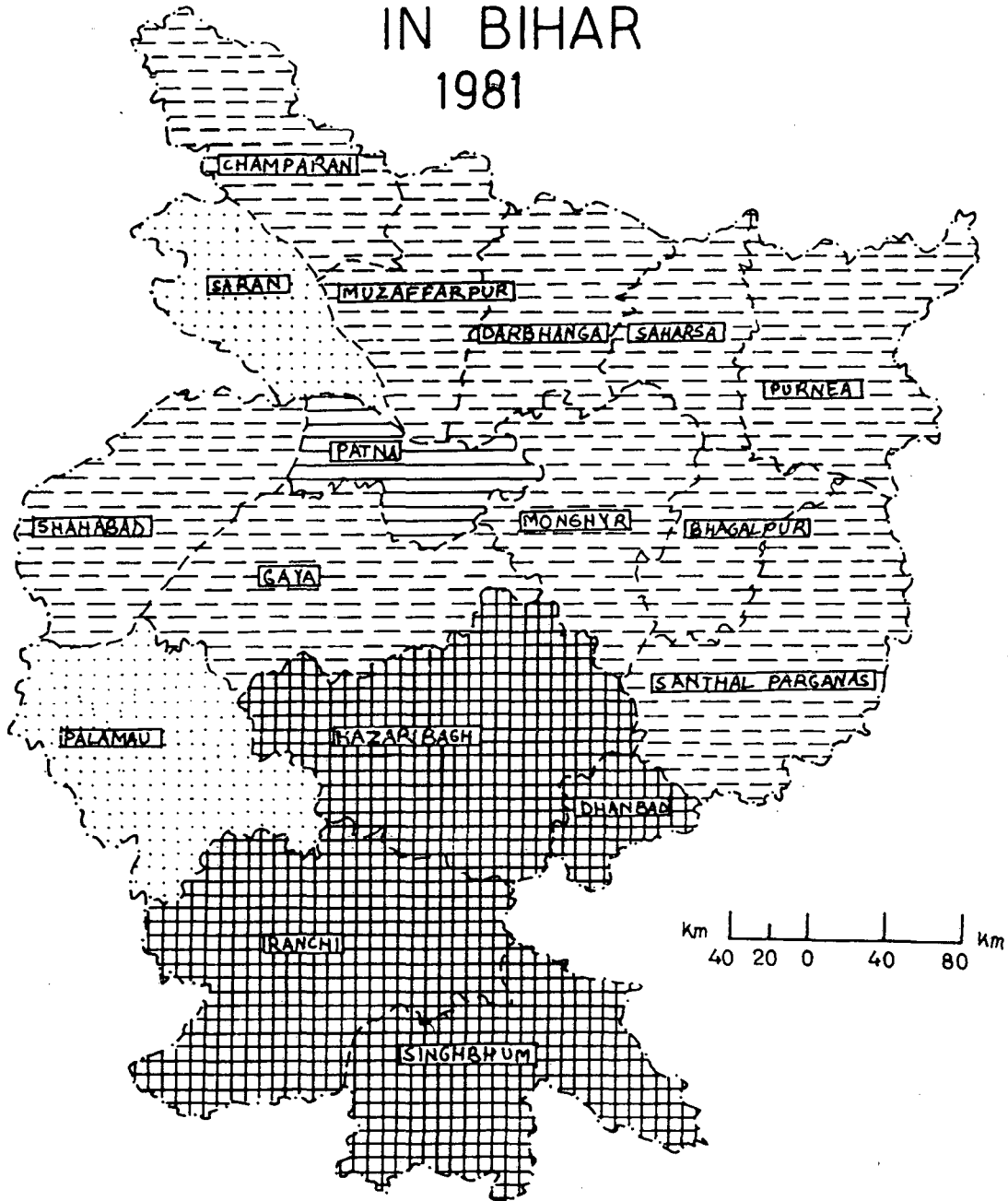
INDUSTRIAL DEVELOPMENT IN BIHAR 1971



LEVELS OF INDUSTRIAL DEVELOPMENT

HIGH		0.68426 & Above
MEDIUM		0.21737 to 0.68426
LOW		-0.7820128 to 0.21737
VERY LOW		Below -0.7820128

INDUSTRIAL DEVELOPMENT IN BIHAR 1981



LEVELS OF INDUSTRIAL DEVELOPMENT

HIGH		0.68426 & Above
MEDIUM		0.21737 0.68426
LOW		0.7820128 0.21737
VERY LOW		Below 0.7820128

Table 3.6

Industrial Growth Among the States

	1961	1971	1981
High .68426 & above	Singhbhum Darbhanga Munger Sahabad	Singhbhum Hazaribagh Darbhanga Patna	Singhbhum Hazaribagh Dhanbad Ranchi
Medium .21737 to .68426	Patna	Ranchi Sahabad Bhagalpur	Patna
Low -.7820128 to .21737	Bhagalpur, Muzaffarpur, Sahabad Saran, Dhanbad, Hazaribagh, Gaya, Purnia, Santhal- Parganas, Ranchi	Munger, Gaya, Santhal- Parganas, Champaran, Purnia Darbhanga	Bhagalpur Santhal- Pargana, Gaya, Sahabad, Munger, Muzaffarpur, Champaran, Darbhanga Purnia
Very Low below to -.7820128	Champaran Palamu	Muzaffarpur Saran Palamu	Saran Palamu

in medium category during 1961. Except Champaran and Palamu rest of the districts were in low category in 1961. Saran was in the low category during 1961, but it found that Saran was in very low category during 1971 and 1981 also. Palamu also remained in very low category in all the three years viz., 1961, 1971 and 1981. Darbhanga and Munger who were found in high category during 1961, found in low category during 1971 and 1981 also. Patna was found in High Category in

1971 and in medium category during 1981. Singhbhum remained at the top in the high category during all the three years viz., 1961, 1971 and 1981. It may be attributed as the most industrialised district of Bihar. Hazaribagh and Ranchi found in low category during 1961, were elevated to higher and medium category respectively. Hazaribagh and Ranchi were found in low category during 1961, were elevated to higher and medium category respectively. Hazaribagh and Ranchi were found in higher category during 1981.

It shows that the development is uneven. Patna being capital of Bihar, is developed. Ranchi, Singhbhum and Hazaribagh are developed because they are based in the rich mineral belt. The entire north Bihar and some parts of south Bihar are totally neglected. North Bihar is totally based on agriculture. These areas are not well developed. Some industries like Ashok paper mill at Darbhanga, Dalmiana Gar in Sahabad, were existing earlier, but now they have closed. No new industries are coming up, but those which are existing are also facing closure.

Table 4.4 depicts the co-efficient of variation of indicators of industrial development during 1961, 1971 and 1981. It has been observed that there are large variation in variables except number of total workers to total population (G_2) workers in other than household industries (G_{18}). Workers in household industries (G_{17}),

other than household industries (G_{18}), workers in mining and quarrying (G_{16}), manufacturing sector (G_{25}) and number of factories working per 10,000 workers have identified as most important variables in the industrial development. Variation in the levels of industrial development has increased because of increase in the co-efficient of variation in most of the variables during 1961-71. But the opposite trend has been observed in most of the variables during 1971-81 as it is shown in Table 4.4.

Table 3.7

Variables of Industrial sector	Co-efficient of Variation		
	1961	1971	1981
G_2	15.92785	6.5441	10.53409
G_5	39.45154	42.45708	44.98552
G_6	38.69762	44.46006	45.15953
G_{17}	22.46795	29.11392	36.7507
G_{18}	99.04444	98.88888	81.25
G_{25}	31.44929	52.51396	50.44776
G_{26}	31.66877	51.52027	48.87118
G_{16}		302.38095	266.51141
G_{38}		40.00518	33.89428
G_{39}		39.36732	33.1861

Ashok Mathur (1983) hypothesised that in the early stages of industrial development, disparities in industrial sector increases and declines latter on.¹⁰ Our study also confirms the same results in most of the case except one or two.

Infrastructure Development in Bihar

This section includes only those workers who are engaged in trade and commerce; transport, storage and communication; and other services. Colin Clark has observed that in the process of economic growth the expansion of tertiary sector is more rapid than the secondary sector, therefore, in connection with the labour force there is a large absorption of labour force in tertiary sector than secondary. But in a country like India "It would be safe conclusion to state that in periods of development tertiary (sector) services may expand somewhat more than the manufacturing industries, but the order of magnitude of the difference in the rate of expansion, is unlikely to be very large."¹¹

Colin Clark's observation holds it good in case of Bihar. For example, in Bihar the proportion of

10. Ashok Mathur, "Sectoral Income Disparities in India: An Inter-regional Analysis, 1956-75," Economic Development and Cultural Change, vol.31, nos.1-4, 1983.

11. Planning Commission, Papers Relating to the Formulation of the Second Five Year Plan, p.268.

workers engaged in tertiary sector is higher than the secondary sector. Although the number of workers engaged in tertiary sector is higher than the secondary sector but it is very small in comparison with primary sector. The proportion of workers engaged in tertiary sector, like secondary sector, has shown a declining trend, i.e., from 11.48 per cent in 1961 to 9.66 per cent in 1971. It reflects rather a negative aspect of the levels of economic development. But it will not be quite correct to conclude on this basis alone, because this decline in their proportion may be due to the change in the definition of workers in 1971. A similar pattern of decline in the proportion of workers engaged in tertiary sector is observed in almost all the districts of Bihar, except Dhanbad and Hazaribagh and Ranchi.

The proportion of workers engaged in tertiary sector indicates the levels of economic development of a region. The higher is the proportion of workers in tertiary sector in a region, the higher will be economic development in that region.

Number of Vehicles Per 10,000 Population (G₃₄)

Number of vehicles per 10,000 population (G₃₄) showed negative correlation with number of vehicles on per 100 kilometre of PWD road (G₃₃), viz., $-.80962$ during

1961, $-.52325$ during 1971 and $-.69884$ during 1981. The result shows that the rate of increase of vehicles is higher than the increase in the PWD roads. So, the pressure of vehicles on the road is higher.

Number of Hospitals Per 1,00,000 Population (G_{37})

Number of hospitals per one lakh population (G_{37}) showed positive correlation with number of vehicles per 10,000 population (G_{34}) viz., $.49373$ and $.69422$ during 1961 and 1971 respectively. But it (G_{37}) shows negative correlation $-.00658$ during 1981. Similarly, number of hospitals per one lakh population (G_{37}) show negative correlation with number of vehicles per 100 kilometre PWD road $-.58158$ during 1961, $-.11069$ during 1971 and positive correlation $.03641$ during 1981. (But during 1981, G_{37} has shown negative correlation with number of vehicle per 10,000 population (G_{34}) $-.00658$).

During 1961 and 1971, there was lack of medical facilities in the villages of state. Our 80 per cent population stay in the villages and transportation was essential for movement of the people. The number of vehicles were adequate for the movement in proportion of the length of PWD roads. But during 1981, the length of PWD road increased but the vehicles per 10,000 population was not adequate. Because population increased

rapidly during 1971 and 1981. The number of hospitals were less during 1961 and 1971. People had to move to towns to avail the medical facilities. During 1981, primary health centres, dispensaries come into existence but were not effective.

Awareness came among the people of villages. They also want to avail the facilities of specialist. The facilities of specialist are not available in the villages. So, people move to the nearby towns to get better medical facilities.

Workers Engaged in Tertiary Sector (G₇)

Workers in tertiary sector (G₇) have shown positive correlation with number of vehicles per 100 kilometre PWD roads (G₃₃), .26482 and number of buses per 10,000 population (G₃₆) .04165 during 1961. But it (G₇) showed negative correlation with number of hospitals per 1,00,000 population (G₃₇) -.42734 during 1961. During 1971 and 1981, the number of vehicles per 100 kilometres PWD road (G₃₃) showed negative correlation -.30227 and -.53757 respectively. During the same time period the number of hospital per one lakh population (G₃₇) .23589 and .02349, number of vehicles per 10,000 population (G₃₄) .31576 and .55744 have shown positive correlation with number of workers in tertiary sector (G₇). The result shows that if the number of vehicles

on the road increases then the workers in tertiary sector would also go up. But during 1971 and 1981, the number of vehicles increased but in comparison of vehicles the PWD roads were not increased. During 1971 and 1981, as the number of hospitals increased, the number of workers in hospitals also increased. Rise in number of vehicles would definitely increase the workers in transportation.

Workers in Trade and Commerce (G_{20})

Workers in trade and commerce (G_{20}) showed positive correlation with workers engaged in tertiary sector (G_7) .58393, number of buses per 10,000 population (G_{36}) .35349 and number of vehicles per 10,000 population (G_{34}) .11574 during 1961. But during 1971 and 1981, it (G_{20}) has shown positive correlation with number of vehicles per 10,000 population (G_{34}) .52954 and .84956, workers in tertiary sector (G_7) .72863 and .73459 respectively. Number of hospitals per one lakh population (G_{37}) showed negative correlation -.11189 during 1961, positive correlation .48898 during 1971 and again negative correlation -.11303 with workers engaged in trade and commerce. It may be attributed that vehicles are an important mode of transportation for trade and commerce. In the tertiary sector, most of the persons are engaged in trade and commerce.

That is why it has been observed that workers engaged in trade and commerce (G_{20}) showed positive correlation with the number of vehicles available and tertiary sector.

Workers Engaged in Transport,
Storage and Communication (G_{21})

It (G_{21}) has shown correlation with vehicle per 1,000 population (G_{34}) (.09431, .84220 and .87165), workers engaged in tertiary sector (G_7) (.41421, .49655 and .50976) and workers engaged in trade and commerce (G_{20}) (-.00292, .67963 and .76394) during 1961, 1971 and 1981. The result shows that during the changing pace of time, transport, storage and communication have become very important in day to day life. Like, the entire trade and commerce is totally dependent on transport, storage and communication. So, it is considered as vital reason for positive correlation of these variables with G_{21} .

Table 5.2 shows number of vehicles per 10,000 population (G_{34}) .90747, number of hospitals per 1 lakh population (G_{37}) .68372 and other services (G_{22}) .61461 have shown positive relationship with that of composite index of infrastructural development during 1961. First factor explains 45.4 per cent of total variance during 1961, which has increased to 59.1 per cent in 1971 and further increased to 59.4 per cent during 1981. It

Table 3.8

Variables of Infrastructure	Factor Matrix (F_1)		
	1961	1971	1981
G_{33}	-.90142	-.46261	-.66168
G_{34}	.90747	.88256	.92867
G_{35}	.91175	.86854	.62789
G_{36}	.82633	.64778	.80008
G_{37}	.68372	.81634	-.02924
G_7	-.15923	.58938	.72593
G_{20}	.24946	.75940	.95443
G_{21}	.02244	.90262	.88068
G_{22}	.61461	.86442	.89188
% of variance	45.4	59.1	59.4

means that the explanatory power of the variables have been increased during 1971 and 1981. During 1961, workers in tertiary sector (G_7) -.15923 was negatively correlated with composite index of infrastructural development found positively correlated in 1971 (.58938) and 1981 (.72593) also.

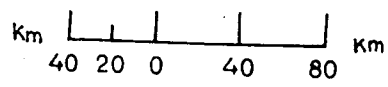
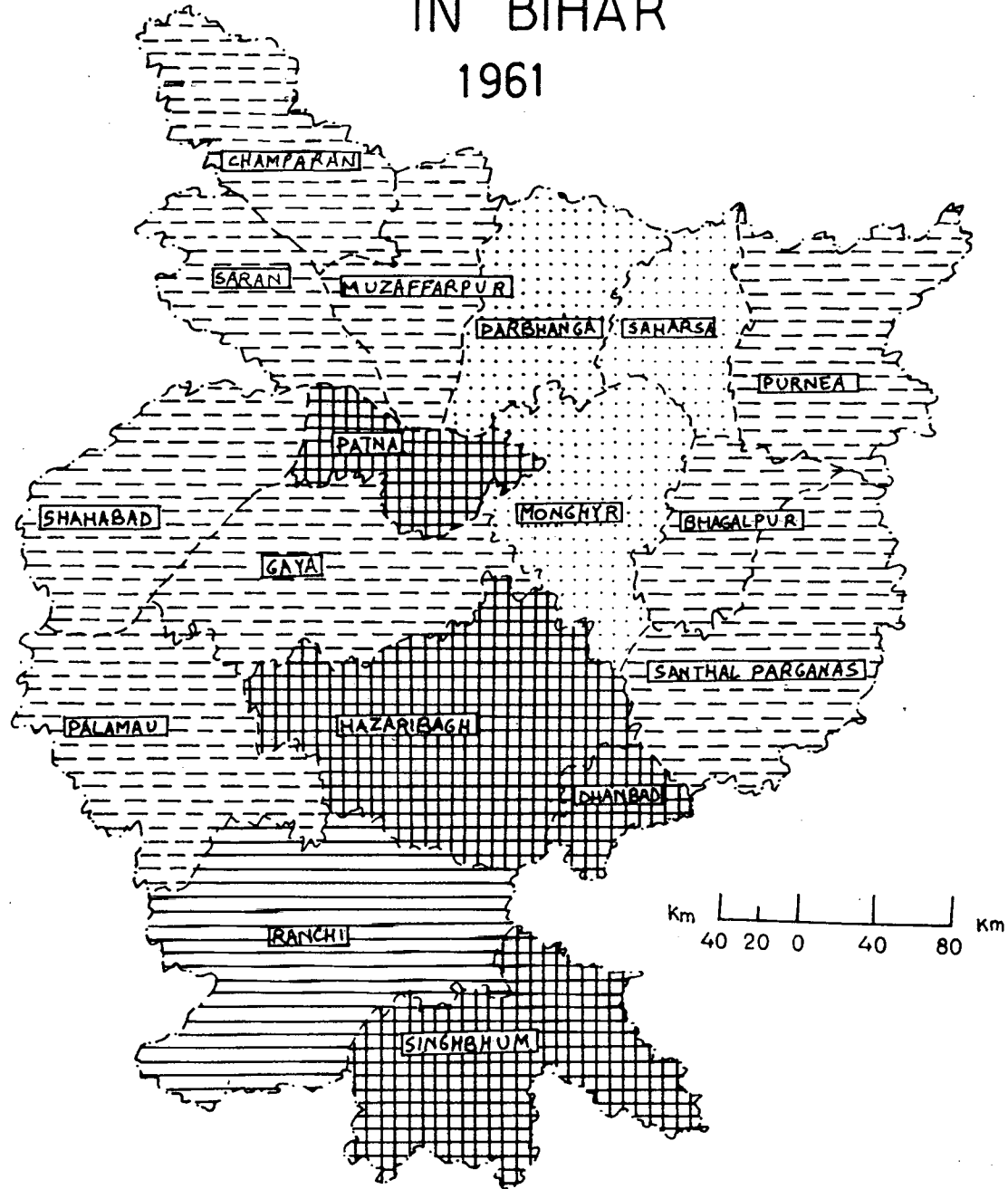
Workers engaged in trade and commerce (G_{20}) and workers in transport, storage and communication (G_{21}) showed low positive correlation .24946 and .02244 during 1961 with the composite index of infrastructural development. But workers in trade and commerce (G_{20}) (.75940

and .95443) and workers in transport, storage and communication (G_{21}) (.90262 and .88068) showed high positive correlation with development index during 1971 and 1981 respectively. Number of vehicles per 100 km PWD road (G_{33}) -.90142 showed negative correlation with infrastructural development during 1961, but it showed declining trend -.46261 during 1971. The result shows that during 1961, the contribution of workers in trade and commerce (G_{20}) and workers in transport, storage and communication (G_{21}) was low. But during 1971 and 1981, their contribution in infrastructural development became very high. Number of vehicles, road and other services also are important component of infrastructural development.

Levels of Development at District Level

While analysing the levels of development under infrastructure sector, the districts of Singhbhum, Hazaribagh and Patna are found in high category in all the three years viz., 1961, 1971 and 1981. Ranchi was found in the medium category during 1961 but found in high category during 1971. Again in 1981, Ranchi was found in the low category. During 1971 and 1981, no district was found in the medium category. During 1961 Munger and Darbhanga during 1971; Palamu, Santhal Pargana,

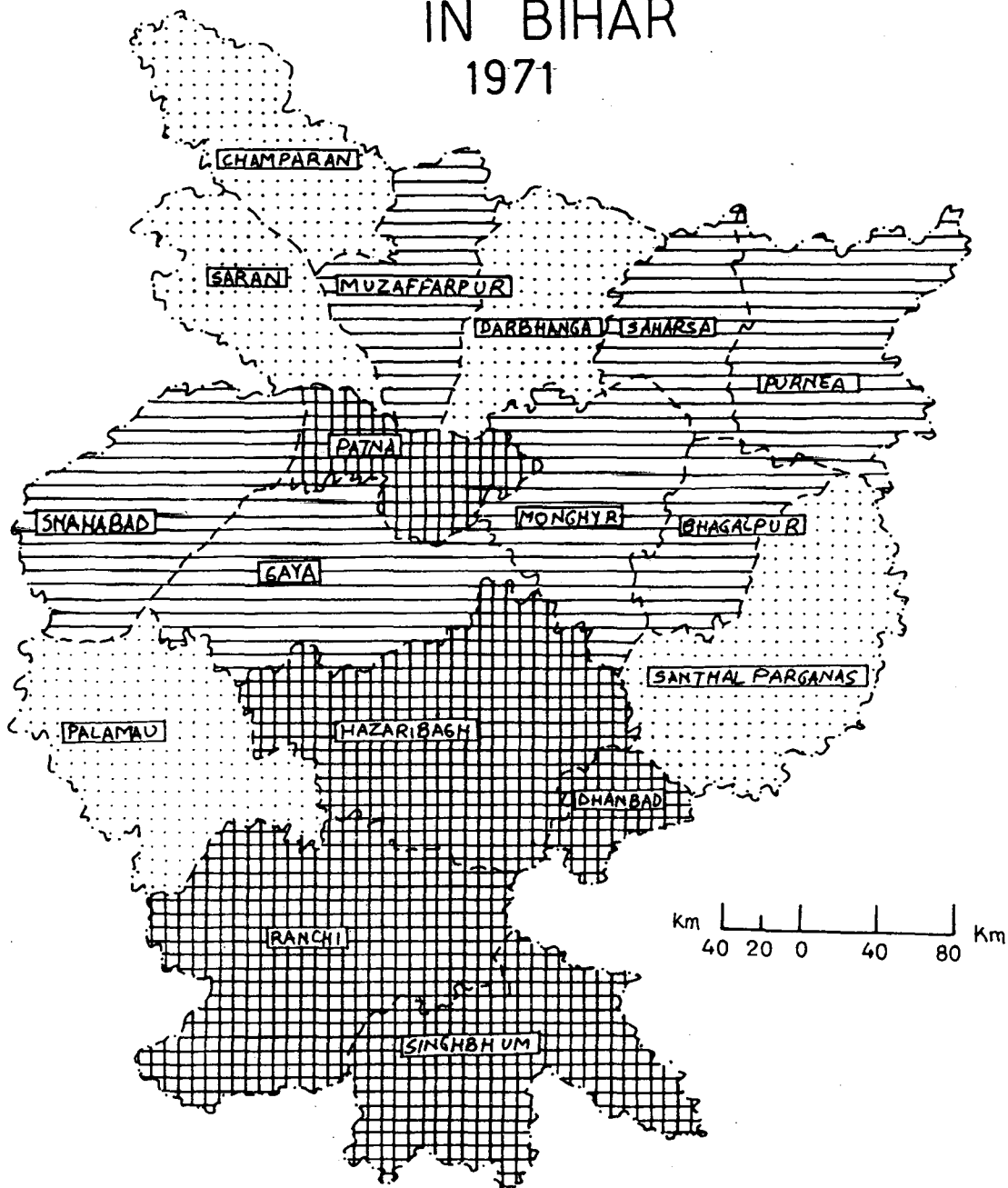
INFRASTRUCTURAL DEVELOPMENT IN BIHAR 1961







LEVELS OF INFRASTRUCTURAL DEVELOPMENT

HIGH		1.048 & Above
MEDIUM		0.48897 to 1.048
LOW		-0.6989 to 0.48897
VERY LOW		Below -0.6989

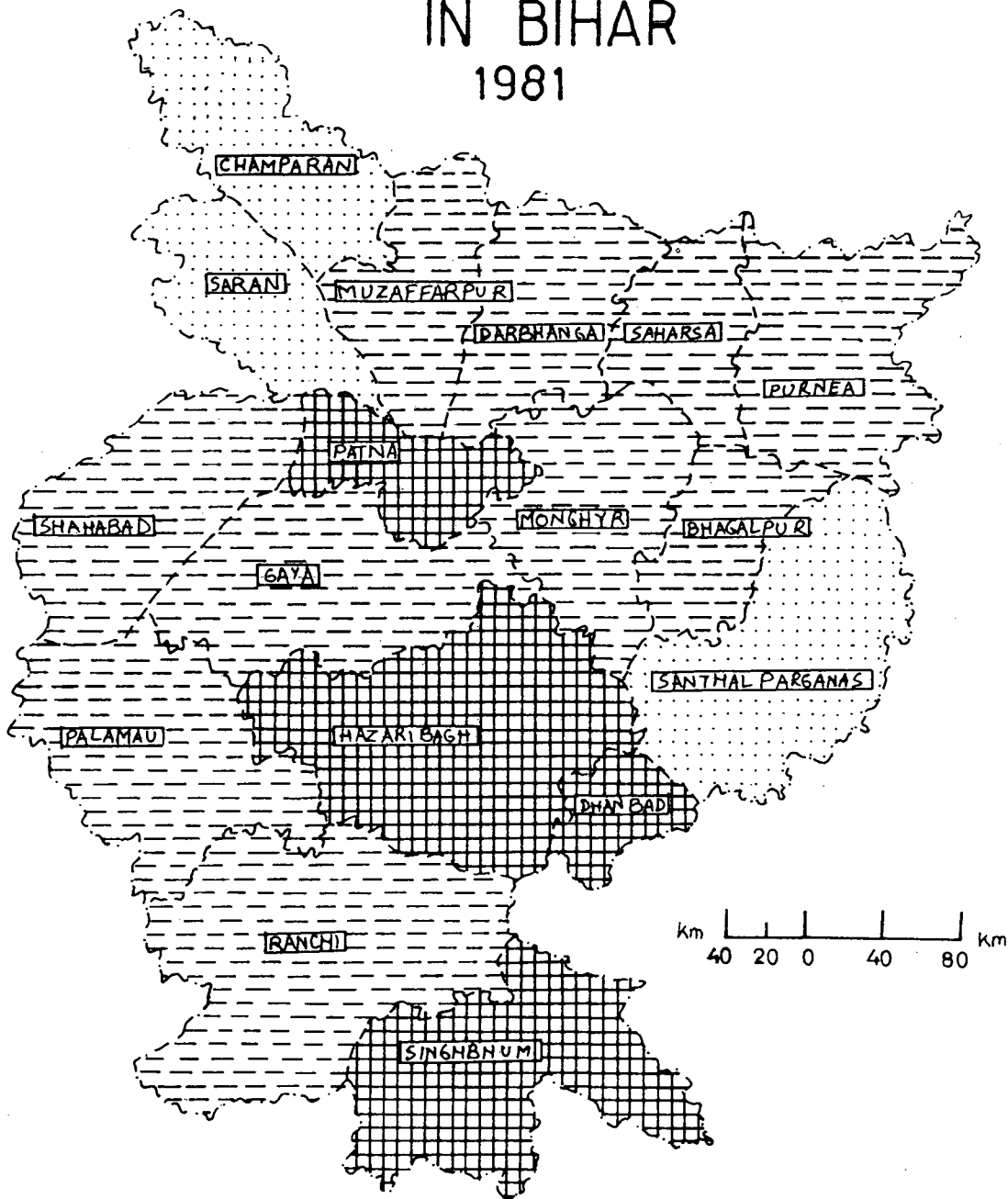
INFRASTRUCTURAL DEVELOPMENT IN BIHAR 1971



LEVELS OF INFRASTRUCTURAL DEVELOPMENT

HIGH		1.0484 & Above
MEDIUM		0.48897 to 1.0484
LOW		-0.6989 to 0.48897
VERY LOW		Below -0.6989

INFRASTRUCTURAL DEVELOPMENT IN BIHAR 1981



LEVELS OF INFRASTRUCTURAL DEVELOPMENT





HIGH		1.0484 & Above
MEDIUM		0.48897 to 1.0484
LOW		-0.6989 to 0.48897
VERY LOW		Below -0.6989

Table
Infrastructural Growth

	1961	1971	1981
High 1.048 and above	Singhbhum Patna Hazaribagh	Hazaribagh Patna Singhbhum Ranchi	Patna Singhbhum Hazaribagh
Medium .48897 to 1.0484	Ranchi		
Low -.6989 to .48897	Bhagalpur Palamu Muzaffarpur Sahabad Gaya Santhal- Pargana Purnea Saran	Sahabad Gaya Muzaffarpur Munger Bhagalpur Purnea	Ranchi Sahabad Purnea Gaya Muzaffarpur Munger Bhagalpur Palamu Dharbhanga
Very low below -.6989	Munger Dharbhanga	Palamu Santhal- Pargana Saran Champan Darbhanga	Santhal- Pargana Saran Champan

Saran and Champan were found in very low category and Ranchi, Sahabad, Purnea, Gaya, Muzaffarpur, Munger, Bhagalpur, Palamu and Darbhanga were found in low category.

The reason may be attributed that Patna developed its infrastructure because it is the capital of Bihar. The infrastructure facilities developed in Ranchi during the period of its industrial development. Singhbhum and Hazaribagh remained in the higher category during all the three years because of being industrial centres. Big public sector units and giant private concerns like Tata's TISCO and TELCO also helped these cities in the development of infrastructure facilities. Table 5.4 shows that except Patna, Singhbhum and Hazaribagh, all the districts are either least developed or backward. It is the failure of the state to develop government the infrastructure facilities in these districts. No districts of north Bihar is either in medium or high category in all the time period viz., 1961, 1971 and 1981, as it is shown in the map.

Table 5.4 shows the co-efficient of variation of variables of infrastructural development during 1961, 1971 and 1981. It has been found that there is large variation in variables during 1961, 1971 and 1981. Number of vehicles per 10,000 population (G_{34}) number of buses per 10,000 population (G_{36}), number of hospitals per one lakh population (G_{37}) and workers engaged in transport storage, trade and communication which have been identified most important in the development of infrastructure facilities.

Table 3.10

Variables of Infrastructure	Coefficient of Variation		
	1961	1971	1981
G ₃₃	53.93103	130.35714	67.1762
G ₃₄	119.31424	108.95211	134.52736
G ₃₅	107.91797	110.01963	89.41437
G ₃₆	62.59479	50.31309	85.83699
G ₃₇	77.29577	26.37003	70.87504
G ₇	38.11124	40.12882	42.94419
G ₂₀	27.43243	30.0813	29.11152
G ₂₁	105.44943	53.1233	50.54294
G ₂₂	28.87594	32.73543	36.71675

Table 5.4 clearly shows variation in the co-efficient of variation during 1961, 1971 and 1981 among the variables of infrastructural development. The result shows that the trend of infrastructural development is not even in the districts of Bihar.

Summary

The development of agriculture, industries and infrastructure is necessary for the balanced economic development of any state. The economy of Bihar is based on agriculture. Because more than 80 per cent of the population stay in the villages. Their main occupation is agriculture. Agriculture itself contributes more the

50 per cent of the state's economy. In order to know the process of development, it becomes necessary to relate the basic development indices of agriculture, industry and infrastructure and overall development with each other.

Agriculture development showed positive correlation with industrial development (.1153) and overall economic development (.2587) during 1961. During the same period agriculture developed showed negative correlation with infrastructural development (-.0616). Table 4.2 shows that during 1971, agricultural development has shown negative correlation with industrial development (-.2843), infrastructural development (-.3161) and overall development (-.5497). But during 1981, agricultural development has shown positive correlation with infrastructural development (.0041), and negative correlation with industrial development (-.4239) and overall economic development (-.4755).

During 1961, agricultural development contributed in the overall economic development of the state. The development of village and small scale industries was also taken up extensively during second, third and fourth plan period. But during 1971 and 1981, agriculture development showed negative trend because of industrialization. But during 1981, with the use of modern techniques

like use of fertilizer, tractors and pumpsets for irrigation, the infrastructure showed positive correlation. During 1971 and 1981 the contribution of agriculture was negative except 1961, with the economic development. So it disproves the hypothesis that agriculture development is directly proportional to economic development.

Industrial development showed positive correlation with agriculture development (.1153), infrastructural development (.1871) and overall economic development (.8088) during 1961. During 1971 and 1981 it has shown negative correlation with agriculture development (-.2843 and -.4239) but positive correlation with infrastructural development (.8307 and .7404) and overall economic development (.9191 and .9631) respectively.

During 1961, many village and small scale industries were based on agriculture. That is why agriculture development showed positive correlation with industrial development during 1961. But during 1971 and 1981, industrialization started taking place in the districts of Bihar. The contribution of industrial development was higher in the economic development of the districts. Industrial development showed positive correlation.

Thus there exists with infrastructural development. A two way relationship between the development of the infrastructure and the overall industrial development of the region, ultimately leading to economic development. So, it substantiates the hypothesis that industrial development is directly proportional to economic development.

Infrastructural development has shown negative correlation with agriculture development (-.0616 and -.3161) during 1961 and 1971 respectively but it showed positive correlation (.0041) during 1981. But infrastructure development showed positive correlation during 1961, 1971 and 1981 with industrial development (.1871, .8307 and .7404) and overall economic development (.6894, .9286 and .8353) respectively.

Infrastructure development has shown significant positive correlation with industrial development and overall economic development. Infrastructure development is necessary to sustain the process of industrial development. It confirms the hypothesis that development of infrastructure is directly proportional to economic development. It also leads to industrial development along with economic development.

Chapter IV

POPULATION AND ECONOMIC DEVELOPMENT:

PATTERN OF ASSOCIATION

Introduction

In order to know the process of development and patterns of association it becomes necessary to relate the basic development indices of agriculture, industry, infrastructure and overall development with population. Such correlation if made at the 'Block' level would have yielded interesting results, and possibly shown some more realistic link between them. This was beyond the scope of the present study because of the time constraints and non-availability of secondary data without field visits. We had, therefore, to content ourselves with a comparison at the district level only.

Table 4.1, 4.2 and 4.3 have shown correlation analysis with population growth and other development indices during 1961, 1971 and 1981 respectively.

Population and Agriculture Development

Agriculture

Agriculture development has shown positive correlation with population growth rate (X_{13}) .2389 during 1961, .2554 during 1981 but negative correlation -.1638 during 1971.

Density of population (X_{14}) showed negative correlation with agriculture development $-.2702$ during 1961 but positive correlation $.6776$ (significant at 1 per cent) and $.7470$ (significant) during 1971 and 1981 respectively.

Agriculture development has shown positive correlation with sex-ratio (X_{15}) $.1727$ during 1961 but negative correlation $-.0874$ and $-.1865$ during 1971 and 1981 respectively. Literacy rate showed negative correlation ($-.4271$) with agriculture development during 1961 but positive correlation $.0137$ and $.1304$ during 1971 and 1981 respectively. Agriculture development showed negative correlation with urban population $-.1415$, $-.3192$ and $-.1979$ during 1961, 1971 and 1981 respectively.

Population growth rate has shown positive correlation during 1961 and 1981. The reason may be that population increased between 1961 and 1971 but the agriculture development did not take place at the same rate. The correlation is also not significant.

The literacy rate also had negative correlation during 1961, but positive correlation during 1971 and 1981. It may be said that if the pressure on the land increases, the yield per hectare cropped area would be more. That is why agriculture development shows positive significant

correlation with density. Higher the density, more would be the pressure on agriculture, and with the help of modern techniques like fertilizers, pesticides, tractors and pumpsets, productivity may be improved. Literacy has positive correlation which indicates the need of skilled and education persons in the field so that with the help of modern techniques, agriculture may do better despite pressure of population growth and higher density. So, it disproves the hypothesis that agriculture development is directly proportional to economic development.

Population and Industrial Development

Industrial development has shown negative correlation with population growth rate (X_{13}) (-.2603 and -.0098) during 1961 and 1971 respectively but it showed positive correlation .0603 during 1981.

Industrial development showed positive correlation with density of population (X_{14}) .3854 during 1961 but negative correlation -.3237 and -.3519 during 1971 and 1981 respectively.

Industrial development has shown positive correlation with sex-ratio (X_{15}) .1228 during 1961 but showed negative correlation (-.4805 and -.3610) during 1971 and 1981 respectively.

Literacy rate (X_{16}) has shown positive correlation with industrial development .4121, .7112* and .6511* during 1961, 1971 and 1981 respectively.

Industrial development showed positive correlation with urban population (X_{17}) .4877, .9216** and .9432** during 1961, 1971 and 1981 respectively.

It may be attributed that during 1961 the phase of industrial development was lower than the population growth. But during 1961 it has only positive significant correlation with overall development. During the same time the pressure of population was not so high, so that it showed positive correlation with density of population and sex ratio also during 1961.

During 1971 and 1981, industrial development has positive significant correlation with infrastructural development, percentage of urban population, literacy rate and overall economic development. It leads to prove the hypothesis that industrial development leads to increase in percentage of urban population and urbanization leads to better standard of living. It also leads to higher literacy rate due to facilities of educational institutions and also awareness among the people. Better standard of living may be improved by improving the infrastructure facilities. Industrial development and infrastructure development are dependent on each other.

because development of infrastructure is necessary to sustain the growth of industrial development. So, it proves the hypothesis that industrial development leads to economic development.

Population and Infrastructural Development

Infrastructure development has shown positive correlation with population growth rate (X_{13}) .1045, .1839 and .3971 during 1961, 1971 and 1981.

It has shown negative correlation with density of population (X_{14}) -.3344 and -.2542 during 1961 and 1971 respectively. but positive correlation with density of population (X_{14}) .0933 during 1981.

Sex-ratio (X_{13}) showed negative correlation with infrastructure development -.4975, -.4336 and .4704 during 1961, 1971 and 1981.

Infrastructure development showed high positive correlation with literacy rate (X_{16}) .6851*, .7654** and .7905* during 1961, 1971 and 1981 respectively.

Infrastructure development has shown high positive correlation with urban population .8814**, .9432** and .9348** during 1961, 1971 and 1981 respectively.

Infrastructure may be attributed as an important segment of economic development. It has positive correlation with population growth but it is not significant. But it is increasing viz., .1045, .1839 and .3971 during 1961, 1971 and 1981 respectively. It shows that infrastructure facilities are improving. Infrastructural facilities are totally based on the policies of the government. It may be attributed that the rate of population growth is higher than the rate of infrastructural development. It has negative correlation with agricultural development during 1961 and 1971 but positive correlation during 1981 which is not significant. It has negative correlation with density and sex ratio during 1961 and 1971. But it has only negative correlation with sex ratio during 1981 and positive correlation with density. It may be said that higher the pressure of population or density at certain region, the pressure would be also higher on the infrastructure. Because during 1961 and 1971, Bihar was going under resources constraint and at low developing level. Due to industrial activities the situation started improving during 1981. Infrastructure has significant positive correlation with industrial development overall economic development, literacy rate and percentage of urban population, except during 1961 it was not significant with industrial

development. It also confirms the hypothesis that development infrastructure leads to economic development along with industrial development. Urbanization is byproduct of industrial development. They all are based on each other. Development of infrastructure means development in roads, electricity, educational institutions, transportation etc. If number of schools and educational institutions increases then number of literates would also increase. So, it may be attributed that development of infrastructure leads to economic development of the region. Because it provides better standard of living to the people by improving the facilities of transportation, educational institution and roads.

Population and Overall Development

Overall economic development showed negative correlation with population growth rate (X_{13}) $-.0641$ during 1961, but showed positive correlation $.1253$ and $.1449$ during 1971 and 1981 respectively.

Density of population (X_{14}) has shown negative correlation with overall economic development $-.4468$ and $-.3328$ during 1971 and 1981 respectively but showed positive correlation $.0093$ during 1961.

Sex-ratio (X_{15}) has shown negative correlation with overall economic development $-.1663$, $-.3963$ and $-.3521$ during 1961, 1971 and 1981 respectively.

Literacy rate (X_{16}) has shown positive correlation with overall economic development during 1961, 1971 and 1981, viz., $.5810$, $.6753^*$ and $.6618^*$

Urban population (X_{17}) has also shown positive correlation with overall economic development $.8070^{**}$, $.9448^{**}$ and $.9310$ during 1961, 1971 and 1981 respectively.

Number of literates and percentage of urban population are important indicators of economic development. There is no doubt that literacy is both the cause and effect of social and economic development urban population leads to the development of infrastructure which ultimately leads to economic development. Literacy improves the skill and efficiency of persons which may be helpful in the development process. It also generates awareness.

Table 4.1 shows that economic development and population growth are negatively correlated ($-.0641$) during 1961, but positively correlated ($.1253$) and ($.1449$) during 1971 and 1981 respectively. It is known that Bihar is considered as backward state. During

1961, it may be attributed that development process was stagnant which is not possible. It might be very slow in comparison with population growth during that period. But during 1971 and 1981 industries came up and the rate of development improved. But all these variables are not significant. Agriculture development has positive correlation (.2587) with economic development, even it is not significant, it may be attributed that during 1961, the population pressure was not so high and this was the only source of economic development of the state. Still today agriculture contributes the highest in the national and state economy. But the resources it utilises is much more costlier than the industrial and infrastructural sector. That is why agriculture sector has negative correlation in economic development during 1971 and 1981. It may be attributed that industrial sector is dominating the economy of the state in terms of cost and production. It may be judged that by absorbing 80 per cent of the population agriculture is only giving 50 per cent of the total economy. Economic development has positive significant correlation with industrial development (.8088), (.9191), (.9631), infrastructural development (.6894), (.9286), (.8353), number of literates (.5810), (.6753), (.6618) and percentage of urban population (.8070), (.9448) and (.9310). These are the most

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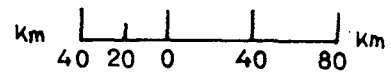
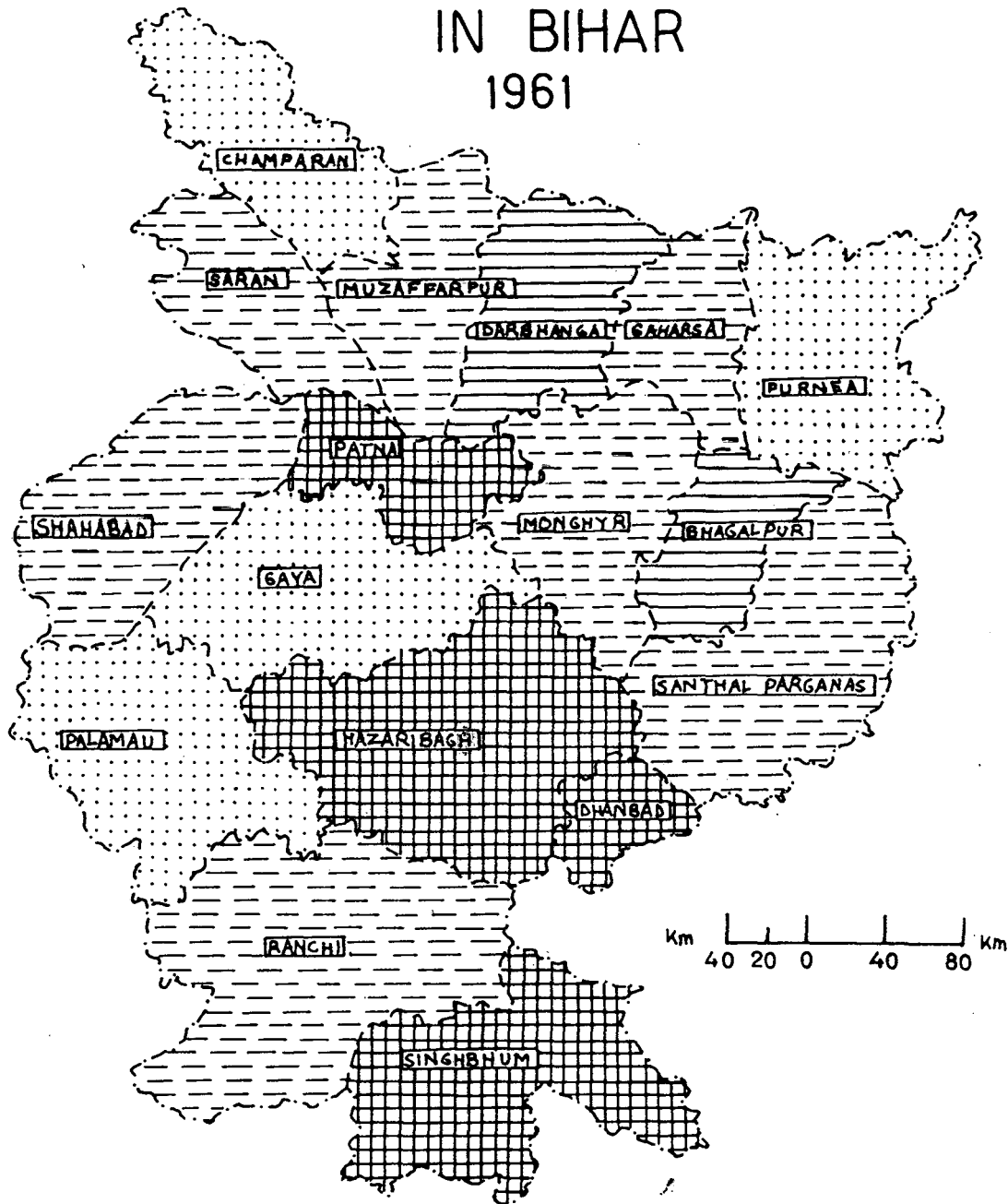
important indicator for the economic development of the state. So, in the case of Bihar industrial and infra-structural development contribute more in comparison than agriculture, in the economic development of the state. The situation may be different in due course of time when the state will be fully industrialised and agriculture will be mechanised. Bihar is still far behind from the main stream of the nation.

Our population growth rate is so high that it does not have any significant relationship. So, it may be attributed that higher growth rate depresses the pace of economic growth. The reason may be resource problem, poor planning etc. Because we are still in developing stage.

Levels of Development at District Level

On the basis of development indices for all the combined sectors and the economy as a whole, the districts are in general classified into four categories, viz., high, medium and low and very low. The districts under very low category may be considered as backward districts of the state, that of low category least developed. Medium category is moderately developed districts and that of high category as comparatively developed or advance district of the state. The details are given in Table 4.4. While analysing the levels of

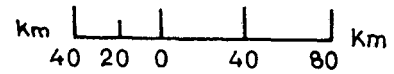
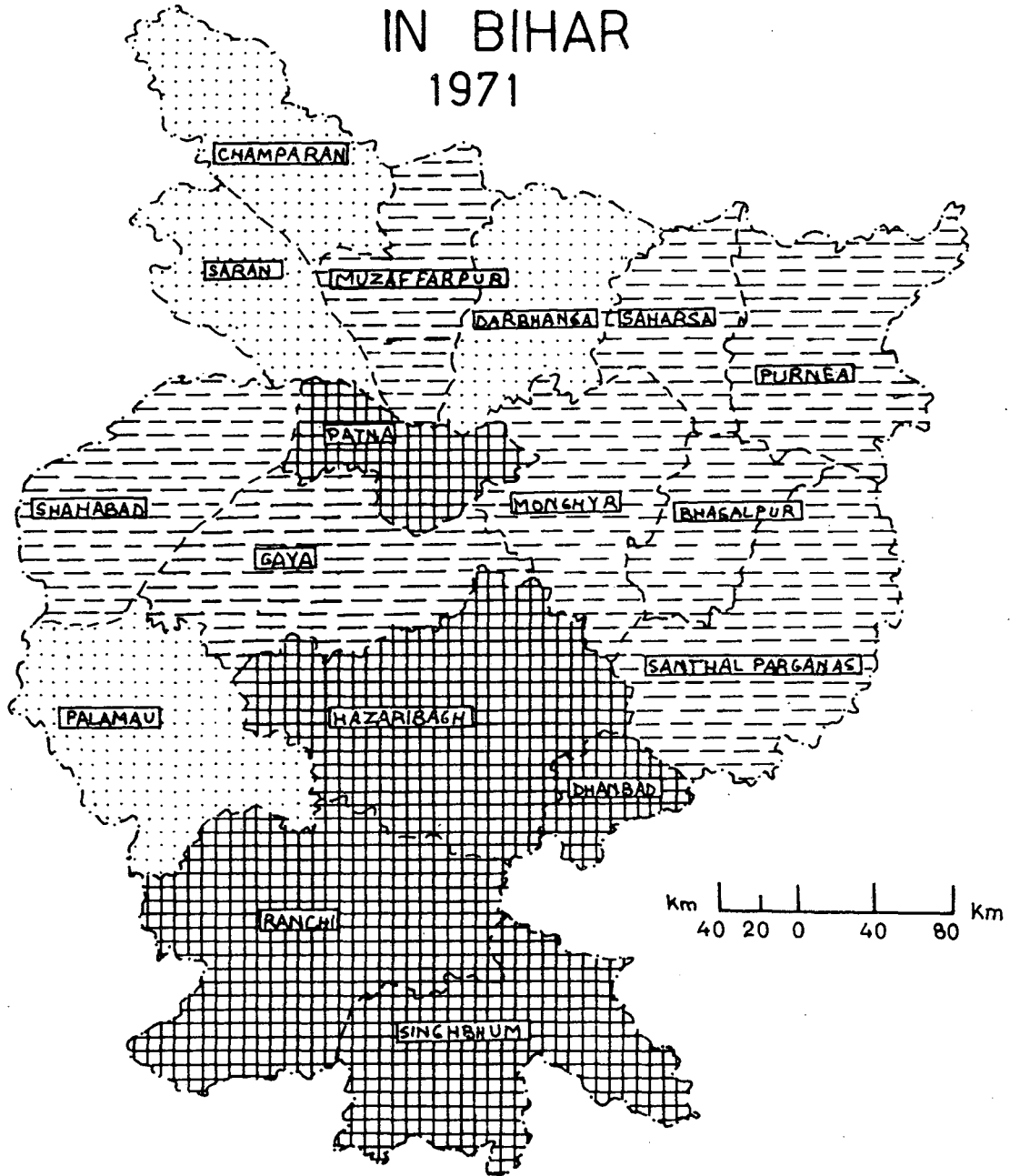
OVERALL DEVELOPMENT IN BIHAR 1961







LEVELS OF OVERALL DEVELOPMENT

HIGH		0.7509 & Above
MEDIUM		0.1973 to 0.7509
LOW		0.657045 to 0.1973
VERY LOW		Below 0.657045

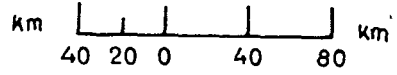
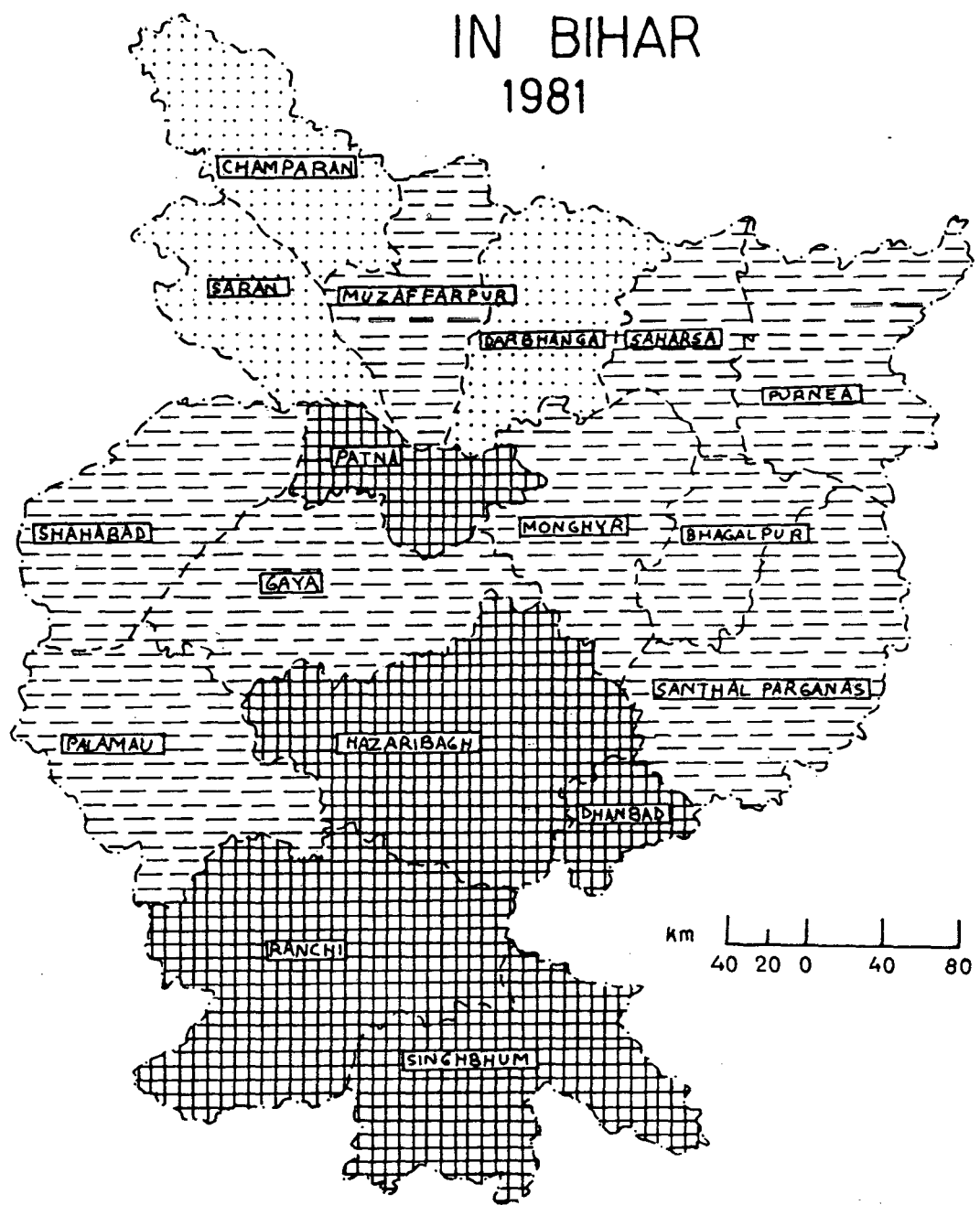
OVERALL DEVELOPMENT IN BIHAR 1971



LEVELS OF OVERALL DEVELOPMENT

HIGH		0.7509 & Above
MEDIUM		0.1973 to 0.7509
LOW		0.657045 to 0.1973
VERY LOW		Below 0.657045

OVERALL DEVELOPMENT IN BIHAR 1981



LEVELS OF OVERALL DEVELOPMENT





HIGH		0.7509 & Above
MEDIUM		0.1973 to 0.7509
LOW		-0.657045 to 0.1973
VERY LOW		Below -0.657045

Table 4.4

Overall Development

	1961	1971	1981
High .7509 and above	Singhbhum Hazaribagh Patna	Singhbhum Hazaribagh Ranchi Patna	Singhbhum Hazaribagh Ranchi Patna
Medium .1973 to .7509	Darbhanga Bhagalpur		
Low -.657045 to .1973	Ranchi, Munger, Muzaffarpur Saran, Sahabad Santhal- Pargana	Bhagalpur Santhal- Pargana Sahabad Gaya Munger Purnea Muzaffarpur	Santhal- Pargana Bhagalpur Sahabad Munger Gaya Purnea Muzaffarpur Palamu
Very low below -.657045	Purnea Gaya Champanan Palamu	Palamu Darbhanga Saran Champanan	Darbhanga Saran Champanan

development under overall economically developed, the districts Singhbhum, Hazaribagh, Dhanbad and Patna are found in high category during 1961, 1971 and 1981 also. Ranchi was in lower category during 1961, found in higher category during 1971 and 1981. It may be due to industrialization of this district. Due to industrial development, infrastructure also improved which led to economically developed district during 1971 and 1981. Darbhanga and Bhagalpur was found in medium

category during 1961, reached very low and low category respectively, during 1971 and 1981. During 1961, Purnea, Gaya, Champaran and Palamu were found in very low category and rest were found in low category. Palamu, Darbhanga, Saran and Champaran were found in very low category during 1971, it remained so also in the 1981 also except Palamu which shifted to low category during 1981. It may be attributed that those districts which went through industrialization, were economically developed. Patna being an important centre for trade and commerce the capital of Bihar developed itself. Rest those in low category and in very low category went neither through industrial development nor infrastructural development. They all are basically based on agriculture or forest resources and still in the backward stage.

Chapter V

SUMMARY AND CONCLUSIONS

After a detailed discussion of the salient features of agriculture economy of Bihar, occupational patterns, infrastructural development and patterns of association with population growth, literacy, percentage of urban population and density in the previous chapters, we come to the understanding that the various hypothesis and assumptions taken for our topic to a considerable extent appear valid for the case study of Bihar. However, there exists the glaring non-existence of the assumption that the higher agricultural development would lead to higher economic growth.

For instance, on account of rich natural endowments and sound regional structure of development the districts of south Bihar plain are comparatively more developed than the rest parts of the state in the fields of agriculture and infrastructure in the state. They are followed by the district of north Bihar plain and Chhottanagpur plateau in the field of agriculture. In case of industrial sector, the districts of Chhotanagpur plateau are comparatively more developed in the state. They are followed by the districts of South Bihar plain and north Bihar plain. This phenomenon is understandable, because the districts of north Bihar plain are mainly

agrarian with low degree of urbanization, industrialization and literacy.

Thus it is found that on an average the districts of Chhotanagpur plateau are comparatively more developed than the other parts of the state in respect of overall development too in the state. They are followed by the districts of South Bihar plain. In this regard the districts of north Bihar plain are relatively less developed. There are certain districts which are quite exceptional. These are the districts of Dhanbad, Hazaribagh, Ranchi and Singhbhum districts of Chhotanagpur plateau in which mining and industrialization have made visible impact on its overall development. In the district of Singhbhum also we find some impact of industrialization on its overall development. To a considerable extent its development would be ascribed to the industrial city of Jamshedpur which is in the same district. The districts of Ranchi and Hazaribagh have also undergone considerable degree of industrial development. In Ranchi, it is primarily due to industrial setting (Heavy Engineering Corporation being the biggest of its kind in Asia) while mining activities gives Hazaribagh background and colour.

Among the districts of South Bihar plain the district of Patna remains at the top in the list of

overall development. In fact, Patna is one among the most developed districts of the state. Its geographical location (in the ancient times the confluence of Ganga, Sone and Punpun not only provided it natural protection - 'Jaladurga' but also developed the city as centre of trade and commerce) endowed with natural resources have kept the city the centre of administration of the state (and the Indian peninsula period). And it being at the seat of government has resulted in certain structural changes which invariably gives the city an eminent position. It has been found that the district of Patna is acting as a core area for the levels of regional development. Although the streams of development are spreading in all directions from here, it is mainly to the adjoining regions of river Ganga. It is evident from the fact that the districts of Saran, Sahabad and Munger rank just next to Patna in terms of agriculture development.

It is observed that Patna is the only district in the state where there has been a balanced/integrated development in the fields of agriculture, industries and infrastructure. It is evident from the fact that in both the periods, 1961 and 1971, it improved its position in agriculture and industrial development, while being second in infrastructural development.

Singhbhum, Hazaribagh and Dhanbad are the other districts of the state which have maintained their top position in all the three years of the present study. Although both the regions lag behind in agricultural development but their relatively developed infrastructure and employment (occupational) opportunities keeps the region high in the seat of economic progress and development.

From our study it also appears except Ranchi no other district has improved its position in overall development. Only Palamu and Gaya appear to have improved a bit. Ranchi has improved its position in respect of overall development on account of its improved ranks in industrial and infrastructural development. On the other hand, the districts of Bhagalpur and Darbhanga have lost their positions in respect of overall development on account of the loss of their ranks in all the three fields of economy. In other words, except Patna, Ranchi, Hazaribagh, Dhanbad and Singhbhum, other districts of Bihar have lagged behind in terms of overall development.

The analysis of correlation of literacy with percentage of urban population, industrial development and infrastructural development has revealed that with an increase in the percentage of literacy there could

be more participational workers in industrial development or, secondary sector and tertiary activities and greater degree of urbanization. It has also revealed that the increase in the proportion of workers in infrastructural sector would be comparatively higher than the secondary sector.

It has also been observed that there exists some relationship between percentage of urban population and infrastructural development. Tentatively, it appears that both the variables are directly proportional to each other. That is, rise in urban population gives rise to infrastructural development

It has been found that with an increase in degree of urbanization there is likely decrease in the proportion of workers engaged in primary sectors (like agriculture). Instead the proportion of workers engaged in secondary and tertiary sector goes up. This phenomenon is obvious enough to need any further explanation (as a matter of fact, the very definition of the word industrialization or urbanization includes greater share of population engaged in non-agricultural sector for employment).

On the basis of correlation analysis of the road mileage density with industrial and infrastructure sectors, literacy and agricultural produce. One may

conclude that with an increase in road mileage density there may be an increase in the proportion of workers engaged in secondary (industrial) and tertiary (infra-structural) sectors. The same phenomenon could also be observed in the spheres of 'literacy' and overall agrarian growth of the state.

In case of industrial sector it has been found that in the state of Bihar with an increase in the proportion of workers in industrial and infrastructural sector, the proportion of workers engaged in primary sector goes down. On the other hand, with an increase in the proportion of workers in secondary sector, the proportion of workers in tertiary sector goes up.

In Bihar the primary sector with approximately 80 per cent of total workers is predominant. It is followed by tertiary sector and secondary sector with approximately 10.4 per cent and 8.6 per cent of the total workers respectively.

An analysis of correlation matrix of primary sector with secondary sector reveals that there is ample scope for the development of house-hold industries in areas where primary activities are predominant especially in north Bihar.

Irrigation is one of the most important factor affecting the agriculture development. An analysis

of correlation of Irrigation with the agrarian produce shows that with an increase in the proportion of gross irrigated area there is some possibility of increase in produce.

Strategy

The foregoing analysis has indicated the levels of development of different regions of the state of Bihar and highlighted the special problems pertaining therein. Now the question arises what strategy should be adopted for accelerated development of less developed regions? In the succeeding paragraphs an attempt has been made to broadly indicate the strategy to reduce the regional imbalances.

The programme for the districts of Chhotanagpur plateau should accord highest priority to the construction of roads, because in all the districts of this region the road mileage density is far below the state average, Dhanbad, Jamshedpur being the sole exception. In this region transport and communication is a factor without which no development strategy can internalize economies of scale advantage. Adequate transport facilities will assure higher income from farm products, more exploitation of forest and mineral resources and thus lead to up-coming of forest based and mineral-based industries in this region.

In the same Chhotanagpur region attempt should be made to increase per hectare yield by using high yield variety seeds, modern agriculture (equipment) implements and improved chemical fertilizers. This is crucial because of the lack of fertile soil in the region. Secondly, attempt should be made to provide better irrigation facilities as the region lacks improved irrigation facilities. Improved facilities can lead to intensive use of land and greater scope of produce.

In the districts of Palamu, Santhal Parganas and Hazaribagh a high percentage of tribes accompanied by low percentage of literacy shows their social backwardness. Therefore, in these districts attention should be given in this direction also.

In the districts of north Bihar plain pressure on land is too heavy. But simultaneously there is enough scope to establish and widen agro based industries which would not only enhance the farming on profit scale but also provide better and large employment opportunities. Secondly, the per hectare yield of the region is also not at par with that of other fertile land. Therefore, attempt should be made to increase per hectare yield of these crops in respective districts by extensive adoption of improved agricultural practices

and enhanced use of inputs. In the districts of north Bihar plain the percentage of gross irrigated area is far below the state average. Thus, assured irrigation facilities are still inadequate in this region and will have to be approved and provided on a large scale.

Floods are recurring features in the districts of North Bihar plain resulting in huge losses to crops, property and public utilities. It is quite natural that the peasant in these areas will not invest more to modernize agriculture in the face of a perpetual threat of floods. The future programme for agricultural development would be meaningless unless a comprehensive attempt is made for flood control.

The flood prevention and control programmes need to be co-ordinated with agriculture, soil and water conservation, and irrigation programmes. This region is interspersed with large number of rivers, which make communication very difficult. Large scale construction of roads and bridges are needed to increase communication facilities, which may open up the hinter-lands and quicken the implementation of development programmes of the area. The water to these rivers running to waste can be used for hydro-electric generation and irrigation facilities. The districts of north Bihar plain are also much behind the state average in educational field.

Literacy percentage is the lowest in these districts. Therefore, efforts are also required in this sphere.

The problems facing the districts of South Bihar plain are to some extent similar to north Bihar plain. For instance, in the districts of south Bihar plain pressure on land is also burdensome. The per hectare yield is below the state average in the districts of Bhagalpur, Munger, Gaya and Sahabad. They are also interspread with many rivers and suffer from frequent occurrence of floods. Thus, in the districts of south Bihar plain also the attempts should be made to overcome these problems by various measures suggested in case of north Bihar plain. Munger is the only district of south Bihar plain where percentage of gross irrigated area is below the state average. Therefore, efforts should be made to provide more irrigation facilities in this district. More attention should be given towards the construction of roads.

Thus we come to the conclusion that for an overall accelerated development of Bihar greater emphasis should be put on assured irrigation facilities, larger per hectare yield, development of agro based industries, forest based and mineral based industries, construction of roads and flood protection embankments. All this could be further enhanced by improving literacy rate.

However, it must be mentioned here that several sub-strategies have to be worked out for small pockets such as blocks of Binar, taking into account of regional differences, resource potentialities, availability of infrastructural facilities and level of development. Since the scope of this study is limited to that of population growth and economic development at district level, detailed blockwise or tehsilwise analysis has not been made. Research efforts in the direction would be worth undertaking.

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Appendix 3.1.1

Correlation of Agriculture Development, 1961

	G ₁	G ₃	G ₄	G ₈	G ₉	G ₁₀	G ₁₁	G ₁₂	G ₁₃	G ₁₄
G ₁	1.00000									
G ₃	.41313	1.00000								
G ₄	.57338	.86827	1.00000							
G ₈	.06206	.32370	.33354	1.00000						
G ₉	-.35813	-.30344	-.32984	-.16461	1.00000					
G ₁₀	.03217	.85260	-.03883	.23417	.56912	1.00000				
G ₁₁	-.07032	-.01050	-.12803	-.02220	.07717	.23364	1.00000			
G ₁₂	-.09676	-.21535	-.21476	.20379	.76835	.82833	-.06827	1.00000		
G ₁₃	-.13624	.26252	.31904	.05217	-.54602	-.37016	-.40590	-.51749	1.00000	
G ₁₄	-.19870	.63242	.44680	.06301	.24173	.35072	.09541	.16757	-.22140	1.00000

Appendix 3.1.2

Correlation of Agriculture Development, 1971

	G_1	G_3	G_4	G_8	G_9	G_{10}	G_{11}	G_{12}	G_{13}	G_{14}
G_1	1.00000									
G_3	.16234	1.00000								
G_4	.27888	.98634	1.00000							
G_8	.20090	-.15029	-.14995	1.00000						
G_9	-.29001	.00852	-.03925	-.06442	1.00000					
G_{10}	-.13583	.44300	.38520	-.16147	.57767	1.00000				
G_{11}	-.50008	-.10373	-.14849	-.21508	.33939	.24783	1.00000			
G_{12}	.04787	.10032	.06689	.15403	.71218	.49622	.11146	1.00000		
G_{13}	-.25086	-.29230	-.29595	.11648	-.39272	-.45403	-.28548	-.43983	1.00000	
G_{14}	-.32661	.41930	.34166	-.07889	.23433	.25983	.58812	.12182	-.58812	1.00000

Appendix 3.1.3

Correlation of Agriculture Development, 1981

	G ₁	G ₃	G ₄	G ₈	G ₉	G ₁₀	G ₁₁	G ₁₂	G ₁₃	G ₁₄
G ₁	1.00000									
G ₃	-.06949	1.00000								
G ₄	-.06967	.98517	1.00000							
G ₈	-.25794	.17245	.11836	1.00000						
G ₉	-.15398	.11991	.06412	.71852	1.00000					
G ₁₀	-.10864	.17522	.11248	.79984	.87868	1.00000				
G ₁₁	-.22155	.26521	.21346	.87229	.71491	.75922	1.00000			
G ₁₂	.12520	.09723	.05550	.53054	.77961	.78119	.54301	1.00000		
G ₁₃	-.42733	-.26895	-.29368	-.44399	-.47224	-.52449	-.56566	-.47680	1.00000	
G ₁₄	-.33987	.51907	.43896	.21400	.23930	.18103	.49777	.11813	-.42794	1.00000

Appendix 3.2.1

Correlation of Industrial Development, 1961

	G_2	G_5	G_6	G_{17}	G_{18}	G_{25}	G_{26}
G_2	1.00000						
G_5	.33250	1.00000					
G_6	.30912	.99683	1.00000				
G_{17}	.24546	.57570	.53755	1.00000			
G_{18}	-.39581	.32490	.37443	.12295	1.00000		
G_{25}	.26685	.69620	.70687	.69932	.66750	1.00000	
G_{26}	.23122	.67344	.69179	.64072	.71688	.99504	1.00000

Appendix 3.2.2

Correlation Matrix of Industrial Development 1971

	G ₂	G ₅	G ₆	G ₁₆	G ₁₇	G ₁₈	G ₂₅	G ₂₆	G ₃₈	G ₃₉
G ₂	1.00000									
G ₅	.08243	1.00000								
G ₆	-.06468	.98339	1.00000							
G ₁₆	-.03460	.41242	.55692	1.00000						
G ₁₇	.20154	.19324	.14737	-.18738	1.00000					
G ₁₈	-.25491	.73561	.68928	.29380	.10764	1.00000				
G ₂₅	-.20816	.75479	.70289	.24260	.35436	.96347	1.00000			
G ₂₆	-.19475	.78858	.76000	.36125	.32963	.95656	.99066	1.00000		
G ₃₈	-.36082	.59389	.60520	.33908	.64560	.59836	.72559	.75769	1.00000	
G ₃₉	-.25936	.59087	.60852	.34665	.65748	.55398	.69680	.73422	.99209	1.00000

Appendix 3.2.3

Correlation Matrix Industrial Development 1981

	G ₂	G ₅	G ₆	G ₁₆	G ₁₇	G ₁₈	G ₂₅	G ₂₆	G ₃₈	G ₃₉
G ₂	1.0000									
G ₅	-.01275	1.0000								
G ₆	.01900	.99618	1.0000							
G ₁₆	.06058	.71035	.72740	1.0000						
G ₁₇	-.30937	.07548	.02591	-.08996	1.0000					
G ₁₈	-.28102	.74389	.71994	.45591	.20020	1.0000				
G ₂₅	-.18314	.75647	.72982	.47006	.39277	.96454	1.0000			
G ₂₆	-.15917	.76794	.74829	.49845	.34968	.96430	.99642	1.0000		
G ₃₈	-.25704	.60956	.60065	.60755	.34524	.71656	.75960	.76380	1.0000	
G ₃₉	.01452	.62740	.63185	.67652	.25729	.62695	.70280	.71809	.95735	1.0000

Appendix 3.3.1

Correlation Matrix Infrastructure Development 1961

	G_{33}	G_{34}	G_{35}	G_{36}	G_{37}	G_7	G_{20}	G_{21}	G_{22}
G_{33}	1.00000								
G_{34}	-.80962	1.00000							
G_{35}	-.79908	.96167	1.00000						
G_{36}	-.77049	.63959	.63073	1.00000					
G_{37}	-.58158	.49373	.61654	.41982	1.00000				
G_7	.26482	-.08565	-.22758	.04165	-.42734	1.00000			
G_{20}	-.10154	.11574	-.02773	.35349	-.11189	.58393	1.00000		
G_{21}	.04158	.09431	.02021	.11679	-.03072	.41421	-.00292	1.00000	
G_{22}	-.34736	.45691	.40002	.53163	.30502	.22089	.77346	-.13196	1.00000

Appendix 3.3.2

Correlation Matrix Infrastructure Development 1971

	G_{33}	G_{34}	G_{35}	G_{36}	G_{37}	G_7	G_{20}	G_{21}	G_{22}
G_{33}	1.00000								
G_{34}	-.52325	1.00000							
G_{35}	-.40839	.73375	1.00000						
G_{36}	-.41225	.57236	.64995	1.00000					
G_{37}	-.11069	.69422	.82654	.53658	1.00000				
G_7	-.30227	.31576	.40538	.17877	.23589	1.00000			
G_{20}	-.23347	.52959	.44891	.24825	.48898	.72863	1.00000		
G_{21}	-.28679	.84220	.79204	.41232	.79940	.49655	.67963	1.00000	
G_{22}	-.24286	.74820	.60677	.50148	.65332	.53821	.82359	.70146	1.00000

Appendix 3.3.3

Correlation Matrix Infrastructure Development 1981

	G_{33}	G_{34}	G_{35}	G_{36}	G_{37}	G_7	G_{20}	G_{21}	G_{22}
G_{33}	1.00000								
G_{34}	-.69884	1.00000							
G_{35}	-.51446	.59051	1.00000						
G_{36}	-.31018	.68088	.24961	1.00000					
G_{37}	.03641	-.00658	.33467	-.16227	1.00000				
G_7	-.53757	.55744	.36414	.51114	.02349	1.00000			
G_{20}	-.58275	.84956	.47585	.84149	-.11303	.72459	1.00000		
G_{21}	-.48064	.87165	.60580	.60148	-.06799	.50976	.76394	1.00000	
G_{22}	-.31790	.75490	.44505	.86666	-.02961	.56395	.89446	.82494	1.00000

Appendix 4.1

Correlation Analysis of Development Indices and Population, 1961

	FAGRI	FINDSI	FINDSI	CINDXI	X ₁₃	X ₁₄	X ₁₅	X ₁₆	X ₁₇
FAGRI	1.0000								
FINDSI	.1153	1.0000							
FINFISI	-.0616	.1871	1.0000						
CINDXI	.2587	.8088	.6894	1.0000					
X ₁₃	.2389	-.2603	.1045	-.0545	1.0000				
X ₁₄	-.2702	.3854	-.3344	.0093	-.4876	1.0000			
X ₁₅	.1727	.1228	-.4975	.1663	-.4869	.5248	1.0000		
X ₁₆	-.4271	.4121	.6851	.5810	-.0508	.0759	-.1759	1.0000	
X ₁₇	-.1415	.4877	.8814	.8070	.0582	-.1392	-.5324	.7747	1.0000

Appendix 4.2

Correlation Analysis of Development Indices and
Population 1971

	FAGRI	FINDSI	FINFSI	CINDXI	X ₁₃	X ₁₄	X ₁₅	X ₁₆	X ₁₇
FAGRI	1.0000								
FINDSI	-.2843	1.0000							
FINFSI	-.3161	.8307	1.0000						
CINDXI	-.5497	.9191	.9286	1.0000					
X ₁₃	-.1638	-.0098	.1839	.1253	1.0000				
X ₁₄	.6776	-.3237	-.2452	-.4468	-.4895	1.0000			
X ₁₅	-.0874	-.4805	-.4336	-.3963	-.39776	.2815	1.0000		
X ₁₆	.0137	.7112	.7654	.6753	-.0767	.0928	-.2087	1.0000	
X ₁₇	-.3192	.9216	.9432	.9448	.0901	-.2394	-.4995	.7402	1.0000

Appendix 4.3

Correlation Analysis of Development
Indices and Population, 1981

	FAGRI	FINDSI	FINFSI	CINDXI	X ₁₃	X ₁₄	X ₁₅	X ₁₆	X ₁₇
FAGRI	1.0000								
FINDSI	-.4239	1.0000							
FINFSI	.0041	.7404	1.0000						
CINDXI	-.4755	.9631	.8353	1.0000					
X ₁₃	.2554	.0603	.3971	.1449	1.0000				
X ₁₄	.7470	-.3519	.0933	-.3328	.2745	1.0000			
X ₁₅	-.1865	.3610	-.4704	-.3521	-.4119	.1313	1.0000		
X ₁₆	.1304	.6511	.7905	.6618	.0133	.0689	-.2663	1.0000	
X ₁₇	-.1979	.8811	.9348	.9310	.1854	-.1423	-.4410	.8031	1.0000